TOEROEK ASSOCIATES, INC.

Bonita Peak Mining District Site

Site Research Summary for
Kittimac Mill and Tailings

March 14, 2017

I. Introduction

On June 29, 2016, Toeroek Associates, Inc. (Toeroek) received Task Order (TO) No. 8001 from the U.S. Environmental Protection Agency (EPA), Region 8, under Superfund Enforcement Support Services Contract EP-S9-16-01. (b) (5), (b) (7)(A) [redacted]

The PRP investigations are focused in scope, and do not include full chain of title research. Findings from these abbreviated PRP reports include associated facility mining claim boundaries, current ownership information, and focused operational and corporate histories.

This report identifies PRPs that owned or operated the Kittimac mill, 1 of the 48 mining-related facilities being investigated under this TO. Figure 1 shows the location of the Kittimac mill and the delineation of the Upper Animas Watershed, which generally corresponds to the Site area approximately 140 square miles of the Silverton, Colorado volcanic caldera.

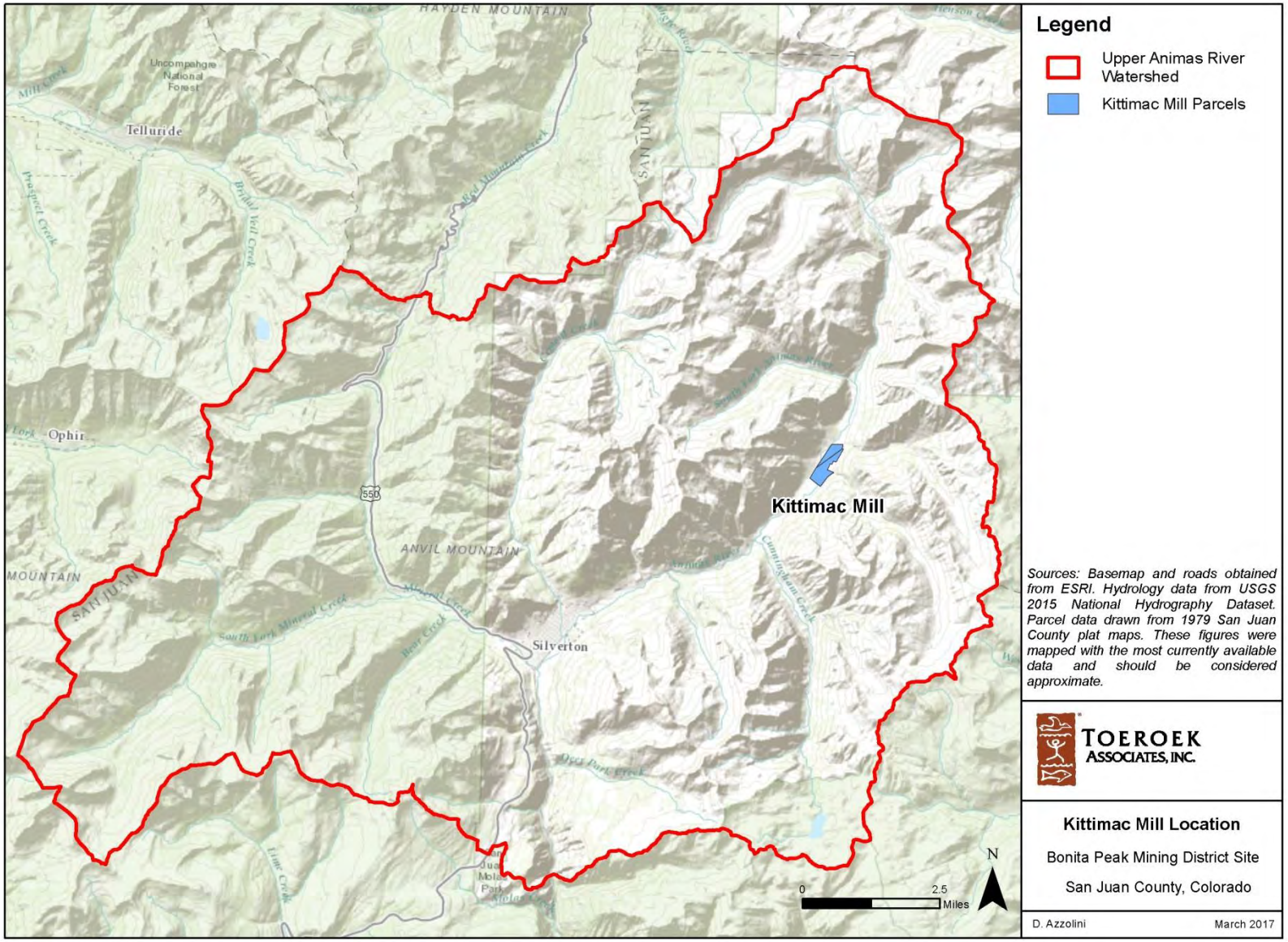

Figure 1: Kittimac Mill Location Map

II. Methodology and Format

CERCLA Section 107(a) imposes liability (1) on current owners or operators of a facility where hazardous substances have been deposited, and (2) on any person or entity who at the time of disposal of hazardous substances owned or operated a facility where hazardous substances were deposited. Sources of information for the abbreviated PRP search investigations are limited to publically available operational records and online current ownership records obtained from the San Juan County Assessor's Office (b) (5), (b) (7)(A)

The PRPs discussed in this report were identified through the review of records obtained from, but not limited to, the following sources: Colorado Bureau of Mines (CBM) annual publications and operator reports; United States Geological Survey (USGS) published reports and bulletins; various university and public historical record databases; and online records obtained from the San Juan County Assessor's Office.

Toeroek reviewed the data sources described in Table 1 for the purpose of identifying the ownership and operational history of the Kittimac facility. Toeroek conducted a data review to determine: 1) a general facility history that includes location, operations, and hazardous waste contamination; 2) patented mining claims associated with the facility; 3) information regarding past and current ownership; and 4) PRPs associated with the mining facility.

Table 1: Data Sources Reviewed

Abbreviation	Data Source	Record Description
BLM	Bureau of Land Management	Historical plat maps and patented claim information obtained from the General Land Office records website.
CBM	Colorado Bureau of Mines	Published annual reports by the Colorado Bureau of Mines and inspection reports conducted by agency geologists and/or facility operators obtained from the Colorado State Archives.
CSM	Colorado School of Mines	Records obtained from sources collected at the Colorado School of Mines Library.
DPL	Denver Public Library	Records and photographs obtained from the Denver Public Library Digital Collections website.
DRMS	Colorado Division of Reclamation, Mining, and Safety	Records obtained from the DRMS-imaged document database containing mining permit files and previous site investigation reports.
GDOC	Google Historical Online Databases	Historical published documents that are stored within Google Books, Google Scholar, and Google News Archive.
NEWS	Colorado Historical Newspaper Collection	Historical Colorado newspaper articles published prior to 1922.
NEXIS	Nexis®	Public corporate and individual records obtained from the Nexis® Public Records Database.

Table 1: Data Sources Reviewed		
Abbreviation	**Data Source**	**Record Description**
SCA	San Juan County Assessor's Office	Online property records obtained from the San Juan County Assessor's Office.
SOS	Secretary of State	Online records obtained from various Secretary of State websites.
UCL	University of Colorado Boulder Library	Historical records obtained from Archives and Special Collections at the University of Colorado Boulder Library.
USGS	United States Geological Survey	Records obtained from the USGS library located in Denver, Colorado and from publications stored on its online publications warehouse repository.

References to the numbered evidentiary documents within this report are made by a document number in parentheses following the sentence(s) to which the reference applies. The document number generally consists of a letter prefix followed by a number. The prefix abbreviation indicates the general source of the document and the numbers are sequential.

III. Research Findings: Kittimac Mill

A. Facility Description

San Juan County is in southwestern Colorado, encompassing approximately 388 square miles within the central San Juan Mountains (SCA-00171). Cycles of geological uplift, subsidence, and glaciation contribute to the undulating terrain of the region. The Animas River valley is a distinct drainage path between Silverton and the abandoned town of Animas Forks. The Animas River flows southwest through the valley and meets with Mineral Creek just south of Silverton (INT-00006, pp. 6-7).

The Kittimac mill and associated tailings impoundment are situated on John H. French Placer in the Eureka mining district. The John H. French Placer is located in Sections 30 and 31, Township 42 North, Range 6 West, and Section 36, Township 42 North, Range 7 West of the New Mexico Prime Meridian (SCA-00152; SCA-00153; SCA-00162). The impoundment location is Latitude 37.85822, Longitude107.57155; and the mill location is Latitude 37.85987, Longitude 107.56930 (USGS-00081, p. 32).

Historically, the mill was used to treat ore from the Kittimac mine. A tram was installed in 1907 to transport ore from the mine to the mill, which was situated at a point along the railroad to Silverton (USGS-00075, pp. 13, 16). Figure 2 is an historical topographic map published by U.S. Geological Survey (USGS) in 1955 showing the tram between Kittimac mine and mill. The red line was added to the figure to enhance the original map feature that shows the direction and extent of the Kittimac aerial tramway. The label on the aerial tramway notes that it was abandoned as of 1955.

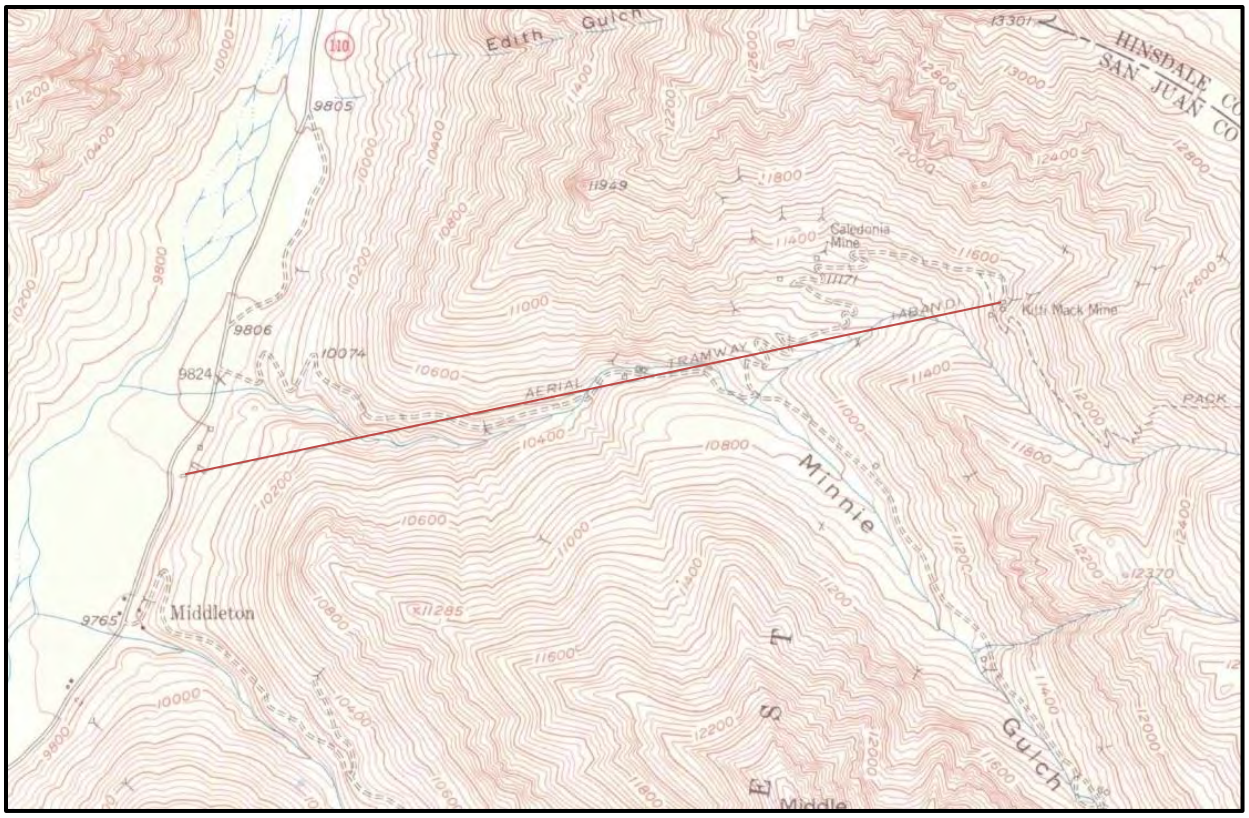

Figure 2: USGS Topographic Map with the Kittimac Aerial Tramway, 1955 (USGS-00078)

The historical Kittimac mill is located east of the Animas road (Colorado Road 2). According to a USGS inventory of mills and tailings in the upper Animas River watershed conducted in 2000, the mill structure is in ruins. The Kittimac tailings are yellowish milling byproduct situated adjacent to the river and southwest of the mill ruins. These tailings comprise the largest impoundment of un-reclaimed tailings in the area (USGS-00076, p. 14). The tailings are piled on tens of acres of alluvial gravels. This location on the Animas flood plain makes the tailings vulnerable to erosion in extreme storms. Additionally, seepage from the tailings can travel directly into the Animas River with little or no chance for natural attenuation (USGS-00074, p. 17). Figure 3 is a photograph of the tailings impoundment. The photograph, taken facing west, shows the tailings spread across the flood plain.

Figure 3: Kittimac Tailings, Upper Animas River Flood Plain (USGS-00074, p. 17)

B. Current Owners

Toeroek obtained current ownership information for patented Kittimac mill claims through San Juan County Assessor online records. Kittimac mill claims were determined based on historical descriptions and operational maps of the mill site and surrounding tailings.

Table 2 lists the properties and current owner information associated with the Kittimac mill and tailings. Figure 5 is a Kittimac mill parcel boundaries map. Due to survey discrepancies among BLM and San Juan County plat maps, adjacent mining claims boundaries have been provided. Parcel boundaries and adjacent mining claims were georeferenced to multiple points that include current building structures and geological features.

Table 2: Current Owner Information

Kittimac Claim - Mineral Survey No.	Parcel No.	Current Owner	Current Address	Source
John H. French Placer - 45	47730310050022	(b) (6) [redacted]	[redacted]	SCA-00152; NEXIS-00052
John H. French Placer - 45	47730310050021	(b) (6) [redacted]	Residential (b) (6) [redacted] Mailing (b) (6) [redacted]	SCA-00153; NEXIS-00053

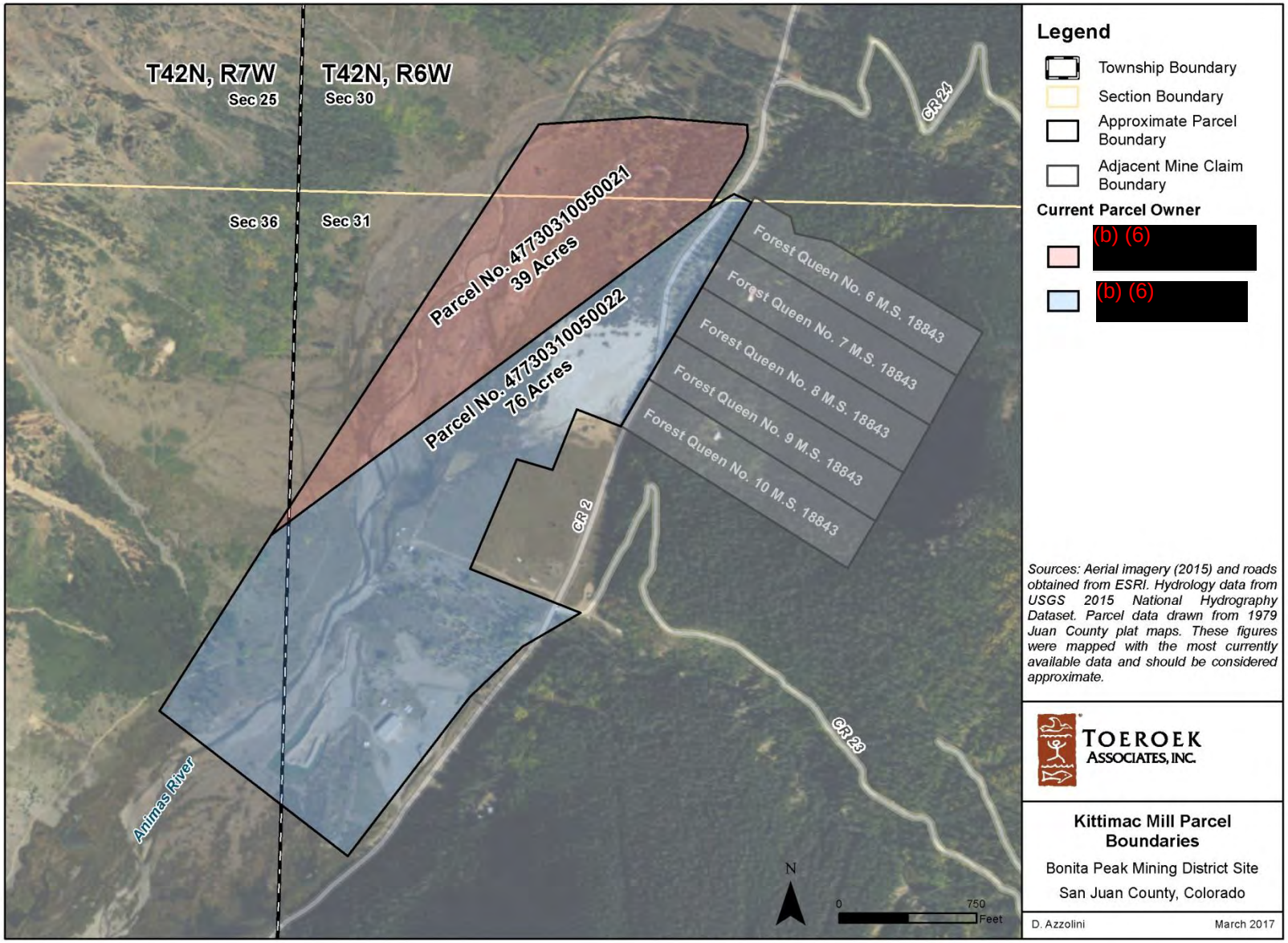

Figure 5: Kittimac Mill Parcel Boundaries Map

C. Operations

According to *Silverton Standard* articles published in 1908, initial construction of the Kittimac mill began in May of that year and continued through the summer (NEWS-00042, p. 1; NEWS-00043, p. 1). A 1908 USGS publication states that Kittimac Mines Company constructed the concentration mill in conjunction with operations at the Kittimac mine (USGS-00004, p. 3). An aerial tramway was also constructed to transport ore from the mine to the mill (USGS-00075, p. 16).

By 1911, the mill had the capacity to process ore at a rate of 50 to 100 tons per day (USGS-00007, p. 4). Despite having the capacity to treat considerable amounts of ore, Kittimac Mines Company struggled to maintain its profitability. Kittimac Mines Company was financially unstable, and its mill equipment was ineffective at treating the complex ores from the mine (INT-00006, p. 146).

In 1912, *Silverton Standard* announced plans for an expansion of the Kittimac mill. The newspaper reported that the "Kittimac company" planned the extension in conjunction with the development of cyanidation and electrostatic milling techniques. By introducing these techniques to the milling process, the company aimed to extract greater amounts of gold and silver (NEWS-00045, pp. 1, 4).

According to *Silverton Standard*, the work of remodeling the mill and installing new machinery began in May 1914 (NEWS-00046, p. 1). A CBM inspector's report, dated September 18, 1915, states, "The Kittimac Mine of Silverton is about to start up. (b) (6) of Silverton is Manager. They are installing, in their mill, a Huff Static ore Separators and an Oil Floatation unit" (CBM-00308). In September of the following year, the *Silverton Standard* reported that J. M. Hyde was operating a flotation machine, and a complete overhaul of the old crushing mill was in progress (NEWS-00048).

In 1916, Kittimac Mining & Milling Company was organized to lease the Kittimac property and take over operations at the mill. (b) (6) was hired to run the mill and improve the flotation process (INT-00006, p. 146).

In 1917, ore quality began to decrease, and the Kittimac Mining & Milling Company defaulted on its debts to Kittimac Mines Company shortly thereafter (INT-00006, p. 146). Daniel B. Carey, president of Kittimac Mines Company, reported to CBM that the mill went idle in June 1917 (CBM-00251). A brief account of the Kittimac mine and mill detailed the decline of Kittimac Mining & Milling Company:

> According to Mr. (b) (6), the local attorney since 1906, who was well acquainted with all the mines and mine operators of the district at the time, the managers of the Kittimac were extravagant and inexperienced, and consequently found themselves in financial difficulties. In about 1916, bonds were formed to raise funds for their operations, and in 1917, full payments not having been made on the bonds, the bondholders had a receiver appointed, and the mine was closed (USGS-00080, p. 5).

In 1921, a group of Pennsylvania investors organized the San Juan Consolidated Mining & Milling Company to lease the Kittimac mine and mill properties (INT-00006, p. 146; GDOC-00012, p. 3). A CBM inspector's report, dated October 12, 1921, reported that the San Juan Consolidated Mining & Milling Company conducted minor rehabilitation and exploration on the Kittimac properties (CBM-00241).

In 1931, (b) (6) attempted to re-start operations at Kittimac mine and mill by organizing the Kittimac Gold Mining Company. The mine and mill facilities were reportedly in such poor condition that no operations were conducted (UCL-00001, p. 9).

In the mid-1930s, (b) (6) of Denver organized the Lone Wolf Mining Company in order to take title, explore, and resume operations on the Kittimac properties. Kittimac mine properties were said to have reverted back to the public domain, and that the mill was in receivership (UCL-00001, p. 3).

An undated letter from a manager of the Lone Wolf Mining Company stated that the Kittimac mill had been "a complete failure" in previous operations. After testing mill tailings for metal content, the manager determined that wasterock contained high metal concentrations, suggesting that previous Kittimac milling process did not yield an adequate output of valuable metals. Lone Wolf Mining Company planned to rehabilitate the mill in order to extract higher metal concentrations from the mill dump (CBM-00242, p. 3).

Although the Lone Wolf Mining Company manager detailed his exploration and testing at Kittimac mine and mill, no subsequent documentation was found to indicate that Lone Wolf Mining Company actually operated the mill. The Colorado State Archives did not have any CBM reports recorded between 1922 and 1944 concerning the Kittimac mill, which suggests that the mill may not have been operational during that period.

Figure 6 is a photograph taken in 1942 showing the Kittimac mill built on timbered slopes. The broken windows and overgrowth of vegetation indicate that mill was vacant in 1942.

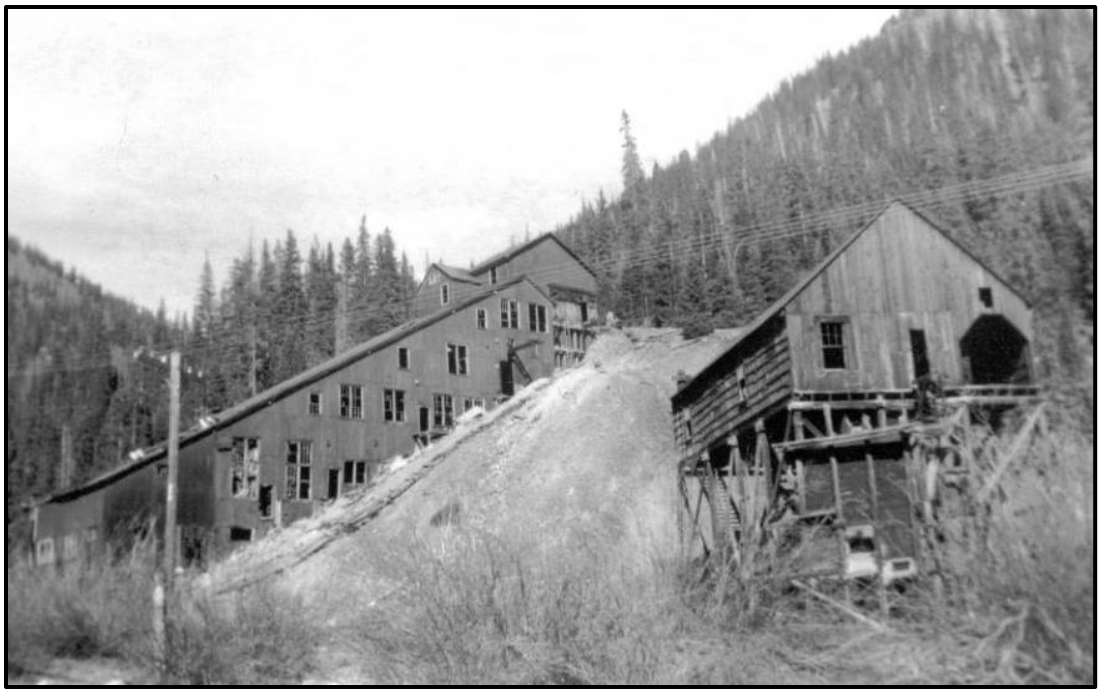

Figure 6: Abandoned Kittimac Mill, 1942 (DPL-00012).

In 1944, the American Smelting and Refining Company (ASARCO) showed interest in the Kittimac property, sending engineers to examine it. The engineers mapped the property and took 16 samples from stopes and veins in the mine. ASARCO abandoned its Kittimac project and no additional information was found to suggest that ASARCO conducted operations at the mill (USGS-00080, p. 5, 125).

On February 4, 1945, Kittimac Mining Company reported to CBM that it owned the Kittimac properties. The unpatented Kittimac properties were listed as follows:

> "8 Isabella claims; 14 Monitor; 4 Calibers; 1 Little Joe; 9 Forest Queens; 5 Iron; 1 Iron Dump; Detroit; Globe; Liverpool; Michigan; Grand Rapids; New York; Chicago; Ann Arbor; Durango; Pittsburg; Lake City; Silverton; French Placer and many others."

Kittimac Mining Company stated that it was incorporated in Colorado and its receiver was William A. Way. The company leased the Kittimac properties to (b) (6) [redacted], who initially operated the mine from August 7, 1944 to December 2, 1944. Kittimac Mining Company stated that the properties did not have a mill or reduction works at the time (CBM-00248).

A CBM operator's report for the year 1945 states that McCullough had leased the Kittimac properties from Kittimac Mining Company and had operated both the mine and the mill for a

total of 150 days. McCullough's operations included milling 211 tons of ore containing gold, lead, copper, silver, zinc, and iron through flotation processes (CBM-00247).[1]

(b) (6) reportedly leased and operated the Kittimac mine in 1948, but no milling was conducted that year (CBM-00246). Kittimac Mining Company continued to own the Kittimac properties in 1951, but (b) (6) was not identified as a lessee for that year.[2] In a CBM operator's report for the year 1951, Kittimac Mining Company states that the Kittimac properties were non-producing and did not have a mill or reduction works (CBM-00245).

In June 1956, (b) (6) obtained a lease on the Kittimac mine. He then transferred the lease agreement to a syndicate, which had organized to reopen the mine. The syndicate drilled three diamond drill holes and based on the results of the drilling, determined that it would not continue to operate the facility. Although the syndicate terminated operations, (b) (6) signed a new five-year lease on the mine in October 1956 (USGS-00080, p. 6).

In November 1956, "(b) (6), d.b.a. Kittimac Mining Co.," applied to United States Department of the Interior Defense Minerals Exploration Administration (DMEA) for funds for an exploration project on the property. (b) (6) listed "O. W. Bentley and Associates" as his partner (USGS-00080, p. 4). When (b) (6) filed the application, he believed the mine could be rehabilitated for ore production, but noted "[t]he mill and tramway are wrecked and are not an asset" (USGS-00080, p. 120).

(b) (6)'s application to the DMEA provides various historical records that include title conveyances, mineral assays, equipment identification, and maps of the Kittimac mine. In correspondence between the DMEA and (b) (6), the DMEA called into question (b) (6)'s ownership of Kittimac properties, and whether or not third parties held any possessory interests. After DMEA requested additional requirements from (b) (6) to process its application, (b) (6) withdrew from the DMEA program on February 17, 1959 (USGS-00080, pp. 44-46, 60-74).

(b) (6) reported to CBM as lessee of the Kittimac properties for the year 1957. He stated that the mine produced 34.3 tons of crude ore and 140.17 tons of milling ore that year. Crude ore was shipped directly to an off-site smelter, and "milling ore" was shipped to the Pride of the West mill (CBM-00244).

(b) (6) filed the most recent Kittimac operator's report with CBM in November 1963. (b) (6) reported that MacPherson Drilling Co. was leasing the Kittimac properties

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[1] (b) (6) states in its 1945 CBM operator report that the mill on the leased property was identified as "Delaputed" (CBM-00247). It is possible that the intended word was "dilapidated," as the mill had been idle since the 1920s.

[2] (b) (6), signatory to the 1951 CBM operator's report for Kittimac Mines Company, reported that the company also possessed 86 unpatented mining claims associated to the Kittimac mine group (CBM-00245).

from United States Minerals Corporation, and that the purpose of the lease was to conduct diamond core drilling. No milling operations were reported for that year (CBM-00243).

It is likely that any reported operations on the Kittimac properties for the period after 1945 did not pertain to milling activities. In 1956, amateur historian, Howard Campbell, visited the site of the Kittimac mill. When writing about the mill and the aerial tramway, Campbell stated, "Disintegration of all these structures was already well advanced at the time . . ." (UCL-00001, p. 2).

Campbell returned to the Kittimac mill site several times between 1957 and 1978 to document deterioration of the structures (UCL-00001, p. 11). Figure 7 is a photograph of Kittimac mill taken by Campbell in 1957. The photograph is evidence of the mill's abandonment and deterioration. Figure 8 is a photograph taken by Campbell in 1978 showing further deterioration of the mill structure.

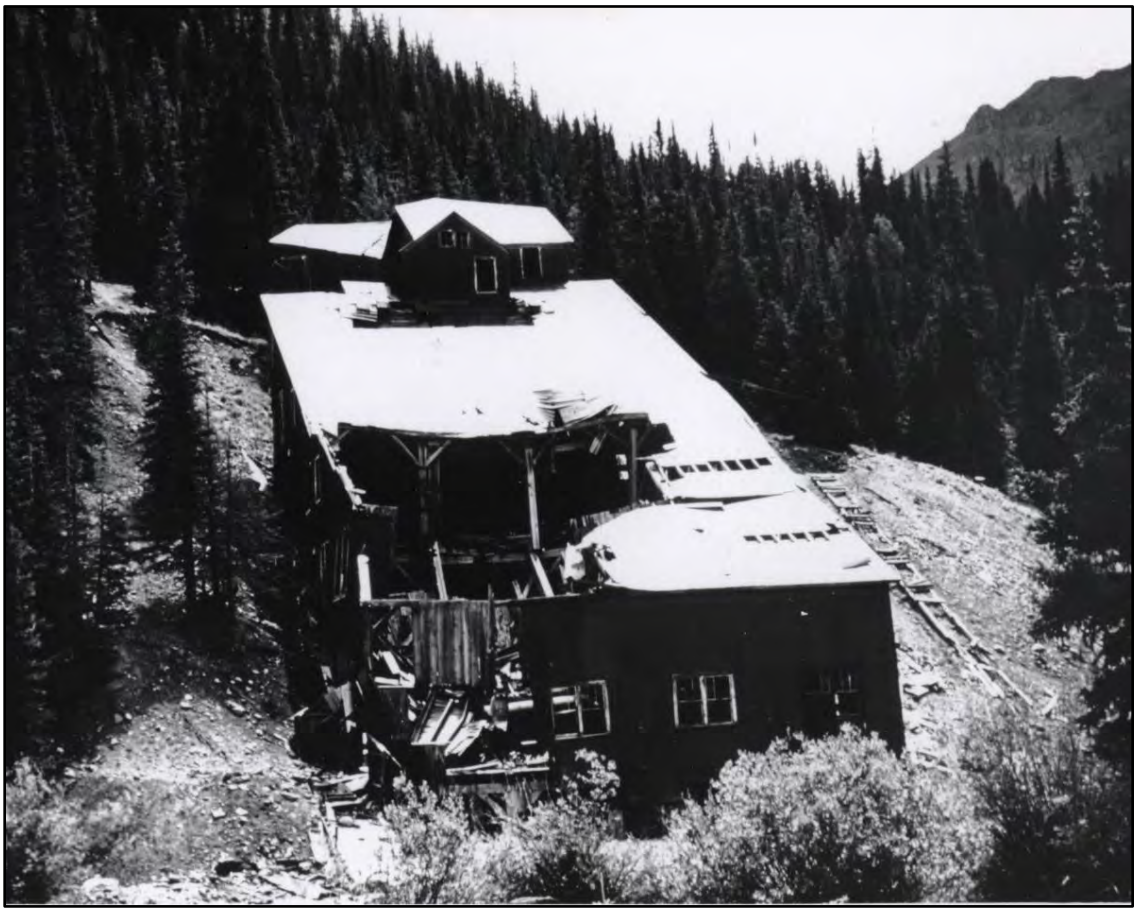

Figure 7: Kittimac Mill in 1957 (UCL-00003).

Figure 8: Kittimac Mill in 1978 (UCL-00004).

Online San Juan County Assessor records show that United States Minerals Corporation conveyed 76.88 acres of the John H. French Placer to (b) (6) and (b) (6) via a Warranty Deed on December 17, 1993 (SCA-00152, p. 2).

Between 1995 and 1999, USGS inventoried and sampled inactive mine-related sites in the Animas River watershed. A report of the findings described the Kittimac tailings as 23,000 cubic yards of mine waste within a 35,000-square-meter area. The tailings were measured at a location of 67 meters from the upper Animas River (USGS-00081, p.45). A report summarizing sampling at the Kittimac tailings impoundment in 1997 and 1998 recommended remediation of the impoundment (USGS-00082).

According to records available online from the San Juan County Assessor, several companies owned the Kittimac mill property after the United States Minerals Corporation conveyed the property in 1993; however, no further records were found indicating that the past owners conducted operations at the Kittimac mill. Further discussion of past ownership and corporate status can be found in the Potentially Responsible Parties section below.

In 2000, USGS published an Open-File Report on mines, dumps, and tailings as sources of contamination in the Upper Animas River watershed. The Kittimac mill tailings were surveyed and identified as the largest impoundment of un-reclaimed tailings in the upper Animas River watershed (USGS-00076, p. 14).

D. Potentially Responsible Parties (PRPs)

Information on corporate and individual PRPs is summarized below in Table 3. The table lists both past and current corporate and individual owners / operators in chronological order based on their period of association with the Kittimac mill facility. Toeroek has assumed, for purposes of this report, that any individuals associated with the property prior to 1955 are deceased. For those individuals associated with the Site after 1955, Nexis public records searches were conducted to verify current residences. The addresses of these individuals, when available, are provided in the table. Following Table 4 are corporate history narratives for all Kittimac mill past and current corporate owners and operators.

Table 3: PRP Summary Table for Kittimac Mill and Tailings

PRP	Association to Facility	Known Year(s) of Activity	Status	Source
Kittimac Mines Company	Past Owner/ Operator	1908-1918	Bankrupt	INT-00006, p. 146; GDOC-00012; CBM-00251; USGS-00004, p. 3
(b) (6)	Past Operator	1915-1917	Presumed deceased	INT-00006, p. 146; NEWS-00048
Kittimac Mining & Milling Company	Past Operator	1916-1917	Bankrupt	INT-00006, p. 146; GDOC-00012, p. 3
San Juan Consolidated Mining & Milling Company	Past Operator	1921-1922	Unknown	INT-00006, p. 146; GDOC-00012; CBM-00241; CBM-00250
Lone Wolf Mining Company	Past Operator	Mid-1930s	Unknown	UCL-0001, p. 3; CBM-00242
(b) (6)	Past Operator	1944-1948	Presumed deceased	CBM-00248; CBM-00247; CBM-00246
Kittimac Mining Company	Past Owner	1944-1957	Unknown	CBM-00248; CBM-00247; USGS-00080

Table 3: PRP Summary Table for Kittimac Mill and Tailings				
PRP	**Association to Facility**	**Known Year(s) of Activity**	**Status**	**Source**
(b) (6) [redacted]	Past Operator	1957	Deceased	CBM-00244; NEXIS-00054; USGS-00080
MacPherson Drilling Co.	Past Operator	1962	Unknown	CBM-00243
United States Minerals Corporation	Past Owner	1962-1993	Void / Tax Delinquent	CBM-00243; SCA-00152
(b) (6) [redacted]	Past Owner	1993-2003	(b) (6) [redacted]	SCA-00152; NEXIS-00055
Great Divide Mining and Milling Corporation	Past Owner	Unknown-1999	Administratively dissolved	SCA-00153; COSOS-00080
(b) (6) [redacted]	Current Owners	1999-present	(b) (6) [redacted]	SCA-00153; NEXIS-00053
K2 Enterprises, LLC	Past Owner	June 27, 2003[3]	Delinquent	SCA-00152; COSOS-00077
C.W.M. and Associates, Inc. (a/k/a C.W.M. Inc.)	Past Owner	2003-2004	Delinquent	SCA-00152; COSOS-00072; TITLE-00013; TITLE-00014
(b) (6) [redacted]	Current Owners	2004- present	(b) (6) [redacted]	SCA-00152; NEXIS-00052

The following past and current corporate owners and operators were identified through operational research and San Juan County Assessor online records. Corporate research with the Colorado Secretary of State was conducted for all companies listed in the PRP Summary Table. Corporate records for companies found to be dissolved or declared defunct prior to 1975 require microfilm searches at the Colorado State Archives and were not performed. Party information is provided in chronological order based on the entity's period of association with the Kittimac facility, first addressing the past corporate owners and operators followed by the current owners. No current operator was identified through this investigation.

[3] Online San Juan County Assessor records show that (b) (6) [redacted] conveyed a portion of the Kittimac mill property to K2 Enterprises, LLC on June 27, 2003. Immediately following the conveyance, K2 Enterprises, LLC conveyed the same property to C.W.M., Inc. (SCA-00152). (b) (6) [redacted] is identified as the Manager of K2 Enterprises, LLC (TITLE-00013).

1. Past Corporate PRPs

PRP:	Kittimac Mines Company
PRP Class:	Past Owner/ Operator
Status:	Bankrupt
Current Address:	n/a
State of Formation:	Unknown
Known Period of Activity:	1908-1918

CBM documents state that Kittimac Mines Company was incorporated in Wyoming (CBM-00251). A 1922 *Mines Handbook* indicates that Kittimac Mines Company went bankrupt in 1917, and then reorganized as the Kittimac Mining & Milling Company, subsequently acquiring title to the Kittimac mine and mill. The company failed to make the Kittimac mill a success, and shortly thereafter the mine and mill shut down and the company went into bankruptcy (GDOC-00012).

The Colorado Secretary of State and Wyoming Secretary of State websites do not contain corporate information for a company named "Kittimac Mines Company."

PRP:	Kittimac Mining & Milling Company
PRP Class:	Past Operator
Status:	Bankrupt
Current Address:	n/a
State of Formation:	Unknown
Known Period of Activity:	1916- 1917

A 1922 *Mines Handbook* indicates that Kittimac Mines Company went bankrupt in 1917, and then reorganized as the Kittimac Mining & Milling Company, subsequently acquiring title to the Kittimac mine and mill. The company failed to make the Kittimac mill a success, and shortly thereafter the mine and mill shut down and the company went into bankruptcy (GDOC-00012).

The Colorado Secretary of State website does not contain corporate information for a company named "Kittimac Mining & Milling Company."

PRP:	San Juan Consolidated Mining & Milling Company, Inc.
PRP Class:	Past Operator
Status:	n/a
Current Address:	n/a
State of Formation:	Unknown
Known Period of Activity:	1921-1922

The Colorado Secretary of State website does not contain corporate information for a company named "San Juan Consolidated Mining & Milling Company." In 1922, The Mines Handbook reported that the "San Juan Consolidated Mine & Milling Company" of Pittsburgh had been organized to take over Kittimac property (GDOC-00012, p. 3). The Pennsylvania Secretary of State website did not have records available for San Juan Consolidated Mining & Milling Company.

Further research at the Colorado State Archives is required to determine the PRP's corporate status.

PRP:	**Lone Wolf Mining Company**
PRP Class:	Past Operator
Status:	n/a
Current Address:	n/a
State of Formation:	Unknown
Known Period of Activity:	Mid-1930s

The Colorado Secretary of State website does not contain corporate information for a company called "Lone Wolf Mining Company."

Further research at the Colorado State Archives is required to determine the PRP's corporate status.

PRP:	**Kittimac Mining Company**
PRP Class:	Past Owner
Status:	n/a
Current Address:	n/a
State of Formation:	Unknown
Known Period of Activity:	1944-1957

According to a 1957 CBM inspector's report, Kittimac Mining Company was an Arizona company (CBM-00244). The Colorado Secretary of State and Arizona Corporation Commission websites do not contain corporate information for a company named "Kittimac Mining Company."

Further research at the Colorado State Archives is required to determine the PRP's corporate status.

PRP:	MacPherson Drilling Co.
PRP Class:	Past Operator
Status:	n/a
Current Address:	n/a
State of Formation:	Unknown
Known Period of Activity:	1962

CBM documents state that MacPherson Drilling Co. operated diamond core drilling at Kittimac (CBM-00243). The Colorado Secretary of State website does not contain corporate information for a company named "MacPherson Drilling Co."

Further research at the Colorado State Archives is required to determine the PRP's corporate status.

PRP:	United States Minerals Corporation
PRP Class:	Past Owner
Status:	Void / Tax Delinquent
Current Address:	Registered Agent Address: 16192 Coastal Highway Lewes, Delaware (302) 645-7400
State of Formation:	Delaware
Known Period of Activity:	1962, unknown-1993

According to CBM records, the United States Minerals Corporation owned Kittimac mill property in 1963 (CBM-00243). Online San Juan County Assessor records show that United States Minerals Corporation conveyed 76.88 acres of the John H. French Placer to Kevin D. and Karen P. Padrick via a Warranty Deed on December 17, 1993 (SCA-00152, p. 2).[4]

Archived Colorado Secretary of State corporate index records indicate that United States Minerals Corporation, a Delaware corporation, was authorized to conduct business in Colorado on June 6, 1962 (CSA-00005). A Colorado Secretary of State representative informed Toeroek that the United States Minerals Corporation was authorized in Colorado on June 6, 1962, and retained its foreign corporate status until the mid-1980s when its status was revoked due to a tax delinquency. The Colorado Secretary of State is continuing its archival search to determine the foreign corporate status of United States Minerals Corporation.

[4] A title search was not conducted for this abbreviated report; consequently, it is uncertain if the United States Minerals Corporation owned the property continuously from 1963 to 1993.

Delaware Secretary of State records show that United States Minerals Corporation was incorporated in Delaware on October 11, 1961, and its corporate status is listed as Void / Tax Delinquent as of March 1, 2008 (DESOS-00015).

PRP:	**Great Divide Mining and Milling Corporation**
PRP Class:	Past Owner
Status:	Administratively Dissolved
Current Address:	n/a
State of Formation:	Colorado
Known Period of Activity:	Unknown-1999

According to records available online from the San Juan County Assessor, Great Divide Mining and Milling Corporation was the past owner of a portion of the John H. French Placer (MS #45). Great Divide Mining and Milling Corporation acquired the property prior to 1999, and conveyed it to (b) (6) and (b) (6) on April 12, 1999 (SCA-00153). No records were found indicating that the Great Divide Mining and Milling Corporation conducted operations at the Kittimac mill.

Records available online from Colorado Secretary of State show that Great Divide Mining and Milling Corporation was incorporated on March 18, 1944, and was administratively dissolved on January 1, 2003 (COSOS-00080).

The Certificate of Incorporation for Great Divide Mining and Milling Corporation states that the company was organized with the purpose of conducting mining activities that includes leasing, franchising, prospecting, developing, and exploiting mining claims and rights; constructing and maintaining mining infrastructure; and manufacturing and selling goods or wares related to mining. Members of the original Board of Directors were (b) (6) (COSOS-00078).

PRP:	K2 Enterprises, LLC
PRP Class:	Past Owner
Status:	Delinquent
Current Address:	Mailing address P.O. Box 3510 Sunriver, Oregon 97707 Office street address 12 River Road Sunriver, Oregon 97707
State of Formation:	Colorado
Known Period of Activity:	2003

According to records available online from the San Juan County Assessor, K2 Enterprises LLC briefly owned a portion of the John H. French Placer (MS #45) for one day in 2003. (b) (6) conveyed the Kittimac mill property to K2 Enterprises, LLC on June 27, 2003; immediately following the conveyance, K2 Enterprises, LLC conveyed the property to C.W.M., Inc. (SCA-00152; TITLE-00013). No records were found indicating that K2 Enterprises, LLC conducted operations at the Kittimac mill.

Records available online from Colorado Secretary of State show that K2 Enterprises, LLC was formed in Colorado on May 3, 1994. On March 1, 2011, the company status was changed to delinquent for failure to file its annual report (COSOS-00076).

According to the Articles of Organization for K2 Enterprises, LLC, the initial managers were (b) (6) and (b) (6), and the registered office was 3815 County Road 2, Silverton, Colorado 81433 (COSOS-00074; TITLE-00013).

The Colorado Secretary of State corporate summary lists the principal office street address as P.O. Box 3510, Sunriver, Oregon 97707 and the Principal office mailing address as 12 River Road, Sunriver, Oregon 97707 (COSOS-00077).

PRP:	C.W.M. and Associates, Inc. (a/k/a C.W.M. Inc.)
PRP Class:	Past Owner
Status:	Delinquent
Current Address:	247 N Ute Avenue Montrose, CO 81401
State of Formation:	Colorado
Known Period of Activity:	2003–2004

On June 27, 2003, K2 Enterprises, LLC conveyed a portion of the John H. French Placer (MS #45) to C.W.M. Inc. According to the deed, C.W.M. Inc.'s address is listed as 100 Hill Top

Drive, Suite 19, Redding, California 97707. The only signatory to the deed was (b) (6), Manager of K2 Enterprises, LLC (TITLE-00013). No records were found indicating that C.W.M. and Associates, Inc. conducted operations at the Kittimac mill.

On March 16, 2004, C.W.M. and Associates, Inc. conveyed the same property to (b) (6) and (b) (6) (SCA-00152; TITLE-00014).

On July 10, 1981, C.W.M. and Associates, Inc. filed its articles of incorporation with the Colorado Secretary of State. The purpose of the company was to engage in mine development. The initial directors of the company were (b) (6), (b) (6), and (b) (6) (COSOS-00071).

A Colorado Secretary of State representative informed Toeroek that C.W.M. and Associates, Inc. was administratively dissolved on January 1, 2000, but was then reinstated on June 13, 2000. C.W.M. and Associates, Inc. submitted its application for reinstatement with the new name, C.W.M. Inc. It appears, however, that the name change was never recognized by the Colorado Secretary of State, and the name of the company remained C.W.M. and Associates, Inc. (COSOS-00072, pp. 3-4).

C.W.M. and Associates, Inc. has remained delinquent with the Colorado Secretary of State since September 1, 2005. (b) (6) is listed as the Registered Agent, and the principal office street address is 247 North Ute Avenue, Montrose, Colorado 81401 (COSOS-00072).

2. Current Corporate Owners

There are no current corporate owners of the Kittimac mill and tailings property.

IV. Conclusions and Recommendations

Historically, the Kittimac facility treated ore from the Eureka Mining District. In 1907, a tram was installed to transport ore from the Kittimac mine to the mill near the railroad (USGS-00075, pp. 13, 16). Various companies and individuals operated the Kittimac mill between 1908 and 1921 (INT-00006, p. 146). After a period of presumed inactivity, companies, including the Kittimac Gold Mining Company, Lone Wolf Mining Company, and ASARCO expressed interest in resuming operations, but they ultimately abandoned their projects on the Kittimac properties (UCL-00001; USGS-00080). There were likely no significant operations at the Kittimac mill after 1945.

Between 1995 and 1999, USGS inventoried and sampled inactive mine-related sites in the Animas River watershed. A report of the findings described the Kittimac tailings as 23,000 cubic yards of mine waste within a 35,000-square-meter area (USGS-00081, p. 45). A report summarizing sampling at the Kittimac tailings impoundment in 1997 and 1998 recommends remediation of the impoundment (USGS-00082).

In 2000, USGS published an Open-File Report on mines, dumps, and tailings as sources of contamination in the upper Animas River watershed. The Kittimac mill tailings were surveyed and identified as the largest impoundment of un-reclaimed tailings in the upper Animas River watershed (USGS-00076, p. 14). The tailings are piled on tens of acres of alluvial gravels. This location on the Animas flood plain makes the tailings vulnerable to erosion during extreme storms. Additionally, seepage is able to travel directly into the Animas River with little or no chance for natural attenuation (USGS-00074, p. 17).

Listed below are recommendations for further research:

- (b) (5), (b) (7)(A) [redacted]

Alex Padilla
California Secretary of State

Business Search - Entity Detail

The California Business Search is updated daily and reflects work processed through Monday, March 6, 2017. Please refer to document **Processing Times** for the received dates of filings currently being processed. The data provided is not a complete or certified record of an entity. Not all images are available online.

C2352753 C.W.M. AND ASSOCIATES, INC.

Registration Date:	08/01/2001
Jurisdiction:	COLORADO
Entity Type:	FOREIGN STOCK
Status:	SOS/FTB FORFEITED
Agent for Service of Process:	MITCH JONES 2177 ANGIE PLACE REDDING CA 96001
Entity Address:	912 NORTH SHANNON CIRCLE MESA AZ 85205
Entity Mailing Address:	2316 BELL EXECUTIVE LANE #100 SACRAMENTO CA 95825

Document Type	File Date	PDF
No documents found!		

* Indicates the information is not contained in the California Secretary of State's database.

- If the status of the corporation is "Surrender," the agent for service of process is automatically revoked. Please refer to California Corporations Code **section 2114** for information relating to service upon corporations that have surrendered.
- For information on checking or reserving a name, refer to **Name Availability**.
- If the image of a Statement of Information is not available online, for information on ordering a copy of that statement refer to **Information Requests**.
- For information on ordering certificates, status reports, certified copies of documents and copies of documents not currently available in the Business Search such as a filing that is not a Statement of Information or filings for other types of business entities, or to request a more extensive search for records, refer to **Information Requests**.
- For help with searching an entity name, refer to **Search Tips**.
- For descriptions of the various fields and status types, refer to **Frequently Asked Questions**.

Modify Search | New Search | Back to Search Results

Bureau of Mines
State of Colorado

San Juan County
October 12, 1921.

Horace F Lunt
Commissioner of Mines
Denver, Colorado

Article filed at back —

KITTIMAC MINE - Operated by San Juan Consolidated Mining & Milling Co. H. G. Brient, Pres-Mgr, J. Malyasovics, Secy; Main Office, 626 Wabash Bldg., Pittsburgh. Brandh Office, Silverton, Colo. Formerly Operated by Kittimac Mines Co of Wyoming. Joseph J. Clark, Secy, 834 Equitable Bldg., Denver, Colo.

Mine is situated in Minnie Gulch, Animas Forks mining district, about 2 miles from the railroad at Middleton. Aerial tramway and fair wagon road to mine.

5 men employed, all on surface.

Operations were begun in June, 1921, repairing buildings, aerial tramway, etc. This work is about completed and development work will be started in the mine and continued during the winter. A winze will be sunk in the vein and a cross-cut driven to the Calibre vein some 700 feet distant. The Calibre vein has never been opened up; it is said to be large and gave assays on the surface up to $20.00 per ton. This is a very good prospect.

Compensation insurance is not carried. Some first aid supplies are on hand. No telephome nor chage rooms. General conditions are fair.

Mine opened by two tunnels connected by a raise. Upper tunnel used for exit only. Lower tunnel cross-cut about 1000 feet to Kittimac vein and 700 feet drift. Considerable ore has been stoped out above this level. Mining by shrinkage. No production at present. Ore values gold, silver, lead and zinc.

Boarding House, Compressor house and blacksmith shop at mine in fair condition. Ingersoll Rand Imperial Compressor driven by 50 H P motor. No fire protection. Mill at railroad track will be remodelled and equipped with floatation.

Magazine about 500 feet from tunnel around the hillside. No explosives at the property. No electricity in mine. Transformers in iron building locked.

Recommendations - Clean out exit and strengthen foundation of air hoist to be used in sinking.

Robert Innes,
Inspector Dis't #4

Denver, Colorado.

Dear Sir:

Replying to your inquiry concerning the Lone Wolf Mining Company, recently organized to operate the property formerly known as the Kittimac Mines, in San Juan County, Colorado:

You are advised that having been operating manager of this mine in 1906-1908 inclusive, when it was being operated by the Kittimac Mines Company, I certainly have considerable knowledge of its merits from personal experience. It is traversed by a veritable network of veins. The principal veins being the Little Joe gold vein. The Isabella, Midnight Suns 1 and 2, Elvina- a whopper but undeveloped, the Calibre and Stanton, and several others, some of which are unnamed.

Some years prior to my appointment as manager of this property it was operated by Samuel G. Martin, and considerable ore of a very good gold grade was shipped from a couple of stopes on the little Joe vein from the lower level. It was opened up first by Level No. 1, and later on 163 feet deeper by Tunnel No. 2, and it was from this tunnel that these shipments were made. From a point about 150 ft. back from the crosscut made thru this vein to open up the Isabella there is a streak of ore from 15 to 20 in. wide that will average about $30, in gold. This streak, in my opinion, is the same as the ore that Martin shipped from the above mentioned stopes. The vein will average about 5 ft. to 6 wide; the remainder of the vein outside of this streak is a low grade, carrying perhaps $5. to $8. per ton. In all, I am of

the opinion that the average grade would be in the neighborhood of $10, to $12. under the present price of gold, which is $35, an ounce. The main veins of the properties to which their work was intended in the main to develop was the Calibre, which is a large sulphide vein from which some good ore was shipped from the surface workings, and the Stanton vein a little further on, which is known to contain good gold values, but has never been developed to any extent. At a point about 1100 ft. in the lower tunnel from its portal I made a crosscut through to the Little Joe vein, and 56 ft. therefrom got what is known as the Isabella vein, which at that time measured 14 ft. between walls, 9 ft. of which was a solid sulphide running about 10% zinc, 8% to 10% lead, 2-3% copper, 5 to 10 oz. in silver, but very little in gold. I would say it is worth about $2. to $3. in gold per ton on an average under the new price. The average value of the solid sulphide in this vein was about $10. per ton under the prices at that time prevailing, about $15.00 now. This vein has been worked out and milled for 450 ft. in length to the overlying slide rock of an average of about 200 to 250 ft. above the level of this tunnel. The western end of this body of ore has been displaced by a very evident faulting, but should be easily recovered by short drift in the right direction. About 75 ft. in a southeasterly direction where the Little Joe vein and the Isabella intersect, both veins at that point have been displaced by heavy faulting, but just how far they are displaced I cannot say as they have never been picked up, but it cannot in any case exceed 50 ft. or 75 ft. to the southwest. A crosscut from the lower tunnel, which was driven upon an intersecting smaller sulphide vein would open up the Isabella

vein and also the Little Joe at a much greater depth. This small amount of work should, in my opinion, place this mine on a good producing basis. To cut the Calibre vein would require about 900 ft. of drifting, and that work would also cut the Elvina vein and a vein called the Youngston vein, which they claim they discovered after I severed connections with this property. Another 200 ft. would cut the gold bearing Stanton vein.

The mill was a complete failure, since 53 test holes made at my instance some years ago by Ben Massey, E. M., now deceased, on the tailings from the mill gave an average value of $7.56. When considered in connection with the average value of the mine as stated above with the values taken from the mill dump, the cause of failure at once becomes obvious. In all, I consider it an excellent property, full of promise and certainly inviting for full development.

I also understand plans are being made for consolidation of this property with other adjoining and nearby, which would be a good thing, as they can be advantageously and economically operated together, with better results, under consolidated management.

I have known Mr. Ross for many years, and Mr. DuRoy for the past few years while I was in this office. My dealings with them convince me that they are experienced mining men and should be able to direct the affairs of this company in such a way as to bring about its successful development, placing it upon a producing basis when they can secure sufficient financial backing.

Yours very truly,

P.S. I inadvertently omitted from the foregoing, the important fact that the Isabella vein continues strong on its downward dip below the upper stopes and the tunnel.

STATE OF COLORADO
BUREAU OF MINES
State Services Building
Denver 3, Colorado

RECEIVED
JAN 23 1963
COLORADO
BUREAU OF MINES

G. A. FRANZ, JR.
DEPUTY COMMISSIONER

FILED FOR RECORD
Date JUN 21 1963
G. A. Franz, Jr.
Assistant Commissioner of Mines

Number 410
County San Juan
Mining District

OPERATOR'S ANNUAL REPORT
for the Year 1962

Name of Operation KITTIMAC Kind of Operation Diamond Core Drilling
(Mine, Mill, Quarry, etc.)

Operator MacPherson Drilling Co. Ownership ( ) Lease ( ) Contractor (X)

Address (Local) P. O. Box 447, Montrose, Colo. Main Office Address 701 North 3rd St.

Owner United States Minerals Corp. Owner Address 19 Rector St., N.Y.6, N. Y.

Location of Property Near Silverton, Colorado

Corporation ( ) Partnership ( ) Individual ( )
If a corporation, give name of state in which incorporated

President Partner or Individual

Vice-President Partner

Secretary Partner

Treasurer Partner

Manager Robert W. Ford Address Box 475, Silverton, Colorado
or Person in Charge Telephone Number

Producing ( ) Developing ( ) Prospecting ( ) Part Time ( ) Idle ( )

Principal Products

Production for the Year

Crude Tonnage (tons, yards, pounds) Produced during the Year Value $

List products separately, i.e., Gold, Silver, Copper, Lead, Zinc, or other minerals, Clay, Sand, Gravel, Stone, etc.

Product (oz., lbs., tons) Value $
Product (oz., lbs., tons) Value $
Product (oz., lbs., tons) Value $
Product (oz., lbs., tons) Value $
Product (oz., lbs., tons) Value $

Labor Statistics

Number of Days Operated during the Year 96 Average No. of Men Employed: Surface Undergd. 2

Number of Man-shifts (8 hours each) during the Year: Surface Underground 1
Number of Lost-time accidents during the Year None Man-hours worked 466
Compensation Insurance Carrier State Compensation Insurance Fund

Total Number of Patented Claims Total Acreage
Total Number of Unpatented Claims Total Acreage
(All Patented and Unpatented Claims which have not been shown on previous reports should be listed on the reverse side of this sheet or on a separate sheet.)

Date of this report 1/22/63 Signed Malcolm MacPherson
By: M. MacPherson
Title Owner

This report must be submitted to the Colorado Bureau of Mines by March 1, 1963.

(over)

CBM-00243
p. 1 of 1

FILED FOR RECORD
6-13-58
W. E. SCOTT, JR.
Commissioner of Mines

RECEIVED
JAN 8 - 1958
COLORADO
BUREAU OF MINES

COLORADO BUREAU OF MINES
Museum Building
Denver 2, Colorado

WALTER E. SCOTT, JR.
COMMISSIONER OF MINES

Number 427

OPERATOR'S ANNUAL REPORT
METAL MINES
For the Year 19 57

Name of Mine Kittimac County San Juan
Location 11 miles northeast of Silverton, Colorado District Eureka
Name of Operator Walter W. Bentley, d.b.a. Kittimac Mining Co., Lessee
Address of local office P.O. Box 541, Silverton, Colorado
Address of principal office -
If incorporated, under laws of what state
President
Address
Vice President
Address
Secretary-Treasurer
Address
General Manager
Address

Name of person locally in charge Walter W. Bentley Title Lessee

If partnership, give name and address of partners:

Name
Address
Name
Address
Name
Address
Name
Address

If individual, name Walter W. Bentley
Address P.O. Box 541, Silverton, Colorado

Principal products mined Copper, Silver, Lead, Zinc, Gold.

PRODUCTION, Tons Crude Ore 34.3 tons Value $ net smelter $1143.21
Tons Milling Ore 140.17 tons Value $ " " $3113.78
Tons Value $

Is work done by any lessees included in this report or do they make separate report showing production and shifts worked all worked by lessee and all shown herein

Have you a mill or other reduction works, or do you ship or sell your ore to a Custom Plant crude ore shipped direct to smelter, milling ore shipped to local (Pride of West) mill.

Total number of days mine operated during year 109
Average number of men employed during year 3
Total number of man shifts underground 246
Total number of man shifts on surface 12
(Note: Man shifts are the total number of men employed times each 8-hour shift they worked)

Approximate cost of new improvements—explorations $
Approximate cost of mine—mill operations $10,892.28

(over)

COLORADO BUREAU OF MINES

Name and survey number of patented claims:

None patented

(If necessary, attach separate sheet listing claims)
(Only show claims patented since your last Report)

Total acreage .....
(List total acreage each year)

Name of unpatented claims:

none located

(If necessary, attach separate sheet listing claims)
(Only show claims located since your last Report)

Total acreage .....
(List total acreage each year)

Name of property owner Kittimac Mines Co.of Arizona, Wm. A. Way, Receiver

Address Silverton, Colorado

Is property worked by owner no or by lessees yes

Was all of property worked during year or only in part part

If part of property was subleased, give name and address of sublessees:

Name none

Address .....

Name .....

Address .....

Name .....

Address .....

Name .....

Address .....

Dated at Silverton, Colorado
January 6, 1958

19 .....

Signed:
By Walter W. Bentley d.b.a. Kittamac Mining Co.

Title Lessee

Blanks must be completely filled out and returned to **COLORADO BUREAU OF MINES** on or before March 1, 1958, as provided by Colorado Statutes.

COLORADO BUREAU OF MINES
Museum Building
Denver 2, Colorado

COMMISSIONER OF MINES
RECEIVED
FEB 29 1952

Walter E. Scott, Jr.
Commissioner of Mines

Number 213

OPERATOR'S ANNUAL REPORT
METAL MINES
For the Year 1951

Name of Mine Kittimac County San Juan
Address of local office Box 371, Silverton, Colorado
Address of principal office 804 Subway Terminal Building, Los Angeles 13, Calif.
If incorporated, under laws of what state
President
Address
Vice President
Address
Secretary-Treasurer
Address
General Manager
Address

Name of person locally in charge R. M. Andreatta Title Superintendent

If partnership, give name and address of partners:
Name
Address
Name
Address
Name
Address
Name
Address

If individual, name Wayne Loel
Address 804 Subway Terminal Building, Los Angeles 13, California

Principal products mined Copper, Lead, Zinc and Silver
PRODUCTION, Tons None Value $
Tons Value $
Tons Value $

Name and survey number of patented claims:

(If necessary attach separate sheet listing claims) Total acreage

Name of unpatented claims: Sheet Attached

(If necessary attach separate sheet listing claims) Total acreage 1,200 more or less

Name of property owner Kittimac Mines Co., Wm. A. Way, Receiver
Address Silverton, Colorado

(over)

COLORADO BUREAU OF MINES

Is property worked by owner_____ or by lessees_____
Was all of property worked during year or only in part Assessment work only
If part of property was subleased, give name and address of sublessees:
Name_____
Address_____
Name_____
Address_____
Name_____
Address_____
Name_____
Address_____

Is work done by any lessees included in this report - or do they make separate report showing production and shifts worked --
Have you a mill or other reduction works, if so, what kind and type No
_____ Capacity, daily_____ monthly_____

Total number of days mine operated during year 0
Total number of man shifts underground_____
Total number of man shifts on surface 5 men 80 days Assessment - Est. Mr. Scott
Total number of days mill operated_____
Total number of man shifts worked in and around mill_____
(Note: Man shifts are the total number of men employed times each 8-hour shift they worked)

Approximate cost of new improvements - exploration $_____
Approximate cost of mine - mill operations $_____

- REMARKS -

Signed: Wayne Loel

Dated at Los Angeles, California
February 28, , 19 52

By_____
Title_____

Blanks must be completely filled out and returned to COLORADO DUREAU OF MINES on or before March 1, 19____, as provided by Section 317, Volume 4, Chapter 110, 1935 Colorado Statutes Annotated.

LODE MINING CLAIMS

The CALIBER LODE MINING CLAIM, the original location certificate of which is recorded in Book 97 at Page 370 and the amended location certificate of which is recorded in Book 92 Page 461 of the records of San Juan County.

The CALIBER NO. 1 LODE MINING CLAIM, the original location certificate of which is recorded in Book 111 Page 142 and the amended location certificate of which is recorded in Book 92 at Page 462 of the records of San Juan County.

The CALIBER NO. 2 LODE MINING CLAIM, the original location certificate of which is recorded in Book 111 at Page 143 and the amended location certificate of which is recorded in Book 92 at Page 463 of the records of the County of San Juan.

The CALIBER NO. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 605 of the records of San Juan County.

The PURSER LODE MINING CLAIM, the original location certificate of which is recorded in Book 97 at Page 241 and the amended location certificate of which is recorded in Book 92 at Page 202 of the records of San Juan County; also in Book 111 at Page 582.

The PURSER NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 Page 583 of the records of San Juan County.

The PURSER NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 584 of the records of San Juan County.

The HOME LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 480 of the records of San Juan County.

The HOME NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 Page 482 of the records of San Juan County.

The HOME NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 Page 482 of the records of San Juan County.

The SLIDE LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 489 of the records of the County of San Juan.

The SLIDE NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book ___ Page ___ of the records of San Juan County.

The DETROIT LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 599 of the records of San Juan County.

The GLOBE LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 598 of the records of San Juan County.

The LIVERPOOL LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 597 of the records of San Juan County.

The MICHIGAN LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 600 of the records of the County of San Juan.

The GRAND RAPIDS LODE MINING CLAIM, the location certificate of which is recorded in Book 111 Page 601 of the records of San Juan County.

The NEW YORK LODE MINING CLAIM, the location certificate of which is recorded in Book 111 Page 602 of the records of San Juan County.

The CHICAGO LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 603 of the records of San Juan County.

The ANN ARBOR LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 604 of the records of the County of San Juan.

The DURANGO LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 585 of the records of San Juan County.

The PITTSBURGH LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 586 of the records of San Juan County.

The HELENA LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 587 of the records of San Juan County.

The LAKE CITY LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 588 of the records of the County of San Juan.

The SILVERTON LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 589 of the records of San Juan County.

The DENVER LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 590 of the records of San Juan County.

The BERLIN LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 591 of the records of San Juan County.

The ST. LOUIS LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 592 of the records of the County of San Juan.

The LONDON LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 593 of the records of the County of San Juan.

The PARIS LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 594 of the records of the County of San Juan.

The BALTIMORE LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 595 of the records of San Juan County.

The BOSTON LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 596 of the records of San Juan County.

The IRON LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 27 of the records of the County of San Juan.

The IRON NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 116 at Page 225 of the records of the County of San Juan.

The IRON NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 116 at Page 226 of the records of the County of San Juan.

The IRON NO. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 116 at Page 227 of the records of the County of San Juan.

The IRON NO. 4 LODE MINING CLAIM, the location certificate of which is recorded in Book 116 at Page 228 of the records of the County of San Juan.

The IRON DUMP LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 29 of the records of the County of San Juan.

The IRON AGE LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 28 of the records of the County of San Juan.

The FOREST QUEEN LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 267 of the records of San Juan County.

The FOREST QUEEN NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 268 of the records of the County of San Juan.

The FOREST QUEEN NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 269 of the records of the County of San Juan.

The FOREST QUEEN NO. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 270 of the records of the County of San Juan.

The FOREST QUEEN NO. 4 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 271 of the records of the County of San Juan.

The FOREST QUEEN NO. 5 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 272 of the records of the County of San Juan.

The FOREST QUEEN NO. 6 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 35 of the records of the County of San Juan, and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 7 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 36 of the records of the County of San Juan and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 8 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 37 of the records of the County of San Juan and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 9 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 38 of the records of the County of San Juan and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 10 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 39 of the records of the County of San Juan and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 11 LODE MINING CLAIM, the location certificate of which is recorded in Book ___ at Page ___ of the records of the County of San Juan.

The ISABELLA LODE MINING CLAIM, the original location certificate of which is recorded in Book 111 at Page 256 and the amended location certificate of which is recorded in Book 111 at Page 615 of the records of the County of San Juan.

The ISABELLA NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 616 of the records of the County of San Juan.

The ISABELLA NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 617 of the records of the County of San Juan.

The ISABELLA NO. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 618 of the records of the County of San Juan.

The ISABELLA NO. 4 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 619 of the records of the County of San Juan.

The ISABELLA NO. 5 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 620 of the records of the County of

San Juan.

The ISABELLA NO. 6 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 621 of the records of the County of San Juan.

The ISABELLA NO. 7 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 622 of the records of the County of San Juan.

The ISABELLA NO. 8 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 623 of the records of the County of San Juan.

The MONITOR LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 24 of the records of the County of San Juan.

The MONITOR NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 25 of the records of the County of San Juan.

The MONITOR NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 26 of the records of the County of San Juan.

The MONITOR NO. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 483 of the records of the County of San Juan.

The MONITOR NO. 4 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 484 of the records of the County of San Juan.

The MONITOR NO. 5 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 485 of the records of the County of San Juan.

The MONITOR NO. 6 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 606 of the records of the County of San Juan.

The MONITOR NO. 7 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 607 of the records of the County of San Juan.

The MONITOR NO. 8 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 608 of the records of the County of San Juan.

The MONITOR NO. 9 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 609 of the records of the County of San Juan.

The MONITOR NO. 10 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 610 of the records of the County of San Juan.

The MONITOR NO. 11 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 611 of the records of the County of San Juan.

The MONITOR NO. 12 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 612 of the records of the County of San Juan.

The MONITOR NO. 13 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 613 of the records of the County of San Juan.

The MONITOR NO. 14 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 614 of the records of the County of San Juan.

The AURORA LODE MINING CLAIM, the location certificate of which is recorded in Book 97 of Page 369 and the amended location certificate of which is recorded in Book 92 at Page 450 of the records of San Juan County.

The AURORA NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 144 and the amended location certificate of which is recorded in Book 92 at Page 451 of the records of San Juan County.

The LITTLE JOE LODE MINING CLAIM, the location certificate of which is recorded in Book 97 Page 63, and the amended location certificate of which is recorded in Book 92 at Page 449 of the records of San Juan County.

The WANDA LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 633 of the records of the County of San Juan.

The FOUNTAIN LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 479 of the records of the County of San Juan.

The CAMILLA LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 634 of the records of the County of San Juan.

The MIDNIGHT SUN NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 486 of the records of the County of San Juan.

The MIDNIGHT SUN NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 487 of the records of the County of San Juan.

The MIDNIGHT SUN NO. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 488 of the records of the County of San Juan.

Also the FOREST QUEEN MILLSITE CLAIM, the location certificate of which is recorded in Book D-2 at Page 109 of the records of the County of San Juan.

The MONITOR MILLSITE CLAIM, the location certificate of which is recorded in Book D-2 Page 110 of the records of the County of San Juan.

THE BRADFORD-ROBINSON PTG. CO., DENVER

IMPORTANT

BLANKS SHOULD BE COMPLETELY FILLED OUT AND RETURNED BY MARCH 1, 1949

METAL MINES AND MILLS

Name of Mine or Plant KITTIMAC

County San Juan, Post Office , District

REPORT TO BUREAU OF MINES

STATE OF COLORADO

For the Year 1948

OPERATOR

Name of Company, Partnership or Individual McCullough Lease

Address of Principal Office Ouray, Colo.

Local Office

If incorporated, under the laws of what state? No.

Names, titles and addresses of Officers, Partners, Individuals

If names of claims have been listed in previous reports, only changes, if any, need be given

Names and numbers of patented claims

Total acreage

Names of unpatented claims

Total acreage

Do you operate these claims yourself or are they being worked under lease? Lease

Was property operated in whole or in part during the past year? Aug 16 to Oct 27 - 1948

If you have given a lease for all or part of the property give names and P. O. address of said lessees, together with description of part leased

Is the work done by your lessees included in this report? Yes

Have you a mill or reduction works? No If so, what is its character and capacity?

List all improvements and developments made during the year Tunnel Portal Relimbered - Track Relined + Graded

Name of Owner W.A. Way, Receiver

Address of Owner S. Iverton, Colorado

PRODUCTION

CRUDE OR SHIPPING ORE: No. of tons No production Average gross value per ton $

Total value $ Average grade of different metallic content in ores as follows:

Gold ..... oz.	Lead ..... %	Copper ..... %	Sulphur ..... %
Silver ..... oz.	Zinc ..... %	Iron ..... %	Fluorspar ..... %
Tungsten ..... %	Vanadium ..... %	Uranium ..... %	Molybdenum ..... %

MILLING ORE: Tons milled Milling processes employed

Average gross value per ton crude ore milled $ Average grade crude ore milled in different metals as follows:

Gold ..... oz.	Lead ..... %	Copper ..... %	Sulphur ..... %
Silver ..... oz.	Zinc ..... %	Iron ..... %	Fluorspar ..... %
Tungsten ..... %	Vanadium ..... %	Uranium ..... %	Molybdenum ..... %

BULLION: Sold to U. S. Mint or other places Total amount: Gold ..... oz.

Silver ..... oz.

CONCENTRATES: No. tons concentrates obtained from ores milled..... Ratio of reduction .....into one. Average value per ton concentrates $..... Total value $.....
Average grade concentrates in the different metals as follows:

Gold .....oz.	Lead .....%	Copper .....%	Sulphur .....%
Silver .....oz.	Zinc .....%	Iron .....%	Fluorspar .....%
Tungsten .....%	Vanadium.....%	Uranium .....%	Molybdenum .....%

COST OF PRODUCTION: State average cost per ton for mining $....., hauling $....., freight $....., milling $....., smelting $..... Total average cost per ton $.....

LABOR DATA

MINE

No. of Days Operated	Average Number of Men Employed	
	Underground	Surface
72	2	

MILL

No. of Days Operated	Average Number of Men Employed
	No. of Men

CLASSIFICATION OF LABOR IN AND ABOUT METAL MINES

UNDERGROUND

	Total 8 Hr. Shifts	Wage Per Shift
Miners	85 3/4	$ 12.00
Machinemen		$
Machine Helpers		$
Trammers & Muckers		$
Cagers & Skippers		$
Timbermen		$
Pumpmen		$
Electricians		$
Other Underg'nd Labor		$

SURFACE

	Total 8 Hr. Shifts	Wage Per Shift
Topmen		$
Hoistmen		$
Firemen		$
Machinists		$
Blacksmiths		$
Carpenters		$
Superintendents		$
Foremen		$
Shift Bosses		$

CLASSIFICATION OF LABOR IN ORE DRESSING PLANTS AND MILLS

	Total 8 Hr. Shifts	Wage Per Shift
Superintendents		$
Foremen		$
Shift Bosses		$
Millmen		$
Roustabouts		$
Machinists		$
Electricians		$
Carpenters		$
Ore Sorters		$

	Total 8 Hr. Shifts	Wage Per Shift
Trammen		$
Truckers		$
Teamsters		$
Timekeepers		$
Bookkeepers		$
Storekeepers		$
Cooks		$
Waiters		$
		$

Total number of shifts performed by all men underground 85 3/4

Total number of shifts performed by all men on surface.....

Total number of shifts performed by all men in mills.....

Total cost of operations during the year. If this cannot be given accurately, give approximately 1500.00

Remarks: New Timber at Tunnel Portal. Track was relined + Graded
There was no production.

Dated at Ouray, Colo April 15, 1949

Signed Jno McCullough

By.....

Title owner of Lease

186 ✓ 8

THE BRADFORD-ROBINSON PTG. CO., DENVER

IMPORTANT

BLANKS SHOULD BE COMPLETELY FILLED OUT AND RETURNED BY MARCH 1, 1946

METAL MINES AND MILLS

Name of Mine or Plant McCullough Lease on Kittimac

County San Juan, Post Office Ouray, District

REPORT TO BUREAU OF MINES

STATE OF COLORADO

For the Year 1945

OPERATOR

Name of Company, Partnership or Individual: McCullough Lease

Address of Principal Office: Ouray Colo

Local Office:

If incorporated, under the laws of what state?

Names, titles and addresses of Officers, Partners, Individuals: William A McCullough Ouray, Colo

If names of claims have been listed in previous reports, only changes, if any, need be given

Names and numbers of patented claims:

Total acreage:

Names of unpatented claims: 88 unpatented lode claims known as Kittimac Group

Total acreage:

Do you operate these claims yourself or are they being worked under lease? Lease

Was property operated in whole or in part during the past year?

If you have given a lease for all or part of the property give names and P. O. address of said lessees, together with description of part leased: All

Is the work done by your lessees included in this report? yes

Have you a mill or reduction works? Delapated If so, what is its character and capacity?

List all improvements and developments made during the year: Retimbered Portal of Little Joe cross-cut Tunnel - Replaced and Relayed Track. Cleaned + Retimbered the 1300' of Crosscut.

Name of Owner: Kittimac Mining Co. W. A. Way, Receiver, Silverton, Colorado.

Address of Owner:

PRODUCTION

CRUDE OR SHIPPING ORE: No. of tons 26.63 Average gross value per ton $ 16.25

Total value $ 432.73 Average grade of different metallic content in ores as follows:

Gold	0.023 oz.	Lead	9.9 %	Copper	4.8 %	Sulphur	16.8 %
Silver	7.23 oz.	Zinc	11.1 %	Iron	12.2 %	Fluorspar	%
Tungsten	%	Vanadium	%	Uranium	%	Molybdenum	%

MILLING ORE: Tons milled 211 Milling processes employed Flotation

Average gross value per ton crude ore milled $ Average grade crude ore milled in different metals as follows:

Gold	0.02 oz.	Lead	2.75 %	Copper	1.15 %	Sulphur	%
Silver	2.50 oz.	Zinc	3.36 %	Iron	4.5 %	Fluorspar	%
Tungsten	%	Vanadium	%	Uranium	%	Molybdenum	%

BULLION: Sold to U. S. Mint or other places: Total amount: Gold None oz.

Silver 544 oz.

CONCENTRATES: No. tons concentrates obtained from ores milled..... Ratio of reduction .....into one. Average value per ton concentrates $..... Total value $.....

Average grade concentrates in the different metals as follows:

Gold ——— oz.	Lead 23.01 %	Copper 11.29 %	Sulphur ..... %
Silver 15.0 oz.	Zinc 11.29 %	Iron 21.7 %	Fluorspar ..... %
Tungsten ..... %	Vanadium ..... %	Uranium ..... %	Molybdenum ..... %

COST OF PRODUCTION: State average cost per ton for mining $ 6.00, hauling $ 3.09, freight $ ~~5.10~~ .51 cents, milling $ 4.00, smelting $ ~~4.00~~ .40 cents Total average cost per ton $ 14.60

LABOR DATA

MINE			MILL	
No. of Days Operated	Average Number of Men Employed		No. of Days Operated	Average Number of Men Employed
	Underground	Surface		No. of Men
150	2.3			

CLASSIFICATION OF LABOR IN AND ABOUT METAL MINES

UNDERGROUND	Total 8 Hr. Shifts	Wage Per Shift	SURFACE	Total 8 Hr. Shifts	Wage Per Shift
Miners	354	$ 7.80	Topmen		$
Machinemen		$	Hoistmen		$
Machine Helpers		$	Firemen		$
Trammers & Muckers		$	Machinists		$
Cagers & Skippers		$	Blacksmiths		$
Timbermen		$	Carpenters		$
Pumpmen		$	Superintendents		$
Electricians		$	Foremen		$
Other Underg'nd Labor		$	Shift Bosses		$

CLASSIFICATION OF LABOR IN ORE DRESSING PLANTS AND MILLS

	Total 8 Hr. Shifts	Wage Per Shift		Total 8 Hr. Shifts	Wage Per Shift
Superintendents		$	Trammen		$
Foremen		$	Truckers		$
Shift Bosses		$	Teamsters		$
Millmen		$	Timekeepers		$
Roustabouts		$	Bookkeepers		$
Machinists		$	Storekeepers		$
Electricians		$	Cooks		$
Carpenters		$	Waiters		$
Ore Sorters		$			$

Total number of shifts performed by all men underground 354

Total number of shifts performed by all men on surface.....

Total number of shifts performed by all men in mills.....

Total cost of operations during the year. If this cannot be given accurately, give approximately $4184.59

Remarks:.....

Dated at 3/22/46 Ouray, Colo., 194.....

Signed McCullough Lease

By William H McCullough

Title Lessee

THE BRADFORD-ROBINSON PTG. CO., DENVER

IMPORTANT

BLANKS SHOULD BE COMPLETELY FILLED OUT AND RETURNED BY MARCH 1, 1945

METAL MINES AND MILLS

Name of Mine or Plant Kittimac Mine ~~Wanderer Mine and Mill Tailings~~

County San Juan ~~Ouray~~, Post Office ..., District Eureka

REPORT TO BUREAU OF MINES

STATE OF COLORADO

For the Year 1944

OWNER

Name of Company, Partnership or Individual: Kittimac Mining Company

Address of Principal Office: Silverton, Colo.

Local Office: ...

If incorporated, under the laws of what state? Colorado

Names, titles and addresses of Officers, Partners, Individuals: William A. Way, Receiver, Silverton, Colo.

If names of claims have been listed in previous reports, only changes, if any, need be given

Names and numbers of patented claims: ...

Total acreage ...

Names of unpatented claims: 8 Isabella claims; 14 Montford Claims; 1 Little Joe; 9 Forest Queens; 5 Iron; 1 Iron Dump; Detroit; Cuba; Liverpool; Michigan; Grand Rapids; New York; Chicago; Ann Arbor; Durango; Pittsburg; Lake City; Silverton; French Placer + many others. Total acreage 600 approximately

Do you operate these claims yourself or are they being worked under lease? Lease

Was property operated in whole or in part during the past year? From 8/7/44 to 12/2/44

If you have given a lease for all or part of the property give names and P. O. address of said lessees, together with description of part leased: All - to William A. McCullough, Ouray, Colo.

Is the work done by your lessees included in this report? Yes

Have you a mill or reduction works? No If so, what is its character and capacity? ...

List all improvements and developments made during the year: Truck road built to mine 1¼ miles from Caledonia Bridge Crossing on Minnie Creek to Kittimac Mine

OPERATOR

Name of Company, Partnership or Individual: McCullough Lease, Ouray, Colo.

Address of Office: Ouray, Colo.

Name and address of those in charge of work: William A. McCullough

PRODUCTION

CRUDE OR SHIPPING ORE: No. of tons ... Average gross value per ton $ ...

Total value $ ... Average grade of different metallic content in ores as follows:

Gold ... oz.	Lead ... %	Copper ... %	Sulphur ... %
Silver ... oz.	Zinc ... %	Iron ... %	Fluorspar ... %
Tungsten ... %	Vanadium ... %	Uranium ... %	Molybdenum ... %

MILLING ORE: Tons milled ... Milling processes employed Shenandoah-Dives Custom Mill

Average gross value per ton crude ore milled $ ... Average grade crude ore milled in different metals as follows:

Gold .0285 oz.	Lead 2.90 %	Copper 1.25 %	Sulphur ... %
Silver 2.40 oz.	Zinc 3.40 %	Iron 4.40 %	Fluorspar ... %
Tungsten ... %	Vanadium ... %	Uranium ... %	Molybdenum ... %

BULLION: Sold to U. S. Mint or other places ... Total amount: Gold ... oz.

Silver ... oz.

CONCENTRATES: No. tons concentrates obtained from ores milled 4.492 Ratio of reduction 10.11 into one. Average value per ton concentrates $ 49.54 Total value $ 222.53
Average grade concentrates in the different metals as follows:

Gold	0.086 oz.	Lead	24.92 %	Copper	10.74 %	Sulphur	%
Silver	19.21 oz.	Zinc	10.03 %	Iron	20.25 %	Fluorspar	%
Tungsten	%	Vanadium	%	Uranium	%	Molybdenum	%

COST OF PRODUCTION: State average cost per ton for mining $ 5.00, hauling $ 3.09, freight $ 0.51, milling $ 3.00, smelting $ 0.38 Total average cost per ton $ 11.98

LABOR DATA

MINE

No. of Days Operated	Average Number of Men Employed	
	Underground	Surface
49	2	1

MILL

No. of Days Operated	Average Number of Men Employed
	No. of Men

CLASSIFICATION OF LABOR IN AND ABOUT METAL MINES

UNDERGROUND

	Total 8 Hr. Shifts	Wage Per Shift
Miners	17	$ 6.40
Machinemen		$
Machine Helpers		$
Trammers & Muckers		$
Cagers & Skippers		$
Timbermen	15	$ 8.00
Pumpmen		$
Electricians		$
Other Underg'nd Labor		$

SURFACE

	Total 8 Hr. Shifts	Wage Per Shift
Topmen		$
Hoistmen		$
Firemen		$
Machinists		$
Blacksmiths		$
Carpenters	62	$ 8.00
Superintendents		$
Foremen		$
Shift Bosses		$

CLASSIFICATION OF LABOR IN ORE DRESSING PLANTS AND MILLS

	Total 8 Hr. Shifts	Wage Per Shift
Superintendents		$
Foremen		$
Shift Bosses		$
Millmen		$
Roustabouts		$
Machinists		$
Electricians		$
Carpenters		$
Ore Sorters		$

	Total 8 Hr. Shifts	Wage Per Shift
Trammen		$
Truckers		$
Teamsters		$
Timekeepers		$
Bookkeepers		$
Storekeepers		$
Cooks		$
Waiters		$
		$

Total number of shifts performed by all men underground 32

Total number of shifts performed by all men on surface 62

Total number of shifts performed by all men in mills

Total cost of operations during the year. If this cannot be given accurately, give approximately 1625.37

Remarks:

Dated at Ouray, Colo.,
February 28, 1945

Signed William A. McCullough
By
Title Lessee

TAL MINES AND MILLS

County SAN JUAN, Post Office ____, District ____

Local Name of Mine or Plant Kittimac

REPORT TO BUREAU OF MINES

STATE OF COLORADO

FOR THE YEAR 1921

Name of Company or Title of Partnership: San Juan Consolidated Mine & Milling Co.

Address of Principal Office: Wabash Building, Pittsburgh, Penn.

Names, titles and addresses of officers, partners or owners:
H. G. Brient.....President.
J. V. Matyasovics.Vice President.
John Matyasovics..Secretary-Treasurer.
Address of all said officers same as Co.address supra

If names of claims have been listed in previous reports, only changes, if any, need be given.

Names and numbers of patented claims
The property known as The Kittimac Mines properties,
San Juan County, Colorado.
Total acreage ____

Names of unpatented claims ____
Total acreage ____

Do you own these claims, or do you operate them under lease? See statement attached.

If you lease them, give name and address of company or person from whom leased ____

If you have given a lease to others for all or part of the property, state the names of the leasing companies, partnerships or individuals:

Name	Manager	P. O. Address

Is the work done by your lessees included in this report? ____

Have you a mill or reduction works; ____ If so, what is its character and capacity? ____

Average contents of products **sold:** (If both crude ore and concentrates are sold, give average contents of each.)

Gold ____ oz.	Copper ____ %	Iron ____ %	Tungstic acid ____%
Silver ____ oz.	Zinc ____ %	Sulphur ____ %	Uranium oxide____%
Lead ____ %	Manganese ____ %	Insoluble ____ %	Vanadium oxide ____%

Molybdenum sulphide ____% Fluorspar (CaF_2) ____%

Crude ore sold ____tons Concentrates sold ____tons Milling ore produced ____tons

Gold or silver bullion produced, value ____

List of buildings, tramways, and other surface improvements made during the year ____

Amount and character of underground development during year: Shafts ____ ft.

Winzes ____ ft. Raises ____ ft. Drifts ____ ft. Crosscuts ____ ft.

LABOR DATA

UNDERGROUND MINES

Name of Mine or Plant	County	Post Office	Shipping Point	No. of Days Operated	Average Number of Men Employed	
					Underground	Surface

ORE DRESSING PLANTS AND MILLS					At Mill

CLASSIFICATION OF LABOR UNDERGROUND AND ON SURFACE ABOUT METAL MINES

	Total 8 hr. Shifts	Wage per Shift		Total 8 hr. Shifts	Wage per Shift
Miners		$	Nippers		$
Machine Runners		$	Other Underg'nd Labor		$
Machine Helpers		$	Topmen		$
Trammers		$	Engineers		$
Muckers		$	Firemen		$
Cagers		$	Machinists		$
Timbermen		$	Blacksmiths		$
Timberman Helpers		$	Blacksmith's Helpers		$
Pumpmen		$	Carpenters		$
Pipemen		$	Superintendents		$
Electricians		$	Foremen		$
Motormen		$	Shift Bosses		$

Total number of shifts performed by all men employed underground 150

Total number of shifts performed by all men employed on surface 50

CASSIFICATION OF LABOR IN ORE DRESSING PLANTS, MILLS AND OTHER SURFACE OCCUPATIONS

	Total 8 hr. Shifts	Wage per Shift		Total 8 hr. Shifts	Wage per Shift
Mill Superintendents		$	Ore Sorters		$
Mill Foreman		$	Tram Men		$
Mill Shift Bosses		$	Teamsters		$
Millmen		$	Timekeepers		$
Roustabouts		$	Bookkeepers		$
Machinists		$	Storekeepers		$
Electricians		$	Cooks		$
Carpenters		$	Waiters		$
		$			$

Total number of shifts performed by all men employed in Mills, etc. .....

Remarks: .....

Dated at ....., Signed .....

....., 1922 By .....

Title .....

NOTE.—PLEASE FILL OUT THIS REPORT COMPLETELY. DO NOT NEGLECT TO GIVE NUMBER OF DAYS OPERATED AND AVERAGE NUMBER OF MEN EMPLOYED. BE SURE TO DATE THE REPORT, AND SIGN IT.

The properties of the Kittimac Mines Company(located in San Juan Colorado) have been taken over by the San Juan Consolidated Mine & Milling Co. under a lease and option which provides for the first cash payment to be made September Ist, I922 ; during the working season of I92I the holders of said lease and option spent some time in a complete examination of the property, cleaning out the workings, sampling the ores, shooting down some ore to determine its value, surface examinations etc. but the properties were not actually worked, no ore mined, milled or shipped.

You are probably advised that the properties in question have not been worked since the appointment of the undersigned as Receiver, June I5th, I9I7, but it is believed that operations will be commenced during the working season of I922.

Dated this I2th, day of April I922.

N. E. Curran

Resident Director of the
San Juan Consolidated M. & M. Co.

ETAL MINES AND MILLS

County San Juan, Post Office Silverton District Eureka

Local Name of Mine or Plant Kittimac Mine

REPORT TO BUREAU OF MINES

IDLE 1919

STATE OF COLORADO

FOR THE YEAR 1919

IDLE 1919

If a Company, fill out this space; otherwise leave it blank.

Name of Company—The Kittimac Mines Co. of Wyoming

Incorporated in the State of Wyoming

Principal Office 716 Colo. Bldg. Denver, Colo

President Daniel B. Carey 716 Colo B. Denver Colo — P. O. Address

Manager none

Manager none

If a firm or partnership, fill out this space; otherwise leave it blaik.

Title of partnership

Partners' Names	P. O. Address

Secretary

If neither Company nor partnership, fill out this space.

Names of Owners	P. O. Address

Manager

Patented Forest Queen, Forest Queen Nos. 1, 2, 3, 4, 5. — John H. French Placer

Total acreage 100.00

Unpatented Little Joe Group - sixty three Claims

Total acreage 630

Do you own or lease these claims? own

If outside Plant or Mill was idle so state all idle since June 1917

If you lease them, give name and address of company or person from whom leased

u have given a lease to others for all or part of the property, state the names of the leasing com-s, partnerships or individuals:

Name	Manager	P. O. Address

ge contents of products sold: (If both crude ore and concentrates are sold, give average con-ch.) none produced in 1919

oz. Copper % Iron % Tungstic acid %

oz. Zinc % Sulphur % Uranium oxide %

% Manganese % Insoluble % Vanadium oxide %

olybdenum sulphide % Fluorspar (Ca F2) %

sold tons Concentrates sold tons Milling ore produced tons

ld or silver bullion produced, value

dings, tramways and other surface improvements made during the year

no production in 1919 as work done.

Wyo. t and character of underground development made during year:

ts None ft. Drifts none ft.

zes ft. Crosscuts ft.

es ft.

Please list labor o[illegible] for mines or mills below.

UNDERGROUND MINES

Name of Mine or Plant	County	Post Office	Shipping Point	Days operated	Average number of men employed	
					Underground	Surface
	No production in 1919					

ORE-DRESSING PLANTS AND MILLS — **At Mill**

Please give below total hours' labor performed by all men during the year, for which wages were paid, as shown by pay roll.

Mines None Mills none.

If assessment work only, give total number of shifts.....

CLASSIFICATION OF LABOR UNDERGROUND AND ON SURFACE ABOUT METAL MINES.

	Total 8 hr. Shifts.	Wage per shift.		Total 8 hr. Shifts.	Wage per shift.
Miners		$	Foremen		$
Machine Runners		$	Shift Bosses		$
Machine Helpers		$	Surveyors		$
Loaders		$	Other Underground Labor		$
Trammers		$	Nippers		$
Shovelers, stope		$	Scavengers		$
Muckers, drifts		$	Powdermen		$
Trackmen		$	Engineers		$
Topmen		$	Firemen	none	$
Stationmen	none	$	Machinists		$
Cagers		$	Blacksmiths		$
Timbermen		$	Blacksmith's Helpers		$
Timberman Helpers		$	Carpenters		$
Pumpmen		$	Dumpers		$
Pipemen		$			$
Electricians		$			$
Motormen		$			$
Superintendents		$			$

CLASSIFICATION OF LABOR IN ORE DRESSING PLANTS, MILLS AND OTHER SURFACE OCCUPATIONS

	Total 8 hr. Shifts.	Wage per shift.		Total 8 hr. Shifts.	Wage per shift.
Millmen		$	Tram Gripmen		$
Mill Sup't		$	Tr. Grip. Helpers		$
Mill Foreman		$	Time Keepers		$
Mill Shift Bosses		$	Other Mill Labor		$
Machinists		$	Bookkeepers	none	$
Assayers		$	Store Keepers		$
Ore Sorters	none	$	Cooks		$
Teamsters		$	Waiters		$
Roustabouts		$	Other Office Help		$
Watchmen		$	Other Boarding Help		$
Electricians		$			$
Carpenters		$			$

Remarks: .....

Dated February 4, 1920

Signed The Kittanning Iron & Steel Company

By Daniel B. Casey

Title President

Note—Please fill out this report carefully, and answer all questions. Be sure to date the report and sign it.

BUREAU OF MINES, STATE OF COLORADO

Inspector's Daily Report.

Durango Colo
Sep 18. 1915

Dist. No. 4

Fred Carroll, Commissioner of Mines,
Denver, Colorado.

Sir:

I have been engaged during the day as follows:

In Durango Colo

Sangaree

Expenses for the day, about $ —

* General Information:

The Kittimac Mine of Silverton is about to Start up. Mr Walters of Silverton is Manager. They are installing, in their mill, a Huff Static ore Separator and an Oil Floatation unit.

Robert Inner
Inspector.

* Under this head, please report all well founded rumors concerning mine operations in your district, such as accidents, new properties starting up, mines closing down, new strikes or matters of general interest to the mining industry.

81 JUL 10 AM 8:57

COLO. DEPT. OF STATE

442945 $10.00

9191

ARTICLES OF INCORPORATION
OF
C.W.M. AND ASSOCIATES, INC.

ARTICLE I
NAME

The name of this corporation is C.W.M. AND ASSOCIATES, INC.

ARTICLE II
DURATION

The period of duration of the corporation is perpetual.

ARTICLE III
PURPOSES AND POWERS

Section 1. Purposes: The purposes for which the corporation is organized are to engage in mine development and to engage in all other lawful business for which corporations may be organized pursuant to the Colorado Corporation Code.

Section 2. Powers: The corporation shall have all the power granted to corporations in the State of Colorado under the Colorado Corporations Code.

ARTICLE IV
AUTHORIZED SHARES

The aggregate number of shares which the corporation shall have authority to issue is 100,000, all of which shares shall be without par value. Shares shall be issued only in accordance with the provisions of the bylaws of the corporation.

ARTICLE V
SHAREHOLDERS' RIGHTS

Section 1. Restrictions on Transfer:

(a) The corporation shall have the right by appropriate action to impose restrictions upon the transfer of any shares of its stock or any interest therein, from time to time issued, provided that such restrictions, or the notice of the substance thereof, shall be set forth upon the face or back of the certificates representing such shares of stock.

8529 7/17/81 24.75

COMPUTER UPDATE COMPLETE
AB

(b) The holders of the stock of the corporation shall have the preemptive right to purchase, at such price and on such terms and conditions as the Board of Directors shall fix, unissued or treasury shares or any additional shares to be issued by reason of any increase in the authorized shares of the corporation, or any bonds, certificates of indebtedness, debentures or other securities, rights, warrants or options, convertible into shares of the corporation, or carrying any right to purchase the shares. Unless otherwise provided by the Board of Directors, such preemptive right shall be exercised in the respective ratio which the number of shares held by each shareholder at the time of such issue bears to the total number of shares outstanding in the names of all shareholders at such time. This preemptive right shall not apply to shares of stock issued pursuant to any employee stock ownership plan adopted by the Board of Directors or shareholders.

Section 2. Dividends: The holders of stock shall be entitled to receive and the corporation shall pay, from funds legal for such payment thereof, dividends when and as declared by the Board of Directors and at a rate fixed by such Board.

Section 3. Distribution of Assets: In the event of the liquidation or dissolution of the corporation, the holders of the stock shall receive, after payment to creditors, the remaining assets in proportion to the number of shares of stock held by each.

Section 4. Voting Rights:

(a) Every holder of stock of the corporation shall be entitled to one (1) vote for each shares of stock standing in his name on the books of the corporation.

(b) Shareholders shall not be entitled to accumulate votes at elections for Directors.

ARTICLE VI

REGULATION OF INTERNAL AFFAIRS

Section 1. The general management of the affairs of the corporation shall be exercised by a Board of Directors.

Section 2. The Board of Directors shall have the power to make, alter, amend or repeal the bylaws, but any bylaws so made may be altered, amended or repealed by the affirmative vote of 2/3 of the shareholders having voting rights at any annual or special meeting.

Section 3. The Board of Directors may designate by resolution passed by a majority of the whole board, an executive committee which

committee, to the extent provided in such resolution or the bylaws, shall have and may exercise all of the authority of the Board of Directors in the management of the corporation, except that no such committee shall have the authority of the Board of Directors in reference to amending the Articles of Incorporation, adopting a plan of merger or consolidation, recommending to the shareholders the sale, lease, exchange or other disposition of all or substantially all of te property and assets of the corporation otherwise than in the usual or regular course of business, recommending to the shareholders voluntary dissolution of the corporation or a revocation thereof, or amending the bylaws of the corporation.

Section 4. No contract or other transaction between the corporation and one or more of its directors, or between the corporation and any firm of which one or more of its directors are members or employees, or in which they are interested, or between the corporation and any corporation or association of which one or more of its directors are shareholders, members, directors, officers, or employees, or in which they are interested, shall be invalid solely because of the fact of such interest or the presence of such director or directors at the meeting of the Board of Directors of the corporation which acts upon or in reference to such contract or transaction, if the fact of such interest shall be disclosed or known to the Board of Directors and the Board of Directors shall, nevertheless, authorize and ratify such contract or transaction by a vote of a majority of the directors present, such interested director or directors to be counted in determining whether a quorum is present, but not to be counted in calculating the majority necessary to carry such vote and not to be permitted to vote upon such question. This section shall not be construed to invalidate any contract or other transaction which would otherwise be valid under the common and statutory law applicable thereto.

ARTICLE VII

REGISTERED OFFICE AND AGENT

The address of the initial registered office of the corporation is 419 Fourth Street (PO Box 142), Ouray, Colorado 81427. The name of the initial registered agent of the corporation at such address is Jack E. Clark, Jr.

ARTICLE VIII

DIRECTORS

The initial Board of Directors shall consist of three (3) members and the names and addresses of the persons who are to serve as directors until the first annual meeting of shareholders or until their successors may be elected and qualify are:

Jack E. Clark, Jr., 419 Fourth Street, Ouray, Colorado 81427
Ronald F. Williams, 4J Trailer Park, Ouray, Colorado 81427
Donald R. McMullin, 4J Trailer Park, Ouray Colorado 81427

ARTICLE IX

INCORPORATOR

The name and address of the incorporator of the corporation is: Richard P. Tisdel, PO Box 646, Ouray, Colorado 81427

ARTICLE X

AMENDMENT OF ARTICLES OF INCORPORATION

The corporation may amend, alter, change or repeal any provision contained herein, or add any provisions to, its Articles of Incorporation from time to time, in any manner now or hereafter prescribed or permitted by the Colorado Corporation Code, and all rights and powers conferred upon directors and shareholders hereby are granted subject to this reservation.

IN WITNESS WHEREOF, I, the undersigned, being the incorporator designated in Article IX of the annexed and foregoing Articles of Incorporation, have executed these Articles on the date indicated.

Richard P. Tisdel, Jr.

Executed this 23rd day of June, 1981.

STATE OF COLORADO)
) ss.
COUNTY OF OURAY)

Subscribed and sworn to before me this 23rd day of June, 1981, by Richard P. Tisdel, Incorporator.

My commission expires 12/10/82.

Notary Public

651826

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FAQs, Glossary and Information

Summary

Details			
Name	C.W.M. AND ASSOCIATES, INC., Delinquent September 1, 2005		
Status	Delinquent	**Formation date**	07/10/1981
ID number	19871442945	**Form**	Corporation
Periodic report month	July	**Jurisdiction**	Colorado
Principal office street address	247 N UTE AVE, MONTROSE, CO 81401 , United States		
Principal office mailing address	n/a		

Registered Agent	
Name	JACK CLARK JR.
Street address	247 N UTE AVE, MONTROSE, CO 81401, United States
Mailing address	n/a

Filing history and documents

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History and Documents

02/01/2017 16:13

Name: C.W.M. AND ASSOCIATES, INC., Delinquent September 1, 2005

ID number: 19871442945

Found 37 matching record(s). Viewing page 1 of 1.

#	Event	Date Filed	Date Posted	Effective Date	Document # *(click to view)*	Comment
1	Articles of Incorporation	07/10/1981	07/10/1981	07/10/1981 12:00 AM	19871442945	C.W.M. AND ASSOCIATES, INC.
2	Status Changed	09/30/1983	09/30/1983	09/30/1983 12:00 AM		
3	Amendment	03/08/1989	03/08/1989	03/08/1989 12:00 AM	19891016135	CHANGE RORA
4	Report	12/13/1990	12/13/1990	12/13/1990 12:00 AM	19851004452	CR85 - 02/26/85 - 8504452
5	Report Printed	06/20/1991	06/20/1991	06/20/1991 12:00 AM		CR - 07/01/91 - 09/30/91
6	Report	12/19/1992	12/19/1992	12/19/1992 12:00 AM	19871036918	CR87 - 09/22/87 - 8736918
7	Report Printed	06/17/1993	06/17/1993	06/17/1993 12:00 AM		CR - 07/01/93 - 09/30/93
8	Report	09/30/1993	09/30/1993	09/30/1993 12:00 AM	19931110929	CORP REPORT
9	Report	12/16/1994	12/16/1994	12/16/1994 12:00 AM	19891013528	CR89 - 02/24/89 - 891013528
10	Report Printed	06/15/1995	06/15/1995	06/15/1995 12:00 AM		CR - 07/01/95 - 09/30/95
11	Report	07/12/1995	07/12/1995	07/12/1995 12:00 AM	19951089405	CORP REPORT
12	Report	12/14/1996	12/14/1996	12/14/1996 12:00 AM	19911072056	CR91 - 09/09/91 - 911072056
13	Report Printed	06/16/1997	06/16/1997	06/16/1997 12:00 AM		CR - 07/01/1997 - 09/30/1997
14	Report	09/03/1997	09/03/1997	09/03/1997 12:00 AM	19971140196	PERIODIC REPORT
15	Report Printed	06/17/1999	06/17/1999	06/17/1999 12:00 AM		CR - 07/01/1999 - 09/30/1999
16	Report Printed	10/22/1999	10/22/1999	10/22/1999 12:00 AM		CR - 10/31/1999 - DA 12/31/1999
17	Status Changed	01/01/2000	01/01/2000	01/01/2000 12:00 AM		
18	Amendment	06/13/2000	06/13/2000	06/13/2000 12:00 AM	20001117297	CHANGE RORA
19	Reinstatement	06/13/2000	06/13/2000	06/13/2000 12:00 AM	20001117297	
20	Report	06/13/2000	06/13/2000	06/13/2000 12:00 AM	20001117297	PERIODIC REPORT
21	Report Printed	06/15/2001	06/15/2001	06/15/2001 12:00 AM		PR - 07/01/2001 - 09/30/2001
22	Amendment	08/07/2001	08/07/2001	08/07/2001 12:00 AM	20011155363	CHANGE RORA
23	Report	08/07/2001	08/07/2001	08/07/2001 12:00 AM	20011155363	CORP REPORT
24	Report Printed	06/13/2002	06/13/2002	06/13/2002 12:00 AM		PR - 07/01/2002 - 09/30/2002
25	Report	07/30/2002	07/30/2002	07/30/2002 12:00 AM	20021207470	CORP REPORT
26	Report Printed	06/18/2003	06/18/2003	06/18/2003 12:00 AM		PR - 07/01/2003 - 09/30/2003
27	Report	07/14/2003	07/14/2003	07/14/2003 12:00 AM	20031226239	CORP REPORT
28	Report Printed	06/16/2004	06/16/2004	06/16/2004 12:00 AM		PR - 07/01/2004 - 09/30/2004
29	Change in Status	10/25/2004	10/25/2004	10/25/2004 09:37 AM		Failure to file annual report
30	postcard notification printed 10/25/2004 to be mailed 11/01/2004	10/25/2004	10/25/2004	10/25/2004 10:00 AM		annual report due: 12/30/2004
31	Report	12/20/2004	12/23/2004	12/20/2004 12:11 PM	20041441518	

32 postcard notification printed 06/22/2005 to be mailed 07/01/2005	06/22/2005	06/22/2005	06/22/2005 09:36 AM	annual report due: 09/30/2005
33 Change in Status	10/01/2005	10/01/2005	10/01/2005 08:31 AM	Failure to file annual report
34 postcard notification printed 10/25/2005 to be mailed 11/01/2005	10/25/2005	10/25/2005	10/25/2005 03:41 PM	annual report due: 12/31/2005
35 Change in Status	01/01/2006	01/01/2006	01/01/2006 01:50 AM	Failure to file annual report
36 postcard notification printed 01/01/2006 to be mailed 02/01/2006	01/01/2006	01/01/2006	01/01/2006 02:11 AM	annual report due: 2005-09-30
37 Change in Name	10/06/2006	10/06/2006	10/06/2006 12:34 AM	Entity name and any active trade names changed due to failure to file annual report

Please include a typed self-addressed envelope

MUST BE TYPED
MUST SUBMIT TWO COPIES

Mail to: Secretary of State
Corporations Section
1560 Broadway, Suite 200
Denver, CO 80202
(303) 894-2251
Fax (303) 894-2242

For office use only

20001117297 C
$ 110.00
SECRETARY OF STATE
06-13-2000 10:40:26

19871442945

APPLICATION FOR REINSTATEMENT

Pursuant to the provisions of the Colorado Business Corporation Act, the undersigned hereby executes the following:

FIRST: The name of the corporation at the time of dissolution JACK E CLARK JR
C.W.M. AND ASSOCIATES, INC.

SECOND: New name under which the corporation is to be reinstated (applicable only if corporate name at time of dissolution is no longer available)
C.W.M. INC.

THIRD: The street address of its registered office and the name of its registered agent at such address is
790 OAK STREET OURAY, COLORADO 81401

Signature of registered agent

FOURTH: The corporation was administratively dissolved on 1-1-2000.

FIFTH: The grounds for dissolution either did not exist or have been eliminated.

SIXTH: All taxes, fees, or penalties imposed by the Colorado Business Corporation Act have been paid.

By Jack E Clark Jr
Its President
Title

Application for reinstatement must be accompanied by a completed corporate report and requisite fees.

☐

FEE $ 25.00
ON OR BEFORE DATE DUE 6/30/00
REPORT YEAR 2000

STATE OF COLORADO
BIENNIAL REPORT OF
A CORPORATION OR LIMITED LIABILITY COMPANY

READ INSTRUCTIONS ON REVERSE SIDE BEFORE COMPLETING
SUBMIT SIGNED FORM WITH FILING FEE

APPLICATION FOR REINSTATEMENT MUST BE FILED

007

THIS FORM MUST BE TYPED

MAILING DATE

INFORMATION BELOW IS ON FILE IN THIS OFFICE - DO NOT CHANGE PRE-PRINTED INFORMATION

CORPORATE NAME REGISTERED AGENT, REGISTERED OFFICE, CITY, STATE & ZIP

19871442945 DPC SUSPEND DATE 01/01/2000
STATE/COUNTRY OF INC CO
CLARK JACK JR
C.W.M. AND ASSOCIATES, INC.
425 7TH AVE
OURAY CO 81427

FOR OFFICE USE ONLY

20001117297 C
$ 110.00
SECRETARY OF STATE
06-13-2000 10:40:26

FIRST REPORT OR CORRECTIONS IN THIS COLUMN

Return completed reports to:
Department of State
Corporate Report Section
1560 Broadway, Suite 200
Denver, CO 80202

TYPE NEW AGENT NAME: Jack E. Clark Jr.
SIGNATURE OF NEW REGISTERED AGENT:
MUST HAVE A STREET ADDRESS: 790 OAK Street
CITY: Ouray STATE: CO ZIP: 81427

OFFICERS NAME AND ADDRESS	TITLE	
WILLIAMS, RONALD L BOX 142 OURAY CO 81427	PR	Jack E. Clark Jr. 790 Oak Street Ouray, Colorado 81427
CLARK, JACK E JR BOX 142 OURAY CO 81427	VS	Barbara J. Clark 790 Oak Street Ouray, Colorado 81427

DIRECTORS OR LIMITED LIABILITY COMPANY MANAGERS	(If you have less than 3 directors, you may list less than 3 directors)
WILLIAMS, RONALD L BOX 142 OURAY CO 81427	Jack E. Clark Jr. 790 Oak Street Ouray, Colorado 81427
CLARK, JACK E JR BOX 142 OURAY CO 81427	N/A

Address of Principal Place of Business

Street: 790 Oak Street Ouray, Colorado 81427
City: Mailing Address 247 North Ute Avenue Montrose, Colorado 81401 State: Zip:

SIGNATURE

Under penalties of perjury and as an authorized officer, I declare that this biennial report and, if applicable, the statement of change of registered office and/or agent, has been examined by me and is, to the best of my knowledge and belief, true, correct, and complete.

BY: (Authorized Agent)
TITLE: President DATE: 6-12-00 19

☐ NOTE: DO NOT USE THIS BOX IF THIS IS YOUR FIRST REPORT!!! SEE INSTRUCTIONS ON REVERSE. IF THERE ARE NO CHANGES SINCE YOUR LAST REPORT, MARK THIS BOX, SIGN ABOVE AND RETURN WITH THE FEE AND BY THE DATE DUE INDICATED ABOVE(UPPER LEFT HAND CORNER). IF YOU ARE FILING AFTER THE DATE DUE ASOVE, CONTACT THIS OFFICE FOR THE PROPER FEE. (303) 894-2251

SEE INSTRUCTIONS ON BACK

ARTICLES OF ORGANIZATION

I, the undersigned natural person of the age of eighteen years or more, acting as organizer of a limited liability company under the Colorado Limited Liability Company Act, adopt the following Articles of Organization for such limited liability company:

FIRST: The name of the limited liability company is K2 Enterprises, LLC.

SECOND: The period of duration is 30 years. 941050641 $50.00 SOS 05-03-94 08:30

THIRD: The limited liability company is organized for any legal and lawful purpose pursuant to the Colorado Limited Liability Company Act.

FOURTH: The street address of the initial registered office of the limited liability company is 3815 County Road 2, Silverton, Colorado 81433, and the mailing address of the initial registered office of the limited liability company is PO Box 298, Silverton, Colorado 81433, and the name of its proposed registered agent in Colorado at that address is Kevin D. Padrick.

FIFTH: The names and business addresses of the initial managers are:

NAME	ADDRESS (include zip code)
Kevin D. Padrick	PO Box 298, Silverton, CO 81433
Karen P. Padrick	PO Box 298, Silverton, CO 81433

SIXTH: The name and address of the organizer is:

NAME	ADDRESS (include zip code)
Kevin D. Padrick	PO Box 298, Silverton, CO 81433

SEVENTH: The company shall indemnify its managers against liability and shall pay or advance expenses incurred in the defense of any proceeding to the full extent allowed by Colorado law.

Signed Kevin D Padrick

COMPUTER UPDATE COMPLETE

E-Filed

Colorado Secretary of State
Date and Time: 10/03/2009 03:32 PM
ID Number: 19941050641

Document number: 20091523920
Amount Paid: $10.00

Document processing fee	
If document is filed on paper	$100.00
If document is filed electronically	**$ 10.00**
Late fee if entity is in noncompliant status	
If document is filed on paper	$ 50.00
If document is filed electronically	$ **40.00**

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Paper documents must be typewritten or machine printed.

ABOVE SPACE FOR OFFICE USE ONLY

Annual Report

filed pursuant to §7-90-301, et seq. and §7-90-501 of the Colorado Revised Statutes (C.R.S)

ID number: 19941050641

Entity name: K2 ENTERPRISES, LLC

Jurisdiction under the law of which the entity was formed or registered: Colorado

1. Principal office street address:
PO BOX 3510
(Street name and number)

SUNRIVER | OR | 97707
(City) | *(State)* | *(Postal/Zip Code)*

(Province – if applicable) | United States *(Country – if not US)*

2. Principal office mailing address: (if different from above)
12 RIVER ROAD
(Street name and number or Post Office Box information)

SUNRIVER | OR | 97707
(City) | *(State)* | *(Postal/Zip Code)*

(Province – if applicable) | United States *(Country – if not US)*

3. Registered agent name: (if an individual)
OTSUKI | JOANNE | | |
(Last) | *(First)* | *(Middle)* | *(Suffix)*

OR (if a business organization)

4. The person identified above as registered agent has consented to being so appointed.

5. Registered agent street address: 2330 S GRAY DRIVE
(Street name and number)

DENVER (*City*) CO (*State*) 80227 (*Postal/Zip Code*)

6. Registered agent mailing address: (if different from above)
(Street name and number or Post Office Box information)

(City) *(State)* *(Postal/Zip Code)*

(Province – if applicable) *(Country – if not US)*

Notice:

Causing this document to be delivered to the secretary of state for filing shall constitute the affirmation or acknowledgment of each individual causing such delivery, under penalties of perjury, that the document is the individual's act and deed, or that the individual in good faith believes the document is the act and deed of the person on whose behalf the individual is causing the document to be delivered for filing, taken in conformity with the requirements of part 3 of article 90 of title 7, C.R.S., the constituent documents, and the organic statutes, and that the individual in good faith believes the facts stated in the document are true and the document complies with the requirements of that Part, the constituent documents, and the organic statutes.

This perjury notice applies to each individual who causes this document to be delivered to the secretary of state, whether or not such individual is named in the document as one who has caused it to be delivered.

7. Name(s) and address(es) of the individual(s) causing the document to be delivered for filing:

Padrick (*Last*) Kevin (*First*) (*Middle*) (*Suffix*)

PO Box 3510
(Street name and number or Post Office Box information)

Sunriver (*City*) OR (*State*) 97707 (*Postal/Zip Code*)

(*Province – if applicable*) United States (*Country – if not US*)

(The document need not state the true name and address of more than one individual. However, if you wish to state the name and address of any additional individuals causing the document to be delivered for filing, mark this box ☐ and include an attachment stating the name and address of such individuals.)

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This form, and any related instructions, are not intended to provide legal, business or tax advice, and are offered as a public service without representation or warranty. While this form is believed to satisfy minimum legal requirements as of its revision date, compliance with applicable law, as the same may be amended from time to time, remains the responsibility of the user of this form. Questions should be addressed to the user's attorney.

History and Documents

02/01/2017 17:20

Name: K2 ENTERPRISES, LLC, Delinquent March 1, 2011

ID number: 19941050641

Found 35 matching record(s). Viewing page 1 of 1.

#	Event	Date Filed	Date Posted	Effective Date	Document # *(click to view)*	Comment
1	Articles of Organization	05/03/1994	05/03/1994	05/03/1994 12:00 AM	19941050641	K2 ENTERPRISES, LLC
2	Report Printed	04/17/1996	04/17/1996	04/17/1996 12:00 AM		CR - 05/01/96 - 07/31/96
3	Report	05/10/1996	05/10/1996	05/10/1996 12:00 AM	19961064947	PERIODIC REPORT
4	Report Printed	04/21/1998	04/21/1998	04/21/1998 12:00 AM		CR - 05/01/1998 - 07/31/1998
5	Report Printed	08/25/1998	08/25/1998	08/25/1998 12:00 AM		CR - 08/31/1998 - SA 10/31/1998
6	Amendment	10/29/1998	10/29/1998	10/29/1998 12:00 AM	19981193913	CHANGE RORA
7	Report	10/29/1998	10/29/1998	10/29/1998 12:00 AM	19981193913	PERIODIC REPORT
8	Report Printed	04/21/2000	04/21/2000	04/21/2000 12:00 AM		CR - 05/01/2000 - 07/31/2000
9	Report	07/25/2000	07/25/2000	07/25/2000 12:00 AM	20001144930	CORP REPORT
10	Report Printed	04/19/2002	04/19/2002	04/19/2002 12:00 AM		PR - 05/01/2002 - 07/31/2002
11	Report	05/30/2002	05/30/2002	05/30/2002 12:00 AM	20021145981	CORP REPORT
12	Report Printed	04/16/2003	04/16/2003	04/16/2003 12:00 AM		PR - 05/01/2003 - 07/31/2003
13	Report	07/01/2003	07/01/2003	07/01/2003 12:00 AM	20031213005	CORP REPORT
14	Report Printed	04/15/2004	04/15/2004	04/15/2004 12:00 AM		PR - 05/01/2004 - 07/31/2004
15	Report	05/05/2004	05/05/2004	05/05/2004 12:00 AM	20041165515	PERIODIC REPORT
16	postcard notification printed 04/21/2005 to be mailed 05/01/2005	04/21/2005	04/21/2005	04/21/2005 10:27 AM		annual report due: 07/31/2005
17	Change in Status	08/01/2005	08/01/2005	08/01/2005 01:37 AM		Failure to file annual report
18	postcard notification printed 08/23/2005 to be mailed 09/01/2005	08/23/2005	08/23/2005	08/23/2005 01:47 AM		annual report due: 10/31/2005
19	Status Changed	10/01/2005	10/01/2005	10/01/2005 12:00 AM		Status changed per 7-90-906 C.R.S.
20	Change in Status	11/01/2005	11/01/2005	11/01/2005 01:46 AM		Failure to file annual report
21	postcard notification printed 11/01/2005 to be mailed 12/01/2005	11/01/2005	11/01/2005	11/01/2005 02:15 AM		annual report due:
22	Change in Name	08/05/2006	08/05/2006	08/05/2006 12:31 AM		Entity name and any active trade names changed due to failure to file annual report
23	Statement Curing Delinquency	09/18/2007	09/18/2007	09/18/2007 04:12 PM	20071428646	
24	postcard notification printed 08/23/2008 to be mailed 09/01/2008	08/23/2008	08/23/2008	08/23/2008 04:37 AM		annual report due: 11/30/2008
25	Change in Status	12/01/2008	12/01/2008	12/01/2008 01:32 AM		Failure to file annual report
26	postcard notification printed 12/18/2008 to be mailed 01/01/2009	12/18/2008	12/18/2008	12/18/2008 03:16 PM		annual report due: 2009-02-28
27	Report	01/13/2009	01/13/2009	01/13/2009 09:30 PM	20091029028	
28	postcard notification printed 08/23/2009 to be mailed 09/01/2009	08/23/2009	08/23/2009	08/23/2009 04:04 AM		annual report due: 11/30/2009

29 Report	10/03/2009	10/03/2009	10/03/2009 03:32 PM	20091523920	
30 postcard notification printed 08/25/2010 to be mailed 09/01/2010	08/25/2010	08/25/2010	08/25/2010 04:25 PM		periodic report due: 11/30/2010
31 Change in Status	12/01/2010	12/01/2010	12/01/2010 01:33 AM		Failure to file periodic report
32 postcard notification printed 12/21/2010 to be mailed 01/01/2011	12/21/2010	12/21/2010	12/21/2010 02:17 AM		periodic report due: 2011-02-28
33 Change in Status	03/01/2011	03/01/2011	03/01/2011 02:08 AM		Failure to file periodic report
34 Change in Name	04/04/2012	04/04/2012	04/04/2012 12:42 AM		Entity name and any active trade names changed due to Failure to file periodic report
35 Filing Officer Correction	11/20/2015	11/20/2015	11/20/2015 08:47 AM	19941050641	Correction of document title from Articles of Incorporation per statute

Summary

Details			
Name	K2 ENTERPRISES, LLC, Delinquent March 1, 2011		
Status	Delinquent	**Formation date**	05/03/1994
ID number	19941050641	**Form**	Limited Liability Company
Periodic report month	September	**Jurisdiction**	Colorado
Principal office street address	PO BOX 3510, SUNRIVER , OR 97707, United States		
Principal office mailing address	12 RIVER ROAD, SUNRIVER, OR 97707, United States		

Registered Agent	
Name	JOANNE OTSUKI
Street address	2330 S GRAY DRIVE, DENVER, CO 80227, United States
Mailing address	n/a

Filing history and documents

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CERTIFICATE OF INCORPORATION

OF

GREAT DIVIDE MINING AND MILLING CORPORATION.

KNOW ALL MEN BY THESE PRESENTS that we, the undersigned, HEROLD A. WADDINGTON, HAROLD E. LAWRENCE, EUGENE B. HEDLUND, all of whom are citizens of the United States of America, have associated ourselves together as a corporation under the name and style, GREAT DIVIDE MIN AND MILLING CORPORATION for the purpose of becoming a bo corporate and politic under and by virtue of the laws of the State of Colorado, and in accordance with the provis of the laws of said State, we do hereby make, execute and acknowledge this certificate in writing of our intention to become a body corporate under and by virtue of said laws.

FIRST: The corporate name and style of the corporation shall be GREAT DIVIDE MINING AND MILLING COR PORATION.

SECOND: The nature of the business of the co poration and the objects or purposes to be transacted, promoted and carried on by it are as follows:

To purchase, option, lease, franchise, grant, dig, prospect for, locate, acquire by discovery, gift, devise or otherwise, to hold, possess, enjoy, develop, wo work, operate and exploit mines, mineral lands, mining claims and rights in the United States or elsewhere. Also to carry on the business in all its various branches of mining for gold, silver, platinum, tungsten, lead, zinc, copper, tin, sulphur, coal, iron, oil, acids, chemicals, and any and all other minerals or other valuable substan

and to explore and operate oil lands.

To construct, purchase, or otherwise acquire, maintain and operate, tunnels, carrier rights of way, sluices, reservoirs and ditches for mining, irrigation, a transportation purposes.

And to construct, purchase, lease or otherwise acquire mills, millsites, building machinery, power house pumping plants and other buildings and structures useful and appropriate to the business of the corporation, pump machinery, dump rights, flumes, pipes, pipe lines, privat railways, private tramways, private roads, easements, franchises, and licenses. To purchase, lease or otherwi acquire, construct and maintain plants for the purpose of extracting values from refractory ores. To purchase, tre and refine minerals and metalliferous substances with a view to obtaining therefrom gold, silver, platinum, radiu tungsten, lead, zinc, copper, nickel, tin, sulphur, iron, oil, acid, chemicals, and other metals and minerals or other valuable substances, and combinations thereof, with the view of preparing the same for market, and generally engage in smelting, reducing, crushing, refining, millin treating, assaying, and selling minerals and ores of all kinds, classes and descriptions. To buy, sell, manufactu and generally deal in machinery, blasting powder, and hig explosives of every description, fuses, caps, implements, candles, and any and all other articles and conveniences suitable for use in connection with mining and metallurgi operations. To purchase, lease, or otherwise acquire lan for the purposes of erecting thereon office buildings, plants, workshops, warehouses, stores, hotels and buildin in connection with the foregoing purposes. To acquire water by purchase, development, or otherwise.

To manufacture, buy, sell, [illegible], and [illegible] conduct and carry on the business of manufacturing, selling and dealing in goods, wares and merchandise of [illegible] class and description. To improve, manage, develop, assign, transfer, lease, mortgage, pledge or otherwise dispose of the property of the corporation, and from time to time vary in the investment or employment of capital the company. To borrow money, and to make and issue bonds and notes, including priority ore bonds or certificates against the profits of the company, without limit to amount, and generally to make and perform agreements and contracts of every kind and description. To the same extent as natural persons might or could do, to purchase otherwise acquire, and to hold, own, maintain, work, deal sell, lease, exchange, hire, convey, mortgage or otherwise dispose of, deal in, lands and leaseholds, and any interest estate and right in real property, and personal or mixed property, and any franchises, rights, licenses or privileges necessary, convenient or appropriate for any the purposes herein set forth. To apply for, obtain, register, purchase, lease, or otherwise acquire and hold own, use, develop, operate and introduce, and to sell, assign and grant, licenses or territorial rights in or to or otherwise to turn to account or dispose of, any copyrights, trademarks, trade names, brands, labels, patent rights, letters patent of the United States or any other country or government, inventions, improvements and processes, whether used in connection with or secured under letters patent or otherwise. To do all and everything necessary, suitable and proper for the accomplishment of any of the purposes or attainment of any of the objects or the furtherance of any of the powers herein set forth,

either alone or in association with other corporations, firms or individuals, and to do every other act or acts, thing or things incidental or appurtenant to or growing out of or connected with the aforesaid business or powers or any part or parts thereof, provided the same be not inconsistent with the laws under which the corporation is organized. To acquire by purchase, subscription or otherwise, and to hold for investment or otherwise, and to use sell, assign, transfer, mortgage, pledge or otherwise deal with, acquire or dispose of stocks, bonds, or any other obligations or securities of any other corporation or corporations, and to give in exchange therefor, the capital stock, bonds, notes, priority ore bonds, or other securities of this corporation, or any other corporation. To merge or consolidate with any corporation in such manner as may be permitted by law, to aid in any manner any corporation whose stock, bonds, or other obligations or securities are held or in any manner guaranteed by this corporation, or in which the corporation is in any way interested, and to do any other acts or things for the preservation, protection, improvement or enhancement of the value of any such stock, bonds, or other obligations or securities and to do any acts or things designed for any other purposes, and while owner of any such stock, bonds, or other obligations or securities to exercise all the rights, powers and privileges of ownership thereto, and to exercise any and all voting power thereon, to guarantee the payment of dividends upon said stock, or principal or interest or both of any priority ore bonds or certificates or the principal or interest or both of any other obligation or security, or the performance of any contracts.

The business or purpose of the company is from time to time to do any one or more of the acts and things hereinabove set forth, and it shall have power to conduct and carry on its said business, or any part thereof, and to have one or more offices, and to exercise all or any of its corporate powers and rights, in the State of Colorado, and in all or any other states, territories, colonies and dependencies of the United States, in the District of Columbia, and in all or any foreign countries.

THIRD: The corporation is to have perpetual existence.

FOURTH: The corporation shall have authority to issue one class of stock, which shall consist of five thousand (5,000) shares of the par value of Fifty Dollars ($50.00) per share, and such stock shall only be issued fully paid and non-assessable.

FIFTH: The affairs of the corporation shall be managed by a Board of Directors which shall consist of nine directors and

Joseph Dresback	Silverton, Colorado
Joseph A. Ford	331 Madison Avenue, New York, N.Y
Albert M. Garbado	219th Street at Jamaica Ave., Queens Village, N.Y.
Harold E. Lawrence	10 - 38th Street, Irvington, N.J
A. Rex Mollette	Newman Building, Durango, Colorado
Hans Moser	Silverton, Colorado
Lee G. Sullivan	60 East 42nd Street, New York, N.Y.
Herold A. Waddington	Silverton, Colorado
William A. Way	Silverton, Colorado

are hereby selected to act as such directors and to manage the affairs of the corporation for the first year of its existence or until their respective successors are elected

and qualified. Each of said directors reserves the rig to resign as such before the end of said first year.

SIXTH: The principal office of the corporati shall be kept in the Town of Silverton, in the County o San Juan, in the State of Colorado.

SEVENTH: The Board of Directors shall have power from time to time to make such prudential by-laws it may deem proper for the management of the affairs of corporation not inconsistent with the laws of the State Colorado, for the purpose of carrying on all kinds of business within the objects and purposes of the corporat The Board of Directors in its discretion may submit any contract or act for approval or ratification at any annu meeting of the stockholders or at any meeting of the st holders called for the purposes of considering any such or contract, and except as otherwise provided herein or the statutes of the State of Colorado, any contract or a which shall be approved or ratified by vote of the holde of a majority of the capital stock of the corporation, represented in person or by proxy at such meeting (provi a lawful quorum of stockholders be there represented in person or by proxy), shall be as valid and as binding u the corporation and upon all stockholders, as though it been approved or ratified by every stockholder of the corporation. In addition to the powers and authorities hereinbefore expressly conferred upon them, the Board of Directors are hereby authorized, when thereunto empowere by a majority vote of all of the stock of the corporatio cast at a regular meeting or at a special meeting of the stockholders called for the purpose, to exercise all such powers and do all such acts and things as may be exercis or done by similar corporations, under the provisions of

the statutes of Colorado then in effect.

EIGHTH: The corporation shall have the right to enter into compromises or arrangements with its stockholders and/or with its creditors, or any class of them, and to reorganize the corporation pursuant to such compromise or arrangement, all pursuant to the provisions of Subdivision 8 of Section 6 of Chapter 41 of the Colorado Statutes Annotated, 1935, as the same now is or may be hereafter amended; and it is hereby expressly provided that this corporation shall have and may exercise all of the rights and powers which said Subdivision 8 of Section 6 of Chapter 41 of the Colorado Statutes Annotated, 1935, now provides, or may hereafter provide, may be exercised by corporations organized under the laws of the State of Colorado.

NINTH: The corporation shall have the right by a majority vote of its whole Board of Directors, with the approval of its stockholders holding two-thirds of the then outstanding voting stock of the corporation evidenced by a vote taken at a stockholders' meeting duly called for that purpose, to sell, lease, exchange and/or convey all of its property and assets, including its good will and its corporate franchises, upon such terms and conditions, and for such consideration or considerations, as the Board of Directors shall deem expedient, and for the best interests of the corporation, and any such consideration or considerations may consist in whole or in part of shares of stock in, and/or other securities of, any other corporation or corporations, all pursuant to the provisions of Subdivision 9 of Section 6 of Chapter 41 of the Colorado Statutes Annotated, 1935, as the same now is or may be hereafter amended; and it is hereby expressly provided that this corporation shall have and may exercise all of the

the statutes of Colorado then in effect.

EIGHTH: The corporation shall have the right enter into compromises or arrangements with its stockho and/or with its creditors, or any class of them, and to reorganize the corporation pursuant to such compromise arrangement, all pursuant to the provisions of Subdivis 8 of Section 6 of Chapter 41 of the Colorado Statutes Annotated, 1935, as the same now is or may be hereafter amended; and it is hereby expressly provided that this corporation shall have and may exercise all of the righ and powers which said Subdivision 8 of Section 6 of Cha 41 of the Colorado Statutes Annotated, 1935, now provid or may hereafter provide, may be exercised by corporati organized under the laws of the State of Colorado.

NINTH: The corporation shall have the right a majority vote of its whole Board of Directors, with t approval of its stockholders holding two-thirds of the outstanding voting stock of the corporation evidenced b vote taken at a stockholders' meeting duly called for t purpose, to sell, lease, exchange and/or convey all of property and assets, including its good will and its corporate franchises, upon such terms and conditions, a for such consideration or considerations, as the Board Directors shall deem expedient, and for the best interes of the corporation, and any such consideration or consi ations may consist in whole or in part of shares of sto in, and/or other securities of, any other corporation o corporations, all pursuant to the provisions of Sub-division 9 of Section 6 of Chapter 41 of the Colorado Statutes Annotated, 1935, as the same now is or may be hereafter amended; and it is hereby expressly provided t this corporation shall have and may exercise all of the

rights and powers which said Subdivision [illegible] of Section [illegible] Chapter 41 of the Colorado Statutes Annotated, 1935, now provides, or may hereafter provide, may be exercised by corporations organized under the laws of the State of Colorado; provided, however, that nothing herein shall be construed to limit the power of the Board of Directors of this corporation to sell, lease, exchange and/or convey such parts or parcels of its real or personal property assets as the Board may determine are no longer necessary or expedient to be held by the corporation.

TENTH: No holder of stock of the corporation shall have any pre-emptive right to subscribe to any additional issues of stock or to any other securities of the corporation.

ELEVENTH: Cumulative voting shall not be allowed in the election of directors.

TWELFTH: All or any part of the business of the corporation may be carried on beyond the limits of the State of Colorado; provided, however, that the original stock ledger of the corporation, and the books of the corporation required to be kept by Sections 31 and 32 of Chapter 41 of the Colorado Statutes Annotated, 1935, as now or hereafter amended, shall be kept at the principal office of the corporation in the State of Colorado. And all meetings of the stockholders and of the directors of the corporation may be held beyond the limits of the State of Colorado, at such time or times and place or places as may be provided by the By-Laws of the corporation or as may be determined from time to time by its Board

Directors.

IN WITNESS WHEREOF, we have hereunto set our respective hands and seals this 25th day of February, A. D. 1944.

Signed and sealed
in the presence of:

F. Nel. Doolittle, Jr.

Harold A. Waddington (L.S.)
HAROLD A. WADDINGTON

Harold E. Lawrence (L.S.)
HAROLD E. LAWRENCE

Eugene B. Hedlund (L.S.)
EUGENE B. HEDLUND

State of New York, } ss.:
County of New York, }

No. 41152

I, ARCHIBALD R. WATSON, County Clerk and Clerk of the Supreme Court, New York C[illegible] the same being a Court of Record having by law a seal, DO HEREBY CERTIFY

Fred E. Egly

whose name is subscribed to the annexed deposition, certificate of acknowledgment or [illegible] was at the time of taking the same a NOTARY PUBLIC acting in and for said County, [illegible] commissioned and sworn, and qualified to act as such; that he has filed in the Clerk's office [illegible] the County of New York a certified copy of his appointment and qualification as a Nota[illegible] Public for the County of Nassau with his autograph signature; that as [illegible] Notary Public he was duly authorized by the laws of the State of New York to protest notes to take and certify depositions, to administer oaths and affirmations, to take affidavits and certify the acknowledgment or proof of deeds and other written instruments for lands, tenements and hereditaments, to be read in evidence or recorded in this State. And further, that I [illegible] well acquainted with the handwriting of such Notary Public, or have compared the signature [illegible] such officer with his autograph signature filed in my office, and believe that the signature [illegible] the said annexed instrument is genuine.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my offic[illegible] this 18 day of Feb 194[illegible]

[signature]

County Clerk and Clerk of the Supreme Court, New York Co[illegible]

State of New York, } ss.:
County of New York, }

No. 41153

I, ARCHIBALD R. WATSON, County Clerk and Clerk of the Supreme Court, New York the same being a Court of Record having by law a seal, DO HEREBY CERTIF[illegible]

Fred E. Egly

whose name is subscribed to the annexed deposition, certificate of acknowledgment or [illegible] was at the time of taking the same a NOTARY PUBLIC acting in and for said County, [illegible] commissioned and sworn, and qualified to act as such; that he has filed in the Clerk's office [illegible] the County of New York a certified copy of his appointment and qualification as a No[illegible] Public for the County of Nassau with his autograph signature; that as [illegible] Notary Public he was duly authorized by the laws of the State of New York to protest [illegible] to take and certify depositions, to administer oaths and affirmations, to take affidavits [illegible] certify the acknowledgment or proof of deeds and other written instruments for lands, tenements and hereditaments, to be read in evidence or recorded in this State. And further, that I [illegible] well acquainted with the handwriting of such Notary Public, or have compared the signature [illegible] such officer with his autograph signature filed in my office, and believe that the signature [illegible] the said annexed instrument is genuine.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my off[illegible] this 18 day of Feb 194[illegible]

[signature]

County Clerk and Clerk of the Supreme Court, New York

State of New York, } ss.:
County of New York, }

No. 41151

I, ARCHIBALD R. WATSON, County Clerk and Clerk of the Supreme Court, New York [illegible] the same being a Court of Record having by law a seal, DO HEREBY CERTIF[illegible]

Fred E. Egly

whose name is subscribed to the annexed deposition, certificate of acknowledgment or [illegible] was at the time of taking the same a NOTARY PUBLIC acting in and for said County, [illegible] commissioned and sworn, and qualified to act as such; that he has filed in the Clerk's office [illegible] the County of New York a certified copy of his appointment and qualification as a No[illegible] Public for the County of Nassau with his autograph signature; that as [illegible] Notary Public he was duly authorized by the laws of the State of New York to protest [illegible] to take and certify depositions, to administer oaths and affirmations, to take affidavits [illegible] certify the acknowledgment or proof of deeds and other written instruments for lands, tenements and hereditaments, to be read in evidence or recorded in this State. And further, that I [illegible] well acquainted with the handwriting of such Notary Public, or have compared the signature [illegible] such officer with his autograph signature filed in my office, and believe that the signature [illegible] the said annexed instrument is genuine.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my offi[illegible] this 18 day of Feb 194[illegible]

[signature]

County Clerk and Clerk of the Supreme Court, New York [illegible]

STATE New York)
: SS.:
COUNTY OF Nassau)

The foregoing instrument was acknowledged before me this 25 day of February, 1944, by HEROLD A. WADDINGTON.

Witness my hand and official seal.

Fred E. Egly
Notary Public

My commission expires the 30 day of March 1944.

FRED E. EGLY
NOTARY PUBLIC
Nassau Co. No. 419
Ctf. filed N. Y. Co. No. 76, Reg. No. 4-E-39
Term expires March 30, 1944

STATE OF Nassau)
: SS.:
COUNTY OF Nassau)

The foregoing instrument was acknowledged before me this 25 day of February, 1944, by HAROLD E. LAWRENCE.

Witness my hand and official seal.

Fred E. Egly
Notary Public

My commission expires the 30 day of March 1944.

FRED E. EGLY
NOTARY PUBLIC
Nassau Co. No. 419
Ctf. filed N. Y. Co. No. 76, Reg. No. 4-E-39
Term expires March 30, 1944

STATE OF Nassau)
: SS.:
COUNTY OF Nassau)

The foregoing instrument was acknowledged before me this 25 day of February, 1944, by EUGENE B. [illegible].

Witness my hand and official seal.

Fred E Egly
Notary Public

My commission expires the 30 day of March 1944.

FRED E. EGLY
NOTARY PUBLIC
Nassau Co. No. 419
Ctf. filed N. Y. Co. No. 76, Reg. No. 4-E-39
Term expires March 30, 1944

108453

CERTIFICATE OF INCORPORATION

OF

GREAT DIVIDE MINING AND MILLING CORPORATION.

Dated: February 25, 1944.

DOMESTIC

RECORDED

BOOK 468 PAGE 5

FILED in the office of the Secretary of State of the State of Colorado, on the 18 day of March A.D. 1944 at 9:00 o'clock A.M.

L. J. BENNETT, Secretary of State

Filing Clerk Slater Fees 60

Old Age Pension Fund 6.50

MAR-18-44 03148 A/60

Indexed by

This document has been inspected and properly Entered on the Records of The Flat Tax Department.

Date Mar. 21, 1944

Anna H. Ward Clerk

CERTIFICATE OF AMENDMENT

of

CERTIFICATE OF INCORPORATION

of

GREAT DIVIDE MINING AND MILLING CORPORATION

THIS IS TO CERTIFY that at a Special Meeting of the Stockholders of GREAT DIVIDE MINING AND MILLING CORPORATION, a Colorado corporation, duly called, noticed and held, pursuant to direction of its Board of Directors, at the principal office of said Corporation in the Town of Silverton, County of San Juan, State of Colorado, on October 15, 1945, at which Special Meeting a quorum was present in person or by proxy and acting throughout, the following Resolution was duly adopted by the affirmative vote of the holders of 4390 shares of the capital stock of said Corporation, such number being in excess of two-thirds (2/3) of the total of 5,000 shares of stock of the Corporation issued and outstanding, viz.:

"RESOLVED, that Article FOURTH of the Certificate of Incorporation of this Corporation, which now reads as follows:

'FOURTH: The corporation shall have authority to issue one class of stock, which shall consist of five thousand (5,000) shares of the par value of Fifty Dollars ($50.00) per share, and such stock shall only be issued fully paid and non-assessable.',

be, and the same hereby is, amended to read as follows:

'FOURTH: The corporation shall have authority to issue one class of stock, which shall consist of six thousand (6,000) shares of the par value of Fifty Dollars ($50.00)

per share, and such stock shall only be issued fully paid and non-assessable.'"

IN WITNESS WHEREOF, this Certificate has been sig- in the name and on behalf of said Corporation by its Presi- ent, Herold A. Waddington, and its corporate seal hereunto affixed and attested by its Assistant Secretary, William A Hay, both thereunto duly authorized, this 15th day of October, 1945.

(Corporate Seal)

GREAT DIVIDE MINING AND MILLING CORPORATION

By Herold A. Waddington

President

ATTEST:

William A. Hay

Assistant Secretary

VERIFICATION

STATE OF COLORADO,
COUNTY OF SAN JUAN, SS.:

HEROLD A. WADDINGTON, being duly sworn, deposes an says, that he is the President of GREAT DIVIDE MINING AND MILLING CORPORATION, a Colorado corporation, on behalf of which he signed the foregoing Certificate; and that he has read said Certificate and that the statements therein made are true and correct.

Herold A. Waddington

Subscribed and sworn to before me this 15 day of October, 1945.

Irene D. Granville

Notary Public

My Commission Expires Feb. 14, 1948

109820

CERTIFICATE OF AMENDMENT

of

CERTIFICATE OF INCORPORATION

of

GREAT DIVIDE MINING AND MILLING CORPORATION

RECORDED

BOOK 481 PAGE 232

DOMESTIC

OCT-24-45 00419 A (4) —

Dated: October 15, 1945.

[illegible] has been inspected and properly entered on the Records of The Flat Tax Department.

Date Oct 25 1945

Edna H. Ward Clerk

OCT-24-45 00426 A (4) —

FILED in the office of the Secretary of State of the State of Colorado on the 24 day of Oct A. D. 1945, at 11:00 o'clock A.M.

WALTER F. MORRISON
Secretary of State

[illegible] Clerk Fee $5.00

Old Age Pension Fund

Indexed by

CERTIFICATE OF AMENDMENT

of

CERTIFICATE OF INCORPORATION

of

GREAT DIVIDE MINING AND MILLING CORPORATION

THIS IS TO CERTIFY that at a Special Meeting of the Stockholders of GREAT DIVIDE MINING AND MILLING CORPORATION, a Colorado corporation, duly called, noticed and held, pursuant to direction of its Board of Directors, at the principal office of said Corporation in the Town of Silverton, County of San Juan, State of Colorado, on June 28, 1946, at which Special Meeting a quorum was present in person or by proxy and acting throughout, the following Resolution was duly adopted by the affirmative vote of the holders of 4428 shares of the capital stock of said Corporation, such number being in excess of two-thirds (2/3) of the total of 5,844 shares of stock of the Corporation issued and outstanding, viz.:

"RESOLVED, that Article FOURTH of the Certificate of Incorporation of this Corporation, which now reads, as heretofore amended, as follows:

'FOURTH: The corporation shall have authority to issue one class of stock, which shall consist of six thousand (6,000) shares of the par value of Fifty Dollars ($50.00) per share, and such stock shall only be issued fully paid and non-assessable.',

be, and the same hereby is, amended to read as follows:

'FOURTH: The corporation shall have authority to issue one class of stock, which shall consist of eight thousand (8,000) shares of the par value of Fifty Dollars ($50.00) per share, and such stock shall only be

issued fully paid and non-assessable."

IN WITNESS WHEREOF, this Certificate has been sign in the name and on behalf of said Corporation by its President, Herold A. Waddington, and its corporate seal hereunto affixed and attested by its Assistant Secretary, William A. Way, both thereunto duly authorized, this 28th day of June, 1946.

(Corporate Seal)

GREAT DIVIDE MINING AND MILLING CORPORATION

By Herold A. Waddington
President

ATTEST:

Wm. A. Way
Assistant Secretary

VERIFICATION

STATE OF COLORADO,
SS.:
COUNTY OF SAN JUAN,

HEROLD A. WADDINGTON, being duly sworn, depo and says, that he is the President of GREAT DIVIDE MINING AND MILLING CORPORATION, a Colorado corporation, on behal of which he signed the foregoing Certificate; and that he has read said Certificate and that the statements therein made are true and correct.

Herold A. Waddington
Herold A. Waddington

Subscribed and sworn to before me this 24 day of June, 1946.

Raymond H. Cooper
Notary Public

My Commission expires March 23-1950

111009

Certificate of Amendment
TO THE
Certificate of Incorporation
of Great Divide Mining and Milling Corporation

DOMESTIC

RECORDED

JUL-1-46 02176 A (C) — 25.0

BOOK 495 PAGE 81

FILED in the office of the Secretary of State, of the State of Colorado, on the 1 day of July A. D. 1946, at 9:10 o'clock A. M.

WALTER F. MORRISON
Secretary of State

Filing Clerk Amendment Fee $2.50

Old Age Pension Fund

Indexed by

This document has been inspected and properly Entered on the Records of The Flat Tax Department.

Date July 2, 1946

Tom H Ward Clerk

DIV-R.A.C

CERTIFICATE OF AMENDMENT

of

CERTIFICATE OF INCORPORATION

of

GREAT DIVIDE MINING AND MILLING CORPORATION

THIS IS TO CERTIFY that at a Special Meeting o the Stockholders of GREAT DIVIDE MINING AND MILLING COR PORATION, a Colorado corporation, duly called, noticed held, pursuant to direction of its Board of Directors, 30 Church Street, New York, N. Y., Room 523, on April 1956, at 5:15 P. M., at which Special Meeting a quorum present in person or by proxy and acting throughout, th following Resolution was duly adopted by the affirmativ vote of the holders of 6753 shares of the capital st of said Corporation, such number being in excess of two thirds (2/3) of the total of 7632 shares of stock o the Corporation issued and outstanding, viz.:

"RESOLVED, that Article FOURTH of the Certificate of Incorporation of this Corporation, which now reads, as heretofore amended, as follows:

'FOURTH: The corporation shall have authority to issue one class of stock, which shall consist of eight thousand (8,000) shares of the par value of Fifty Dollars ($50.00) per share, and such stock shall only be issued fully paid and non-assessable.',

be, and the same hereby is, amended to read as follows:

'FOURTH: The corporation shall have authority to issue one class of stock, which shall consist of ten thousand (10,000) shares of the par value of Fifty Dollars ($50.00) per share, and such stock shall only be issued fully paid and non-assessable.'"

IN WITNESS WHEREOF, this Certificate has been signed in the name and on behalf of said Corporation by its President, Albert M. Garbade, and its corporate sea hereunto affixed and attested by its Secretary, Harold Lawrence, both thereunto duly authorized, this 19th day of April, 1956.

GREAT DIVIDE MINING AND MILLING CORPORATION

By Albert M. Garbade

Albert M. Garbade
President

ATTEST:

Harold E. Lawrence

Harold E. Lawrence
Secretary

VERIFICATION

STATE OF NEW YORK,
COUNTY OF NEW YORK, SS.:

ALBERT M. GARBADE, being duly sworn, deposes and says, that he is the President of GREAT DIVIDE MINING AND MILLING CORPORATION, a Colorado corporation, on behalf of which he signed the foregoing Certificate; and that he has read said Certificate and that the statements therein made are true and correct.

Albert M. Garbade

Albert M. Garbade

Subscribed and sworn to before me this 19th day of April, 1956.

Fred E. Eagly

Notary Public

FRED E. EAGLY
Notary Public, State of New York
No. [illegible]
Qualified in Bronx County
Cert. filed with New York County
County Clerks and Registers

132482

Certificate of Amendment

TO THE

Certificate of Incorporation

of Great Divide Mining and Milling Corporation

DOMESTIC

FILED in the office of the Secretary of State, of the State of Colorado, on the 10th day of May A.D. 1956, at 9:00 o'clock A.M.

GEORGE J. BAKER
Secretary of State

Filing Clerk Robinson Fee 25.00

Old Age Pension Fund

RECORDED

BOOK 749 PAGE 252

This docum... and pr... ...ted cords ... ...t.

Date May 11, 1956

at OK

Ward Clerk

Filing Fee - $5.00

RO-RA 10082

DOMESTIC

DESIGNATION OF REGISTERED OFFICE AND REGISTERED AGENT

Great Divide Mining and Milling Corporation, a corporation
(Name of Corporation)

organized and existing under the laws of the State of COLORADO

hereby certifies that the address of the registered office of the corporation in the State of Colorado shall be William A. Way - Silverton Colorado

that the registered agent of the corporation whose business address is identical with such registered office, shall be Silverton Col. William A. Way

and that the principal place of business of the corporation in Colorado is:

Silverton Colorado
Number Street City

(If same address as registered office, insert "same as above")

IN WITNESS WHEREOF, the undersigned corporation has caused this certificate to be executed in its name by its President, this ✓ day of April, 1960

Great Divide Mining & Milling C
(Name of Corporation)

By Albert H. Garbade
(Signature of Officer)
Albert H. Garbade Pres

STATE OF New Jersey)
) ss
COUNTY OF Essex)

Before me Albert H. Matthews A Notary Public in and for the said County and State, personally appeared ALBERT H. GARBADE who acknowledged before me that he is the President of GREAT DIVIDE MINING & MILLING CORPORATION, that he signed the foregoing, and that the statements contained therein are true.
(Name of Corporation)

In witness whereof I have hereunto set my hand and seal this 26th day of April, A. D. 1960.

My commission expires

HARRY NATHANSON
NOTARY PUBLIC, State of New York
No. 24-0100100
Residing in Kings County
Commission Expires March 30, 1962

Albert H. Matthews
Notary Public

NOTE:
Effective January 1, 1959, each corporation shall have and continuously maintain in the State of Colorado:

(a) A registered office which may be, but need not be, the same as its place of business.
(b) A registered agent, which agent may be either an individual resident, or a domestic corporation, or a foreign corporation authorized to do business in Colorado, having a business office identical with such registered office.

Filing Fee - $5.00

Filing Fee - $5.00

RO-RA 10082

DOMESTIC

DESIGNATION OF REGISTERED OFFICE AND REGISTERED AGENT

Great Divide Mining and Milling Corporation, a corporation organized and existing under the laws of the State of COLORADO, hereby certifies that the address of the registered office of the corporation in the State of Colorado shall be William A. Way - Silverton Colorado; that the registered agent of the corporation whose business address is identical with such registered office, shall be Silverton Col. William A Way; and that the principal place of business of the corporation in Colorado is:

Silverton Colorado
Number Street City

(If same address as registered office, insert "same as above")

IN WITNESS WHEREOF, the undersigned corporation has caused this certificate to be executed in its name by its President, this ✓ day of April, 1960

Great Divide Mining & Milling Co.
(Name of Corporation)

By Albert H. Garbade
(Signature of Officer)
Albert H. Garbade Pres

STATE OF New York)
) ss
COUNTY OF Queens)

Before me Albert H. Matthiessen A Notary Public in and for the said County and State, personally appeared ALBERT H. GARBADE who acknowledged before me that he is the President of GREAT DIVIDE MINING & MILLING CORPORATION, that he signed the foregoing, and that the statements contained therein are true.
(Name of Corporation)

In witness whereof I have hereunto set my hand and seal this 26th day of April, A.D. 1960.

My commission expires

HARRY MATHIESEN
NOTARY PUBLIC, State of New York
No. 24-0100100
Residing in Kings County
Commission Expires March 30, 1962

Albert H. Matthiessen
Notary Public

NOTE:
Effective January 1, 1959, each corporation shall have and continuously maintain in the State of Colorado:

(a) A registered office which may be, but need not be, the same as its place of business.
(b) A registered agent, which agent may be either an individual resident, or a domestic corporation, or a foreign corporation authorized to do business in Colorado, having a business office identical with such registered office.

Filing Fee - $5.00

RO-RA 10082

DESIGNATION OF REGISTERED OFFICE AND REGISTERED AGENT

_____

_____

_____

_____

DOMESTIC

FILED in the office of the Secretary of State, of the State of Colorado, on the
4th Day of May
A.D. 19 22, at _____ o'clock, M.
GEORGE J. BAKER
Secretary of State
Filing Clerk _____ Fees _____
Old Age Pension Fund _____

STATE OF COLORADO

DEPARTMENT OF STATE

CERTIFICATE OF AMENDMENT

I, Byron A. Anderson,

Secretary of State of the State of Colorado, hereby certify that duplicate originals of Articles of Amendment to the Articles of Incorporation of ----------

----------GREAT DIVIDE MINING AND MILLING CORPORATION----------

duly signed and verified pursuant to the provisions of the Colorado Corporation Act, have been received in this office and are found to conform to law.

Accordingly the undersigned, as such Secretary of State, and by virtue of the authority vested in me by law, hereby issues this Certificate of Amendment and attaches hereto a duplicate original of the Articles of Amendment.

Dated this -----THIRD------ day of- --SEPTEMBER----- A. D. 19 65

Byron A. Anderson
SECRETARY OF STATE

BY Fred Dash
DEPUTY

CERTIFICATE OF AMENDMENT

of

CERTIFICATE OF INCORPORATION

of

GREAT DIVIDE MINING AND MILING CORPORATION

- -

THIS IS TO CERTIFY that a Special Meeting of the Stock holders of GREAT DIVIDE MINING AND MILLING CORPORATION, a C corporation, duly called, noticed and held, pursuant to dir of its Board of Directors, at the Hotel Picadilly, 227 Wes Street, New York City, on July 19th, 1965, at which Specia Meeting a quorum was present in person or by proxy and not throughout, the following Resolution was duly adopted by t affirmative vote of the holders of 7019 shares of the capi stock of said Corporation, such number being in excess of thirds (2/3rds) of the total of 10,000 shares of stock of Corporation issued and outstanding, viz/:

"RESOLVED, that Article FOURTH of the Certificat of Incorporation of this Corporation, which now reads as heretofore amended, as follows:

'FOURTH: The corporation shall have authority issue one class of stock, which shall consist of ten thousand (10,000) shares of the par value of Fifty ($50.00) Dollars per share, and such stock shall onl be issued fully paid and non-assessable.',

be, and the same hereby is, amended to read as follo

'FOURTH: The corporation shall have authority to issue one class of stock, which shall consist of fifty-thousand (50,000) shares without par value, and such stock shall only be issued fully paid and non-assessable.'"

IN WITNESS WHEREOF, this Certificate has been signed name and on behalf of said Corporation by its Vice-Preside MILTON LEVIN, and its corporate seal hereunto affixed and

attested by its Secretary, JOHN T. BORMAN, both thereunto dul authorized, this day of August, 1965.

(Corporate Seal)

GREAT DIVIDE MINING AND MILLING CORPORATION

By: _____
Milton Levin, Vice-President

ATTEST:

_____
Secretary

VERIFICATION

STATE OF NEW YORK }
COUNTY OF QUEENS } SS:.

MILTON LEVIN, being duly sworn, deposes and says, that he the Vice-President of GREAT DIVIDE MINING AND MILLING CORPORAT a Colorado Corporation, on behalf of which he signed the fore going Certificate; and that he has read said Certificate and that the statements therein made are true and correct.

Subscribed and sworn to before me this 20th day of August, 1965.

_____
Milton Levin

_____
Notary Public

GRACE VERDEROSA
NOTARY PUBLIC, State of New York
No. 41-4094550
Qualified in Queens County
Term Expires March 30, 1967

182163

ARTICLES OF AMENDMENT
TO THE
ARTICLES OF INCORPORATION

OF GREAT DIVIDE MINING AND MILLING CORPORATION

DOMESTIC

FILED in the office of the Secretary of State, of the State of Colorado, on the 3rd day of September A.D. 19 65
BYRON A. ANDERSON
Secretary of State
Filing Clerk Dunn Fee $25.00
Old Age Pension Fund

CHANGE IN CAPITAL STOCK

This document has been inspected and properly entered on the Records of The Flat Tax Department
OK
Date September 13, 1965
Clerk

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ROLL 85 PAGE 1833

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670

17

SS: FORM DF1
(Rev 6/73)

FILED in the office of the
State of the State of C
BYRON A. ANDERS
Secretary of State
11/30/7

STATEMENT OF CHANGE OF REGISTERED OFFICE OR REGISTERED AGENT, OR BOTH.

To the Secretary of State
of the State of Colorado

26616

Pursuant to the provisions of the Colorado Corporation Act, the undersigned corporation, organized under the laws of the State of COLORADO submits the following statement for the purpose of changing its registered office or its registered agent, or both, in the State of Colorado:

First: The name of the corporation is GREAT DIVIDE MINING AND MILLING CORPORATION

Second: The address of its REGISTERED OFFICE is 3233 ZENOHIA, DENVER COL. 80201

Third: The name of its REGISTERED AGENT is RAY ABENNETT

Fourth: The address of its registered office and the address of the business office of its registered agent, as changed, will be identical.

Fifth: The address of its place of business in Colorado is 3233 ZENOHIA, DENVER, COL. 80201 (BOX 2727)

GREAT DIVIDE MINING AND MILLING CORPORATION (Note

By Albert M. Garbade (Note
Its President PRES

STATE OF NEW YORK
County of NASSAU

Before me, SELMA HELLER, a Notary Public in and for the said County and State, personally appeared ALBERT M. GARBADE, who acknowledged before me that he is the PRESIDENT (President) (Vice-President) of GREAT DIVIDE MINING AND MILLING CORPORA a COLORADO (State of Incorporation) corporation, that he signed the foregoing, and that the statements contained therein are true.

In witness whereof I have hereunto set my hand and seal this 20th day of November, A. D. 1973.

My commission expires March 30, 1974

Selma Heller

SELMA HELLER, Notary Public
NOTARY PUBLIC, STATE OF NEW YORK
No. 41-6043338
Qualified in Queens County
Commission expires March 30, 1974

Notes: 1. Exact corporate name of corporation making the statement.
2. Signature and title of officer signing for the corporation,— must be President or Vice-President except for nonprofit.
3. Signature of Notary Public must be exactly as shown on Notarial Seal, and must agree with notarial commission.
4. This document must be typewritten.

SUBMIT ONE
Filing fee $5.00

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ROLL 252 PAGE 170

File Card Made JMG

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SS [illegible]

MAIL TO:
Colorado Secretary of State
Corporations Office
1575 Sherman St., 2nd Fl
Denver, Co 80203
(303) 866-2361

for office use

366398

SUBMIT ONE
Filing fee $5.00
This document must be typewritten.

STATEMENT OF CHANGE OF REGISTERED OFFICE OR REGISTERED AGENT, OR BOTH.

Pursuant to the provisions of the Colorado Corporation Code, the Colorado Nonprofit Corporation Act and the Colorado Uniform Limited Partnership Act of 1981, the undersigned corporation or limited partnership organized under the laws of Colorado

submits the following statement for the purpose of changing its registered office or its registered agent, or both, in the state of Colorado:

First: The name of the corporation or limited partnership is:

Great Divide Mining and Milling Corp.

Second: the address of its REGISTERED OFFICE is Vranesh and Raisch, 2120 13th Street, P. O. Box 871, Boulder, CO 80306

Third: The name of its REGISTERED AGENT is George Vranesh

Fourth: The address of its registered office and the address of the business office of its registered agent changed, will be identical.

Fifth: The address of its place of business in Colorado is GREAT DIVIDE MINING AND MILLING CORP. (Note)

By George Vranesh (Note)

STATE OF COLORADO
COUNTY OF BOULDER

Its president
Its X registered agent (Note 3)
Its general partner

Subscribed and sworn to before me this 12th day of April, 19[illegible]

My commission expires _____

Notary Public (Note 4)

Address

Notes: 1. Exact name of corporation or limited partnership making the statement.
2. Signature and title of officer signing (for the corporation, must be president or vice president; for a limited partnership, must be a general partner).
3. Regarding profit corporations: This statement may be executed by the registered agent when it involves only a registered address change. A copy of this statement has been forwarded to the corporation by the registered agent.
4. Signature of notary public must be exactly as shown on notarial seal, and must agree with notarial commission.

COMPUTER [illegible]

1 2037 4 13/[illegible] 5.00

History and Documents

02/02/2017 14:27

Name: GREAT DIVIDE MINING AND MILLING CORPORATION, Dissolved January 1, 2003

ID number: 19871108453

Found 24 matching record(s). Viewing page 1 of 1.

#	Event	Date Filed	Date Posted	Effective Date	Document # *(click to view)*	Comment
1	Articles of Incorporation	03/18/1944	03/18/1944	03/18/1944 12:00 AM	19871108453	GREAT DIVIDE MINING AND MILLING CORPORATION
2	Amendment	04/13/1984	04/13/1984	04/13/1984 12:00 AM	19871566698	CHANGE RORA
3	Amendment	05/01/1990	05/01/1990	05/01/1990 12:00 AM	19901061522	CHANGE RORA
4	Report	12/14/1991	12/14/1991	12/14/1991 12:00 AM	19861002772	CR86 - 02/18/86 - 8602772
5	Report Printed	02/18/1992	02/18/1992	02/18/1992 12:00 AM		CR - 03/01/92 - 05/31/92
6	Report	12/13/1993	12/13/1993	12/13/1993 12:00 AM	19881005233	CR88 - 02/05/88 - 881005233
7	Report Printed	02/15/1994	02/15/1994	02/15/1994 12:00 AM		CR - 03/01/94 - 05/31/94
8	Report	04/19/1994	04/19/1994	04/19/1994 12:00 AM	19941045673	CORP REPORT
9	Report	12/13/1995	12/13/1995	12/13/1995 12:00 AM	19901061522	CR90 - 05/01/90 - 901061522
10	Report Printed					

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Summary

Details			
Name	GREAT DIVIDE MINING AND MILLING CORPORATION, Dissolved January 1, 2003		
Status	Administratively Dissolved	**Formation date**	03/18/1944
ID number	19871108453	**Form**	Corporation
Periodic report month	March	**Jurisdiction**	Colorado
Principal office street address	n/a		
Principal office mailing address	n/a		

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ON OR BEFORE DATE DUE 05/31/2000
REPORT YEAR 2000

STATE OF COLORADO
BIENNIAL REPORT OF
A CORPORATION OR LIMITED LIABILITY COMPANY

READ INSTRUCTIONS ON REVERSE SIDE BEFORE COMPLETING
SUBMIT SIGNED FORM WITH FILING FEE

007

THIS FORM MUST BE TYPED

MAILING DATE 03/01/2000

INFORMATION BELOW IS ON FILE IN THIS OFFICE - DO NOT CHANGE PRE-PRINTED INFORMATION

CORPORATE NAME REGISTERED AGENT, REGISTERED OFFICE, CITY, STATE & ZIP

19871108453 DPC STATE/COUNTRY OF INC CO
HENDERSON JOHN R
GREAT DIVIDE MINING AND MILLING CORP
ORATION
1720 14TH STREET
BOULDER CO 80302

FOR OFFICE USE ONLY

ST

20001068869 M
$ 25.00
SECRETARY OF STATE
04-05-2000 08:51:05

FIRST REPORT OR CORRECTIONS IN THIS COLUMN

TYPE NEW AGENT NAME

SIGNATURE OF NEW REGISTERED AGENT

MUST HAVE A STREET ADDRESS

CITY | STATE CO | ZIP

Return completed reports to:
Department of State
Corporate Report Section
1560 Broadway, Suite 200
Denver, CO 80202

OFFICERS NAME AND ADDRESS	TITLE
LEVIN MILTON 99 POWERHOUSE RD ROSLYN HEIGHTS NY 11577	PT
LEVIN, JAMES P. 99 POWERHOUSE RD STE 102 ROSLYN HEIGHTS NY 11577	VP
LEVIN JAMES P 99 POWERHOUSE RD ROSLYN HEIGHTS NY 11577	SE

DIRECTORS OR LIMITED LIABILITY COMPANY MANAGERS	(If you have less than 3 shareholders, you may list less than 3 directors)
LEVIN MILTON 99 POWERHOUSE RD ROSLYN HEIGHTS NY 11577	
HELLER, GENE A. 99 POWERHOUSE RD STE 102 ROSLYN HEIGHTS NY 11577	
LEVIN JAMES P 99 POWERHOUSE RD ROSLYN HEIGHTS NY 11577	

Address of Principal Place of Business

Street _____

City _____ State _____ Zip _____

SIGNATURE

Under penalties of perjury and as an authorized officer, I declare that this biennial report and, if applicable, the statement of change of registered office and/or agent, has been examined by me and is, to the best of my knowledge and belief, true, correct, and complete.

BY James P Levin
Authorized Agent

TITLE V.P. DATE March 30 19 2000

☐ NOTE: DO NOT USE THIS BOX IF THIS IS YOUR FIRST REPORT!!! SEE INSTRUCTIONS ON REVERSE. IF THERE ARE NO CHANGES SINCE YOUR LAST REPORT, MARK THIS BOX, SIGN ABOVE AND RETURN WITH THE FEE AND BY THE DATE DUE INDICATED ABOVE(UPPER LEFT HAND CORNER). IF YOU ARE FILING AFTER THE DATE DUE ABOVE, CONTACT THIS OFFICE FOR THE PROPER FEE. (303) 894-2251

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5298652B-3

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FAQs, Glossary and Information

Summary

Details			
Name	CONNORS HOLDINGS, INC., Dissolved November 18, 2010		
Status	Voluntarily Dissolved	**Formation date**	05/26/1967
ID number	19871280743	**Form**	Corporation
Periodic report month	May	**Jurisdiction**	Colorado
Principal office street address	2260 Major Lane, MONTROSE, CO 81401, United States		
Principal office mailing address	2260 Major Lane, Montrose, CO 81401, United States		

Registered Agent	
Name	PHIL EDWARDS
Street address	2260 Major Lane, MONTROSE, CO 81401, United States
Mailing address	2260 Major Lane, Montrose, CO 81401, United States

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State Of Delaware

Entity Details

3/1/2017 5:24:26PM

File Number: 573925 Incorporation Date / Formation Date: 10/11/1961

Entity Name: UNITED STATES MINERALS CORPORATION

Entity Kind: Corporation Entity Type: General

Residency: Domestic State: DELAWARE

Status: Void, AR's or Tax Delinquent Status Date: 3/1/2008

Registered Agent Information

Name: HARVARD BUSINESS SERVICES, INC.

Address: 16192 COASTAL HWY

City: LEWES Country:

State: DE Postal Code: 19958

Phone: 302-645-7400

Tax Information

Last AnnualReport Filed: 2005 Tax Due: $ 45525

Annual Tax Assessment: $45525 Total Authorized Shares: 2000000

Filing History (Last 5 Filings)

Seq	Description	No of Pages	Filing Date mm/dd/yyyy	Filing Time	Effective Date mm/dd/yyyy
1	Renewal for Void	1	9/20/1996	9:00 AM	9/20/1996
2	Blnkt Address - Corp	0	7/23/1990	8:30 AM	7/23/1990
3	Blnkt Address - Corp	0	7/23/1990	8:30 AM	7/23/1990
4	Renewal for Void	1	3/6/1990	9:00 AM	3/6/1990
5	Blnkt Address - Corp	0	2/14/1986	4:30 PM	2/14/1986

Print this item: **Kittimac Mill - near Howardsville**

INTERNATIONAL EDITION

THE MINES HANDBOOK

SUCCEEDING

THE COPPER HANDBOOK

Founded by Horace J. Stevens, 1900

DESCRIBING

THE MINING COMPANIES OF THE WORLD

BY

WALTER HARVEY WEED, E. M.

Former Geologist in the United States Geological Survey, 1883-1906; Member of Mining and Metallurgical Society of America; Fellow Geological Society of America; Author: Copper Mines of the World; Geology of Butte, Montana; Classification of Ore Deposits, etc.

Copyright, 1922

by Walter Harvey Weed

VOL. XV

Suplementing Volumes I to XIV

Price $15.00

PUBLISHED BY

THE MINES HANDBOOK CO.

Tuckahoe, N. Y.

1922

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Inc. October, 1919, in Wyoming. Succeeds Backoff Leasing Co.

Property: lease and bond on the Bonanza King mine of the Midget Cons. Gold Mining Co. at Cripple Creek. Operated 1920 and 1921.

KEYSTONE CONSOLIDATED M. & M. CO. **COLORADO**

Company dead; but Keystone mine and mill, using flotation, operated 1920. See Vol. XIV for former operations.

KEYSTONE METALS CO. **COLORADO**

Address: H. M. Armstrong, mgr., Polar Mesa, via Grand Junction, Colo.

Property: a carnotite, uranium mine.

KING SOLOMON MINING CO. **COLORADO**

Address: 256 Mining Exch. Bldg., Denver, Colo. Mine office: Frisco, Summit, Co., Colo.

Officers: F. C. Dinsmore, pres.-gen. mgr.; S. H. Alexander, v. p.; C. W. Rowe, sec.-treas., with Q. A. Kelley, H. J. Theobald, J. R. Anders, and C. J. O'Connor, directors.

Inc. September, 1920, in South Dakota. **Cap.** $500,000; $1 par.

Property: 64 quartz claims about 250 acres of placer claims, in the Ten-Mile district, Frisco, Summit county, shows fissure veins in granite, carrying auriferous and argentiferous copper and lead ores.

Development: by a 5,200′ tunnel with 5,000′ of drifts. Company is working the Eleven vein, 3,700′ from portal of the tunnel, said to carry gold, silver, and lead. Steady shipments were made from this vein. Company suspended operations in Fall of 1918 owing to labor conditions, but planned extending tunnel to No. 12 vein in 1919. In 1920, a lessee opened rich ore on No. 11 vein and, in extending a tunnel, cut 18 to 30″ of rich silver-copper ore. Mine reopened by company May, 1921, and 4′ of silver-lead ore was uncovered on the Wheel of Fortune, besides an 18′ body of manganese ore on another claim.

Equipment: includes a 160-h. p. steam and 115-h. p. electric plant, with an 8-drill compressor. Management plans to erect a mill when development warrants. Colorado & Southern R. R. runs by the property.

KISHMAN LEASING CO. **COLORADO**

Out of business in May, 1916. Fully described, Vol. XII.

KITTIE LANE GOLD MINING CO., THE **COLORADO**

Address: Transfer office, 507 Exchange Bank Bldg., Colorado Springs, Colo.

Officers: Marx Lorig, pres.; B. F. Webster, v. p.; Arthur Cornforth, sec.-treas.

Inc. in 1912. **Cap.** 2,000,000 shares; par 1c; 265,000 shares in treasury. On Jan. 1, 1919, company had $240 in cash, a certificate of deposit for $1,000, and bills receivable, $516. Stock listed on Colorado Springs Exchange.

Property: about 30 acres on Raven hill, adioining the Elkton, at Cripple Creek, includes the Nil Desperandum, Rhinocerous, Kittie Lane, and Sitting Bull No. 1 and 2 claims. The Kittie Lane has been leased. Company inactive.

KITTIMAC MINES CO. **COLORADO**

Address: Herbert E. Curran, receiver of company, Room 44, Capital Bldg., Denver, Colo. Company went bangrupt 1917. See Vol. XIV.

Mine in Minnie Gulch, San Juan county, reopened 1921, under H. G. Brient, superintendent, financed by Pittsburg capital.

KOKOMO MINING CO. **COLORADO**

Address: Stilwell Connor, lessee, Kokomo, Colo.

Property: the Pearl group on Chalk mountain, near Buffers, Summit county, owned by the Pearl Cons. M. Co. Ore carries silver, gold, and lead. **Development:** by tunnel. Nine feet of ore had been opened late in 1920, some of it rich in silver. A mill is contemplated.

KOKOMO-RECEN MINING & DREDGING CORPN. **COLORADO**

Address: 5205 West Lake St., Chicago, Ill.

Mine address: Paul Mauver, Kokomo, Colo.

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MINERA EL REFUGIO **MEXICO**

ddress: Parral, Chih.; Mex.
; controlled by the Alvarado Mining & Milling Co., whose address is
[adison Ave., New York City.
'wns the Refugio mine at Parral.

KER HILL COPPER CO., erroneously printed: **Bunker Hill Mines** .o., on first description under that title on page 234.

CUPINE DAVIDSON GOLD MINES, LTD. **ONTARIO**
'he following paragraph from the editorial column of the Canadian ıg Journal is reprinted for our readers benefit: "We must confess that)avidson is not in the same class as the Associated Goldfields. It, the ıson, has something to show in the way of ore. Also it has a very ative directorate. But its finances have been juggled so wonderfully 'earfully that only an expert accountant could tell a shareholder where ands. Neither concern is a credit to Canadian gold mining."

S. SOUTHERN ARIZONA MINING CO. **ARIZONA**
Erroneously printed **Continental Cons. Copper Co.** in third heading on 254.

OCIATED GOLDFIELDS MINING CO.,, LTD. **ONTARIO**
Merged 1921 with other companies to form Canadian Associated Gold- s, Ltd.
The Canadian Mining Journal of June 16, 1922 says this new company n "illicit promotion," and "Against a capitalization of $30,000,000, its ng properties are given a book-value of $20,985,398. This, of course, ı arrant absurdity. It would be much nearer the truth to cut off the figures to the right of the dollar sign and let it go at that."

'TIMAC MINING & MILLING CO. **COLORADO**
Herbert E. Curran, receiver, Room 44 Capital Bldg., Denver, Colo.
This company was organized in Colorado in 1916, as a reorganization he Kittamac Mines Co. of Wyoming, thus acquiring title to the Kitti- : mine and the mill and flotation plant put up by J. M. Hyde, the flota- ı expert. In Oct., 1916 mill was started and shipments of concentrate le. Various changes in the mill made in November and December of 5, failed to make the work a commercial success, and mine and mill 'e shut down and company went into hands of a receiver.
In Oct., 1921, work was resumed under H. G. Brent as manager, and property optioned to Pittsburgh people, who organized the San Juan ısolidated Mine & Milling Co., to take over the property.

N JUAN CONSOLIDATED M. & M. CO., INC. **COLORADO**
Office: 626 Wabash Bldg., Pittsburgh, Pa. **Mine address:** Silverton, Colo.
Property: the Kittmac group, formerly owned by the Kittimac Mines . (1915), in theEureka mining district, better known as the San Juan trict, 8½ miles N. of Silverton and 3½ miles S. E. of Eureka.
Property consists of 76 claims in a solid block, 7,200′ long by 2,900′ de, crossed by 9 vein outcrops, viz. Calibre vein, a gold bearing vein, 30′ de, traceable 9,000′; Isabella, 3′-5′ wide traceable 6,000′, and at 450′ depth -19′ thick; Little Joe vein, 3′ wide and outcropping for 3,300′; Midnight n, No. 1 and No. 2 veins, Stanton, London, Esmeralda and Elvina veins. ıe Isabella vein is reported to show 12′-19′ of silver lead (sulphide) ore, eraging $23 for 12′ width.
Reports by A. S. Walter (1915) and Morris Stockder (1910), show that operty had an orebody of commercial size opened up at that time, but ıerations in 1916 were unprofitable. Veins, like that of Camp Bird mine cur in San Juan andesite (1,000′ thick) capping Silverton formation.

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Provide the following information on continuation sheets. Cite the letter and title before each section of the narrative. Assign page numbers according to the instructions for continuation sheet in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 16B). Fill in page numbers for each section in the space below.

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National Register of Historic Places
Multiple Property Documentation Form

This form is used for documenting multiple property groups relating to one or several historic contexts. See instructions in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 10-900-a). Use a typewriter, word processor, or computer to complete all items.

_X_ New Submission __ Amended Submission

SECTION A: NAME OF MULTIPLE PROPERTY LISTING

Historic Mining Resources of San Juan County, Colorado

SECTION B: ASSOCIATED HISTORIC CONTEXTS

(name each associated historic context, identifying theme, geographical area, and chronological period)

The Gold Rush, 1860-1861
Return to the San Juans, 1870-1874
Settlement and Establishment of Industry, 1875-1881
The Early 1880s Boom, 1882-1885
The Value of Silver is Restored, 1890-1893
The Silver Crash, 1894-1897
The Great Mining Revival, 1898-1910
World War I Revival, 1915-1921
Great Depression Era Revival, 1933-1939
Post World War II Recovery, 1946-1954

SECTION C: FORM PREPARED BY

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city or town Lafayette state CO zip code 80026

SECTION D: CERTIFICATION

As the designated authority under the National Historic Preservation Act of 1966, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in CFR Part 60 and the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation.
(see continuation sheet for additional comments [ ])

State Historic Preservation Officer
Signature and title of certifying official — date

Office of Archaeology and Historic Preservation, Colorado Historical Society
State or Federal agency and bureau

NPS Form 10-900-b
(Revised March 1992)

OMB No.1024-0018

United States Department of the Interior
National Park Service

Historic Mining Resources of San Juan County, Colorado

National Register of Historic Places Multiple Property Documentation Form

This form is used for documenting multiple property groups relating to one or several historic contexts. See instructions in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 10-900-a). Use a typewriter, word processor, or computer to complete all items.

_X_ New Submission __ Amended Submission

I hereby certify that this multiple property documentation form has been approved as a basis for evaluating related properties for listing in the National Register.

_____

Signature of the Keeper date of action

Section E 1: History of Mining in San Juan County

INTRODUCTION

In terms of mining history, San Juan County is among the most important regions in the Rocky Mountain states. The county hosted a local mining industry that was significant for its longevity, productivity, role in key industry events, and association with important people. For example, in 1860, the Animas River drainage was the scene of the first popular gold rush in southwestern Colorado. This initial event led to the exploration and popularization of the San Juan Mountains. During the late 1870s, hardrock mining took hold and became important enough to convince the Denver & Rio Grande Railroad to grade a narrow-gauge line to the San Juans and then up to Silverton. The railroad is still in service today as one of Colorado's premiere tourist attractions, designated a National Historic Landmark in July 1961. Following the Silver Crash of 1893, the owners of the two largest mines in the county instituted the practice of producing and milling low-grade ore in unprecedented volumes to offset the meager returns per ton of material. When these two individuals demonstrated that the strategy was effective, the rest of Colorado's hardrock mining industry followed and pulled the state out of the mid-1890s depression.

An outstanding assemblage of historic resources represents the county's fascinating and important hardrock mining industry. Following abandonment, many of the prospects, mines, and mills succumbed to the pressures of mineral exploration, scavenging, recreational use, and especially natural decay, leaving a number of resources in various states of preservation. While some of the important mines and towns are well-known, forgotten resources are being rediscovered through historic preservation efforts, environmental cleanup, and greater attention to local and Federal public lands.

To foster the understanding and preservation of important sites, the Bureau of Land Management (BLM) commissioned a Multiple Property Documentation Form focused on the county's rich mining heritage. Little other context work has been completed as of 2009 regarding the county's mining history. Several popular publications and a series of resource inventory reports constitute the only broad-scale body of historical analysis. Between the late 1990s and early 2000s, the BLM funded a sweeping inventory of the county's principal mine and settlement sites. The BLM divided the county into study units, identified the principal sites within each unit, and contracted with archaeological consultants to inventory the selected resources. The consultants then produced reports of findings.[1]

While these projects established an important baseline, they were not designed to provide specific guidance regarding the identification, interpretation, and evaluation of the county's

[1] Steve Baker, *Cement Creek West Study Unit-AML Historic Site Survey* (Montrose, CO: Centuries Research, 1998); Ross S. Curtis, *Recording of Historic Mining Properties in the Galena Mountain Study Unit, San Juan County, Colorado* (Durango, CO: Durango Archaeological Consultants, 2001); Eric Twitty, *Mining Cement Creek: A Selective Inventory of Historic Mine Sites on the East Side of the Cement Creek Drainage, San Juan County, Colorado* (Boulder: Mountain States Historical, 2000); Eric Twitty, *The Silverton Mining District k: A Selective Inventory of Principal Historic Sites, San Juan County, Colorado* (Boulder: Mountain States Historical, 2002).

mining resources. The 2010 *Historic Mining Resources of San Juan County, Colorado Multiple Property Documentation Form* commissioned by the BLM attempts to fill this need. The document contains an abundance of information that has been formatted for an understanding of the common types of mining-related resources that may be encountered today.

The *Historic Mining Resources of San Juan County, Colorado* is a subcontext of the larger statewide Multiple Property Documentation Form *The Mining Industry in Colorado*.[2] Jay Fell and Eric Twitty wrote the document in 2005, and the Colorado Historical Society published a revision in 2008. *The Mining Industry in Colorado* provides a broad overview of mining throughout Colorado between 1858 and 2001, general descriptions of its common resource types, and their general registration requirements. A subcontext with greater detail and specificity to San Juan County is necessary to better support regional nominations. The county's history is complex, and the resources varied in type specialized to the region's environment.

Section E.1 of the subcontext describes San Juan County's geography, mining districts, and history in greater detail than the statewide context, and in chronological order. The statewide context, in contrast, follows a geographic approach. The subsection on history is new material and covers the events, trends, people, organizations, and Periods of Significance specific to the county. The subsection is crucial for placing present historic resources in time and place, and identifying relevant Areas of Significance for nomination. Section E.2 reviews the technology, methods, and equipment commonly employed for prospecting, mining, and milling in the county. This information is important to promote a better understanding of the county's mining history and to help interpret mining resources in the field. Section E.2 directly reproduces a parallel section in the statewide context, with author permission, and adapted to the county-specific industry. Material not directly relevant to San Juan County, such as coal mining, has been omitted.

Section F of the subcontext describes the property types common to the mining industry in San Juan County as well as their registration requirements. The section was also directly repeated from the statewide context for consistency, and because terminology and many resource types are universal throughout the greater Rocky Mountains. Section F was, however, adapted to San Juan County where needed. Some resource types are described in more detail while those not found in the county, such as dredge placers, were omitted. Editorial improvements were made as well, and embedded illustrations removed to comply with revision to National Park Service policy.

THE PHYSICAL ENVIRONMENT OF SAN JUAN COUNTY

San Juan County lies in southwestern Colorado, and it encompasses approximately 753 square miles within the central San Juan Mountains. Cycles of geological uplift, subsidence, and glaciation contributed to particularly difficult terrain dominated by high alpine peaks and deep

[2] Jay Fell and Eric Twitty, *The Mining Industry in Colorado Multiple Property Documentation Form* (Denver: On file with the Colorado State Historic Preservation Office, Colorado Historical Society, 2008).

valleys. The peaks range in elevation from around 11,000 to 14,000 feet, and separate several distinct drainages.

The Animas River carved the county's principal valley from between towering landforms. Following a cultural geographic pattern common to the greater Rocky Mountains, nearly all the county's principal towns grew in the valley. The river begins at the confluence of three alpine creeks in the county's northern extent. The appropriately named town of Animas Forks lay at the confluence, and from here, the river trends southerly for around three miles to the townsite of Eureka. The valley widens, curves southwest around two miles to Howardsville, and continues three more miles to the town of Silverton, the county seat. From there, the valley constricts again and resumes a southward course out of the mountains toward Durango.

Numerous streams descend into the Animas River valley from both sides, draining basins between the principal peaks. On the north side, the principal streams are, west to east, Mineral Creek, Cement Creek, Eureka Gulch, California Gulch, and the North Fork of the Animas.

Mineral Creek ascends northwest from Silverton for several miles and then branches at a point historically known as Burro Bridge. The South Fork continues west into a cluster of peaks and basins forming a divide with the Telluride area in the western San Juans. Ice Lake Basin, near the headwaters, was noteworthy because it was center to the Ice Lake Mining District and a cluster of mines developed during the 1880s. The basin is above treeline, features an alpine environment, and, historically, was remote and difficult to access, which confounded mining.

The main fork of Mineral Creek ascends due north from Burro Bridge for around four miles and ends at Red Mountain Pass. Here, the tributary Mill Creek extends west into a group of peaks. The historic settlement of Chattanooga grew at the confluence, and it was center to a small collection of mines. When the Red Mountain Mining District boomed on the north side of the pass (Ouray County) during the mid-1880s, Mineral Creek became a principal route and Chattanooga served as a gateway.

Cement Creek, another principal drainage, ascends north from Silverton and is flanked on both sides by high peaks. The valley trends north for around six miles, curves northeast, and ends at the townsite of Gladstone, which was established at a confluence. Near Gladstone, Prospect Gulch ascends steeply northwest into the Red Mountain peaks, which rise to elevations of more than 12,000 feet. At Gladstone, the South Fork of Cement Creek branches south, the main fork ascends north, and both end in alpine basins. While Cement Creek was heavily prospected during the late 1870s, twenty years passed before the drainage saw mining of significance. Most of the substantial operations were relatively close to Gladstone, and a few were in Prospect Gulch. The Gold King, one of the county's most productive mines, was on the east edge of Gladstone.

Eureka Gulch enters the Animas valley at the townsite of Eureka, and it passes northwest between peaks to Lake Emma and Sunnyside Basin. The gulch saw some of the county's earliest activity, and Sunnyside Basin hosted the Sunnyside Mine, which was one of the most important mines both in the county and state.

California Gulch and the North Fork of the Animas are the last two principal drainages on the north side of the Animas River. They and Cinnamon Creek join at the townsite of Animas Forks, and this confluence serves as the Animas River's headwaters. California Gulch ascends gently west, the North Fork ascends north, and Cinnamon Creek extends east. High peaks rising

to elevations of 12,500 to 13,200 feet surround the confluence, and the confluence itself is a lofty 11,000 feet.

The south side of the Animas River valley features almost as many tributary drainages as the north side. From west to east, the tributaries include Arrastra Gulch, Cunningham Gulch, Maggie Gulch, Minnie Gulch, and Burns Gulch. Arrastra Gulch, scene of the first hardrock mine in the San Juans, is relatively short and ascends steeply south to an abrupt headwall bracketed by high peaks. Beyond lies Silver Lake Basin, which hosted several of the county's most advanced mines.

Cunningham Gulch is one of the deepest of the tributaries and featured several of the earliest and longest-lived mines. The drainage extends southeast from Howardsville for one mile and curves southwest. At the curve, Stony Gulch veers southeast, and while it is a minor tributary to Cunningham, the gulch is noteworthy because it was historically one of the main entry points into the region. Cunningham Gulch continues south for around two miles and branches into several alpine creeks. King Solomon Mountain and North Star Peak form the gulch's west side, and Green Mountain serves as the east side.

Maggie and Minnie gulches open into the Animas valley relatively close together. Over the course of two miles, Maggie Gulch curves from southeast to south and ends in a glaciated basin. Minnie Gulch is almost as long and follows a similar course. Burns Gulch, which featured several productive mines, lies between Eureka and Animas Forks and follows a short and southeastern ascent into numerous peaks.

The far northern reach of the county, mostly above treeline, is the only portion that drains northwest away from the Animas River. Mineral Creek carries snowmelt from the area north of Animas Forks westerly into Ouray County and the Uncompahgre River. Poughkeepsie Gulch, north of Cement Creek, flows from alpine basins into Mineral Creek. Both drainages were, for a brief time early in the county's history, important centers of prospecting.

The climate in the San Juan Mountains presented the mining industry with conditions that some observed were second in difficulty only to Alaska. The editors of the *Silverton Standard* summed the general weather pattern in a simple sentence: "Snow-banks whiten these upper elevations from January to August, and from August to January. The clouds weep about all the year round."[3] What the editors forgot to mention were the high winds.

The summers were the most important season for activity, and while they tended to be hospitable, they were remarkably short and cool. Summer begins in June when temperatures in the 60s and 70s, Fahrenheit, melt the thick snowpack from lower elevations and improve transportation. June is usually clear and bright, but by July, a regional phenomenon known as the monsoon shrouds the mountains in clammy and rainy weather until September, when reliable warmth and sun return. With occasional snows, the middle of summer in the San Juans could be mistaken for mild winter in more temperate climates. The fall begins in October, and while it tends to be dry, the weather has an element of unpredictability. At the least, the temperatures during both day and night are cooler, and cold snaps, snow, and prolonged warm weather are all possible through November. Winter sets in during November and lasts through April. Powerful

[3] *Silverton Standard* (7/27/95): 1.

Pacific storms blowing in from the west deposit up to several feet of snow at a time and send temperatures plummeting well below zero degrees. Cold air masses that follow the storms force the temperatures down as low as -40 degrees, although readings in the 30s and 40s are more typical. Because the cold air tends to sink, the mountain canyons, where most of the settlements were located, channeled streams of frigid air, while the areas on the slopes where the mines lay tended to be much warmer. Despite such conditions, mining thrived in the San Juans by the 1880s and all-year residence became common. Nevertheless, both the geographic and climatic factors contribute to a distinct sense of physical isolation.

SAN JUAN COUNTY'S MINING DISTRICTS

In general, prospectors across the West organized mining districts as a primitive form of frontier government to regulate claim activity and some behaviors of miners. The boundaries of a mining district were usually drawn around concentrations of mineral claims. When prospecting and mining spilled outside of an established district, the boundaries were usually amended to incorporate the additional activity. An elected board set regulations that defined the types of claims, claim sizes, requirements to maintain title, rights for infrastructure and engineering projects, and discovery rights for placer and hardrock deposits. The board also kept records, defined laws that governed behavior and enforced law and order. With the rise of effective county governments throughout Colorado, the majority of these responsibilities fell to a clerk and recorder, while the sheriff administered law enforcement. Mining districts, however, continued to be recognized.

Roughly between 1870 and 1880, prospectors in San Juan County established seven formal mining districts: Animas, Bear Creek, Eureka, Ice Lake, Mineral Creek, Mineral Point, and Poughkeepsie. The press, industry experts, and local interests often attributed new centers of activity to the nearest district and substituted popular names for original designations. As a result, some of the county's districts are known by several names, and their exact boundaries remain nebulous.

Las Animas Mining District

The Las Animas Mining District enjoys the status of first district in the county and probably the greater San Juan Mountains. Prospectors organized the entity, often known simply as the Animas district, on June 15, 1871, to govern claim activity throughout the Animas River drainage.[4] The original district proved unwieldy in size, and when prospectors arrived in significant numbers in 1873, they began carving other districts out of the Las Animas. The Eureka district was the first and took in the territory north of the Animas River and east of Cunningham Gulch. Mineral Creek was the second and assumed the Mineral Creek drainage and mountains west of the Animas River. This left the large cluster of towering peaks southwest of Silverton as the Las Animas district, and they included Kendall Mountain, Kendall Peak,

[4] Allen Nossaman, *Many More Mountains: Volume 1: Silverton's Routes* (Denver: Sundance Publications, 1989) 103.

Hazelton Mountain, Round Mountain, King Solomon Mountain, and North Star Peak. Silver Lake Basin lay near the center. In terms of final boundaries, the Animas River defined the district's west and north edges, Cunningham Gulch was the east side, and Whitehead Peak marked the south line. Silverton anchored the district's northwest corner and Howardsville the northeast corner.

Eureka Mining District

Ruben J. McNutt and George W. Howard, two of the county's pioneers, were the driving force behind the Eureka Mining District. They formalized the district in 1873 and, while the original boundaries are unclear, they designated the region north of the Animas River, east of Cunningham Gulch, and west of the Continental Divide. The boundaries became defined in 1874 or 1875 when prospectors created the Mineral Creek district to the west, and the Mineral Point district to the north. Ultimately, the Eureka district assumed a complex shape. Silverton lay at the southwest corner, and from here, the west boundary passed northwest through the series of peaks that culminated as the Red Mountains. In particular, the west boundary passed through, south to north, Anvil Mountain, Ohio Peak, McMillan Peak, and Red Mountain No.3.

The district's north boundary was inconsistent. It started at Red Mountain No.3, followed the ridge east to Red Mountain No.1, and wrapped around the head of Cement Creek to Hurricane Peak. The north boundary then followed the ridge northeast to Tuttle Mountain, east to Houghton Mountain, and crossed over the North Fork of the Animas to Cinnamon Pass. In essence, the entire north boundary followed the separation between south-flowing and north-flowing drainages.

The east boundary followed a similar principal. That boundary was drawn along the Continental Divide from Cinnamon Pass south to Stony Pass. The Divide also served as the separation between San Juan and Hinsdale counties.

The south boundary was almost as complex as the north. Specifically, the boundary extended from Stony Pass west to Cunningham Gulch and then followed the gulch northward to Howardsville. Thus, the mountains on the west side of the gulch remained within the Animas district while those on the east side belonged to the Eureka district. The south boundary then followed the Animas River west to Silverton.

Cement Creek Subdistrict

It remains uncertain whether the Cement Creek Mining District was formally organized, but archival sources, including mining journals and mine inspectors', reports allude to the existence of a district by that name. The Cement Creek district was limited to the Cement Creek drainage and can be considered a subdistrict within the Eureka.

Mineral Creek Mining District

When prospectors fanned out into the western portion of the county in 1874 and 1875, they found enough mineral deposits to justify a mining district. The prospectors organized the Mineral Creek Mining District, and because the discoveries were widely scattered among the peaks and drainages, the district boundaries remained poorly defined. In general, we can assume that the district included the Mineral Creek drainage west of the Animas and Eureka districts. Most of the activity in the district occurred along the forks of Mineral Creek.

Ice Lake Mining District

During the late 1870s, prospectors found a concentration of mineralized veins in Ice Lake Basin, near the head of the South Fork of Mineral Creek, at the county's west edge. Because the collection was a distinct entity, they organized the Ice Lake Mining District, which was limited to the basin and head of the creek. Ground largely devoid of mineralization between Ice Lake Basin and the mines on Mineral Creek helped the district maintain recognition as distinct.

Mineral Point Mining District

The county's northern extent featured a second Mineral Creek, and it was center to another early district. When Albert W. Burrows and Charles H. McIntyre prospected the area and staked a number of claims in 1873, they almost certainly organized a district at the same time. The original name probably contained the term Mineral but excluded Point because the name Mineral Point did not come into being until 1875 when the Postal Service recognized the settlement of Mineral City as Mineral Point. Afterward, the mining industry adopted the name Mineral Point, and the district was one of the most remote, highest, and difficult to work in.

The district straddled southeast Ouray and northeast San Juan County and encompassed the Mineral Creek drainage. The northeast edge followed the Continental Divide between Wood and Engineer mountains, and extended west from Engineer Mountain across several unnamed peaks. The west edge went almost due south to Tuttle Mountain and respected the divide between the Mineral Creek and Poughkeepsie drainages. The district's south boundary was the same as the Eureka district's north boundary. In particular, the south edge connected the crests of Tuttle and Houghton mountains, and leapt over the North Fork of the Animas River to Cinnamon Pass. The east edge then followed the Continental Divide from the pass north to Wood Mountain, closing the loop.

Poughkeepsie Mining District

The Poughkeepsie Mining District encompassed the Poughkeepsie Gulch area, which was also the headwaters of the Uncompahgre River, in the county's northern portion. From another perspective, the district occupied a pocket of territory west of the Mineral Point and north of the Eureka districts. McNutt and Howard may have formulated a version of the district as early as 1873, when they staked the Poughkeepsie and other claims. The original boundaries are uncertain, but the district became well-defined by 1875. The Poughkeepsie district's east

boundary was the same as the Mineral Point district's west edge. In particular, the boundary formed a line from Tuttle Mountain north over Mineral Creek to the crest of an unnamed peak. Originally, the west boundary may have extended as far as Ironton Park and Red Mountain Creek, but this was pushed eastward with the creation of the Red Mountain Mining District in the early 1880s. As a result, the Poughkeepsie district's western edge followed the crest of Brown Mountain, which was also the boundary between San Juan and Ouray counties. The district's southern edge respected the divide between the Cement Creek and Poughkeepsie drainages and extended from the south end of Brown Mountain through Poughkeepsie Pass to Hurricane Peak.

Bear Creek Mining District

The Bear Creek Mining District was one of the last designated in San Juan County. Prospectors discovered gold on Bear Creek in 1893, prompting a small rush the following year. The district centered on Bear Creek, which flows northeast into the headwaters of the Rio Grande River. Deep in the mountains southeast of Cunningham Gulch, the district was so remote that mining companies found Creede in Mineral County to be easier to reach and relied on it as the nearest point of commerce instead of Silverton. The district extended west over the Continental Divide and included the headwaters of Elk Creek.

THE HISTORY OF MINING IN SAN JUAN COUNTY

Each subheading in Section E itemized below refers to a discrete Period of Significance in San Juan County mining history as defined by historical events, trends, and patterns:

The Gold Rush, 1860-1861
Return to the San Juans, 1870-1874
Settlement and Establishment of Industry, 1875-1881
The Early 1880s Boom, 1882-1885
The Value of Silver is Restored, 1890-1893
The Silver Crash, 1894-1897
The Great Mining Revival, 1898-1910
World War I Revival, 1915-1921
Great Depression Era Revival, 1933-1939
Post World War II Recovery, 1946-1954

The Gold Rush, 1860 – 1861

Mining in San Juan County began not in the San Juan Mountains, but far to the northeast in California Gulch near present-day Leadville. A prospector named Charles Baker postulated that the gulch lay within a huge mineral belt extending from Boulder County southwest to points deep in the mountains. Baker came to Colorado with the Pikes Peak Gold Rush in 1859 or 1860,

examined placer mining centers on the Front Range and in Park County, and finding the most profitable ground already claimed, joined the excitement in California Gulch. Arriving late, he found the same conditions there and, in need of income, joined a crew of miners working for S.B. Kellogg & Company. In his travels, Baker observed that from Boulder County to California Gulch, the placer fields conformed to a northeast-southwest pattern, which supported the mineral belt idea.

Baker discussed the concept with Kellogg and convinced him that more gold probably lay to the southwest. Kellogg agreed to fund an expedition, which Baker led into uncharted territory during the summer of 1860. Leaving the Arkansas River valley, the Baker party crossed over the Continental Divide and descended west along the Gunnison River panning for gold. Repeated failures to find even traces put the mineral belt hypothesis in doubt, although had the party gone south along Cochetopa Creek or north in the Elk Mountains, they would have been successful. Baker instead continued southwesterly toward the San Juan Mountains and followed the Lake Fork of the Gunnison River. When the party arrived at Lake San Cristobal, Baker found gold, but the small deposits were unprofitable and some members turned back. The gold, however, was enough to tantalize Baker and six or seven others into further exploration, and they crossed west over Cinnamon Pass into the Animas River valley. Thus Baker and partners became the first Euro-Americans clearly known to penetrate the deep San Juan Mountains.[5]

When the party reached the Animas River, it followed the constricted, rocky gorge until the valley broadened into an area where tributary drainages converged from nearly all directions. Here, the members pitched camp and prepared for a systematic search for gold. The party allotted specific tributary drainages to its members, who would later compare findings in camp. W.H. Cunningham assumed the first deep gulch near camp that extended south, a prospector named Mason took the only gulch to the west, Baker wandered the Animas valley, and others fanned out to the north.

In the latter portion of summer, Baker and partners grew excited when they discovered what they thought were bonanza placers at the mouths of Cunningham and Mason gulches (later renamed Arrastra Gulch), and near the later townsite of Eureka, presumably named after this initial placer strike. During August, men converged on the discoveries and pursued deeper deposits. Had they taken the time, however, to track the horizontal extent of the gold-bearing gravel, the prospectors may have proceeded less enthusiastically.

Regardless, they processed the shallow gravel with pans and sluices through September, realizing that the season's end drew near. In need of supplies, and seeking to popularize the find, Baker traveled out from the San Juans. In October, he followed the Animas River south to the New Mexican trading outpost of Abiquiu. After relaying his story, Baker turned east and trekked to settlements on the Rio Grande River, where he not only acquired goods, but found a ready audience. After heavily promoting the placer discoveries, Baker assembled a party of around 150 prospectors and other individuals willing to try their luck in what he referred to as Baker's Park.[6]

[5] Nossaman, 1989: 36-37.
[6] Nossaman, 1989: 39.

By mid-October, the original party welcomed Baker and his 150-member entourage. Baker apparently neglected to inform the new prospectors that their window for exploring the high country was short and that they would have to descend before deep snows stranded them. This became painfully obvious as the temperatures fell and the weather turned increasingly unpredictable. Still, the participants of the small rush had just enough time to examine the placer fields, stake claims, and break ground. In response to new competition and out of certainty that the following year would see a major rush, the Baker party claimed their camp and surrounding land as Baker's Park. When winter set in, the entire assemblage of prospectors decided the season was over and descended south out of the mountains.[7]

When they approached the lower elevations, the prospectors broke into several groups. Wanting more than just the Animas River gold, Baker and several others wrapped west around the San Juans to the Dolores River for additional prospecting. Some of the 150 returned to the San Luis Valley and Abiquiu, while Baker's original party and others established a small settlement on the Animas River. The group named their collection of dank and crude cabins Animas City and felt some security in its strategic location (another town by the same name was founded during the mid-1870s down river). The immediate area offered water, shelter, timber for cabins, and game, and the settlement was as close as possible to the gold discoveries. Reasons for insecurity also abounded, however. Because Animas City was completely isolated, residents had to be completely self-sufficient. Of greater import, the settlement was within territory traditionally used by the Ute Indians, and the presence of the prospectors fueled tribal fears of encroachment. Ultimately, these fears would prove well-founded.[8]

As various parties left the San Juans in late fall, they conveyed information that contributed substance to the rumors initially spread by Baker. The reports of gold in the mysterious San Juans spread like wildfire. The Pikes Peak Gold Rush was souring, mountain discoveries were at their zenith, older gold fields were claimed and moreover showed signs of exhaustion, while optimistic wealth seekers continued to arrive. Colorado was ready for another significant gold discovery.

As individuals repeated Baker's stories, the richness and extent of the gold deposits were wildly elaborated. Even the voices of rational and experienced prospectors who personally journeyed to Baker's Park were unable to counter the exaggerations. The highly seasoned Richard Sopris and partners left Animas City by December and returned to the Front Range to report that Baker's discoveries were a bust. Another prospector went so far as to write a series of letters to *Rocky Mountain News* in January 1861 arguing against Baker's finds. The dissent did little to dissuade the unsuccessful, optimistic, and adventurous from journeying to the San Juans as early as October 1860.[9]

S.B. Kellogg was among those that mobilized almost immediately. He felt that Baker's discovery would incite a significant rush and wanted to be among the first to stake profitable ground. He quickly returned East for his family, brought them to Colorado, and organized a party

[7] Ibid.
[8] Ibid.
[9] Nossaman, 1989: 40, 51.

of 150 to 200 individuals. Some of Colorado's most notable pioneers were among the group, and their interest fostered a sense of confidence that Baker's Park would be the next bonanza. Abe Lee, the discoverer of California Gulch, Henry Allen, a founder of Auraria, and Thomas Pollock, one of Denver's first settlers and business operators, all joined Kellogg. In an attempt to establish a foothold in advance of the big rush, Kellogg's party hastily left in the uncertain weather of December with relatively few provisions.

Meanwhile, the idle residents at Animas City grew impatient as they waited for the weather to change. Eager to be first at the diggings, Baker and partners built sleds, hauled supplies 30 miles up to the park, erected cabins, and readied for the season. Much to their surprise, Kellogg's massive party arrived at Animas City in early April along with other, smaller groups of prospectors. Kellogg then joined Baker on what they hoped would be the last trudge up to the placer fields. Despite snow, they tramped to the discovery site and began panning gravel in the icy water.[10]

After Baker had been absent for some days, some Animas City residents assumed that conditions had dramatically improved. A large contingent ascended into the park, and they were undoubtedly disappointed when they saw a thick snowpack covering much of the ground not exposed to direct sun. Further, the weather turned and snow began falling. And yet, the prospectors respected the frontier etiquette of permitting the discoverer, Baker in this case, to stake his claims first before defining their own. As the conditions worsened, the prospectors grew panicky at the thought of being snowbound and implored Baker and partners to take action. Aware of the potential uprising, Baker, his partners and members of Kellogg's party reluctantly staked claims, despite the snow, over the areas that Baker remembered being the best. The group staked 20 claims ascending Cunningham Gulch from its confluence with the Animas River, a like set of claims in Mason Gulch, and another 20 on the Animas at what the group named Eureka. In the context of haste and uncertainty, the Baker party staked the first claims recorded in the San Juan Mountains. As soon as this was finished, the extraneous prospectors then staked their locations adjoining the Baker and Kellogg assemblages, and all retreated back down to Animas City and safety.[11]

Finally, in May, scouts reported that the passes were negotiable, and within several days, Animas City emptied. When the swarm of prospectors arrived in Baker's Park, some paused to build cabins around Baker's supposed townsite while others continued on to the diggings. There, eager prospectors looked over the groups of claims staked in April, added their own, and built cabins and crude shelters nearby. Through May and into June, more prospectors continued to arrive, constituting the first mineral rush to the San Juan Mountains. Silverton historian Allen Nossaman claims that more than 1,000 individuals were interested in Baker's Park in 1861 but not all came. In total, the rush probably drew between 500 and 700 prospectors who invested considerable emotional capital and time in the difficult journey.[12]

[10] Ibid:53.
[11] Nossaman, 1989: 56.
[12] Ibid:60.

Within several weeks, the Animas River ran muddy as those prospectors fortunate enough to possess claims began to process gravel for gold. As a brilliant June progressed, however, doubt about the richness of Baker's Park slowly grew. The meager returns from backbreaking labor demonstrated that the gravel deposits in the lower reaches of Cunningham and Mason gulches and at Eureka were the only ones that contained appreciable amounts of gold and that all the rest offered nothing. Further, the profitable deposits had been claimed by the Baker party and the other prospectors who braved the April snows, leaving little for hundreds of others. Some despaired, many grew angry, and the disenfranchised prospectors looked for someone to blame for their failure. They seized upon Baker, who countered that he had been accurate and that exaggerations of his factual reports were at fault. Regardless, some prospectors attempted to foment rebellion and sought punishment of and even threatened to hang Baker. Most, however, conceded defeat and left the San Juans in June and early July, popularizing the event as the San Juan Humbug.[13]

After most of the rush participants departed, Baker, Kellogg, and party members continued to recover gold but realized that they were not going to be wealthy. The party quickly exhausted its claims in Mason and Cunningham gulches then contracted around Eureka, and after a number of weeks, quit and packed their tools. With little to show after a year of hardship, Baker and partners left the San Juans and brought to an end a gold rush in a land that would later yield millions of dollars in silver.

When Baker arrived at Fort Garland, he found that the Civil War had begun, and feeling the call of duty, hastened to his native state of Virginia to enlist in the Confederacy. After the war's end, Baker returned to Colorado to resume prospecting and was drawn to the upper Arkansas River valley in 1867 by gold discoveries at Granite. Probably still interested in his gold belt hypothesis, he and a small party began exploring the Western Slope and followed the Colorado River into Utah. There, Baker, who managed to survive the deadly Civil War, was killed in tribal conflict with the Ute.[14]

Return to the San Juans, 1870 – 1874

The failure of the San Juan Humbug etched an indelible prejudice against the mountains during the 1860s and 1870s, even though the region was in reality a mineralogical treasure trove. Experienced prospectors, however, remained cognizant of this potential. Unknown to each other, two parties made plans during the late 1860s to search the San Juans not for additional placer deposits, but for hardrock silver and gold ore.

One party consisted of Adnah French, John C. Dunn, Rodney McKinnon, and Solomon Shoup, who prospected together in west-central Arizona. Born in Brandon, Vermont, French

[13] Robert L. Brown, *An Empire of Silver* (Denver: Sundance Publications, 1984) 19; Nossaman, 1989: 64; J.G. Pangborn, *The New Rocky Mountain Tourist Arkansas Valley and San Juan Guide* (Chicago: Knight & Leonard, 1878) 41; Robert E. Sloan, and Carl A. Skowronski, *The Rainbow Route: An Illustrated History of the Silverton Railroad, the Silverton Northern Railroad, and the Silverton, Gladstone, & Northerly Railroad* (Denver: Sundance Ltd, 1975) 14.

[14] Brown, 1984: 19; Nossaman, 1989: 74; Pangborn, 1878: 41; Sloan and Skowronski, 1975: 14; Muriel Sibel Wolle, *Stampede to Timberline: The Ghost Towns and Mining Camps of Colorado* (University of Ohio Press, 1991 [1949]; Swallow Press) 340.

joined the famed Lawrence Party in 1858, one of the three original groups to find placer gold in Colorado and launch the Pikes Peak Gold Rush. As such, French was one of the founders of St. Charles City at the Cherry Creek diggings, and went on to help found Denver. Two years later, French hoped to repeat his good fortune and joined the Baker Party, where he became intimately familiar with Baker's Park. Dunn was born in New Brunswick in 1838, moved to Maine, and then to Lawrence, Kansas at the age of sixteen. Seeking adventure, he traveled over the Santa Fe Trail to wild New Mexico in 1862 and worked at the Apache-Navajo Indian Agency. Dunn also served as an agent between 1864 and 1866. During his time in New Mexico, Dunn heard of the failed rush to Baker's Park and suspected that the gold came from a parent source.[15]

Corydon E. Cooley, Henry W. Dodd, and Dempsey Reese constituted the second party, also in Arizona. Like French, Reese had direct experience as a prospector. Born in Henry County, Indiana, in 1835 Reese joined the Pikes Peak rush in 1860. Finding no gold, he worked for outfitters and helped Charles Baker begin his journey into the San Juans. When the Pikes Peak rush went bust, Reese left Colorado and joined a party to prospect in Oregon. Wealthy in experience but not gold, he returned to the East via Idaho, British Columbia, and Montana. Restless, Reese came west on another whirlwind prospecting tour of Utah; California; Nevada; and Sonora, Mexico, winding up in Arizona in 1868.[16]

Whether the two groups met or simultaneously came up with a common idea is unknown, but both parties idealized the potential for hardrock ore in the San Juans and joined forces. In 1869, the merged party began its journey across the Southwest and quickly confronted problems. Water was difficult to find, and Apache raids and threats struck fear into most of the party, who had increased beyond the original eight. Within a short time, all but the original eight turned back. With Dunn's experience as an Indian agent, the party successfully negotiated passage across the desert and finally reached abandoned Animas City by October. An early snowstorm blocked their ascent into Baker's Park, but the group was unwilling to hunker down in the abandoned collection of cabins, some of which the Utes had destroyed, and went southwest to the safety of Fort Lowell in New Mexico.[17]

Once there, the party decided to split and winter in various points in the region. A few stayed at Santa Fe, several went on to Tierra Amarilla, and Reese and others took up residence at San Juan Pueblo. There, Reese met Miles T. Johnson, an old Pikes Peak friend. During the winter, Cooley arrived at San Juan Pueblo with several of the prospectors who turned back, and all waited for the spring thaw.[18]

When April 1870 arrived, the party amassed at Tierra Amarilla and left for the San Juans. They reoccupied the intact cabins at Animas City and waited for the snowpack on the passes to thaw. During the idle time, Dunn and some of the other members grew impatient, and they left for a venture around the west base of the San Juans to the Dolores River drainage, which was

[15] Roger Henn, *Lies, Legends & Lore of the San Juans* (Montrose: Western Reflections, 1999) 14; Nossaman, 1989: 43, 81.
[16] Nossaman, 1989: 82.
[17] Brown, 1984: 21; Nossaman, 1989: 81-82; Pangborn, 1878: 42; Sloan and Skowronski, 1975: 15.
[18] Brown, 1984: 20; Nossaman, 1989: 84.

free of snow. French, Reese, Johnson, and a few others, however, were still fixated on Baker's Park and awaited passage.[19]

Later in the month, French was able to wait no longer and broke tracks over the passes and into Baker's Park. These adventurous prospectors were the first Euro-Americans in the area since the rush of nine years before and must have thought that the realization of riches was only a matter of time. They had the river valley to themselves, and furthermore sought hardrock ore, which the Baker party had not considered. French and partners at once returned to the scene of the original gold discoveries in Cunningham and Mason gulches and probably occupied one of the original cabins built in 1861. Possibly working as a group, the prospectors tried the stream gravels again for gold but eagerly began examining the sides of the gulches for the parent veins.

While French, Reese, and Johnson would have considered silver ore, they were interested primarily in gold. In 1870, gold was valued at $20.70 per ounce and could be easily separated in the field with fine crushing and amalgamation with mercury. Silver, by contrast, was valued at $1.33 per ounce and usually required in-depth processing including roasting, leaching, and smelting. In addition, the exact process was dictated by the proportion of silver and other metals, which could only be determined through assay.

With this in mind, the trio began their search for ore in Cunningham Gulch, followed the drainage to its end, and veered southwest up a tributary they named Mountaineer Creek. Near an unusual geological formation on the north side, one of the prospectors found a vein that carried metals. Close examination suggested that the metal was silver, and the party claimed the formation as the Mountaineer (later part of the Highland Mary Mine). French, Reese, and Johnson thus found the first hardrock lode and staked the earliest hardrock claim in the Animas drainage. On the way down and north out of the gulch, the party examined the steep walls and found another vein of similar character on the east side and staked it as the Manderfield, the second lode and claim (later the Green Mountain Mine).[20]

Afterward, French, Reese, and Johnson focused on Mason Gulch, which had featured the richest placer deposits in the past. At first, the prospectors examined mineralized veins in the gulch's outcrops and cliffs, and one of them ascended a ridge on the west side and encountered a third silver vein. The group staked the region's third discovery as the Mammoth (later part of the Aspen Mine) and then resumed the search for gold.[21]

Rather than try to find the source of the placer gold by happenstance, the party resorted to a systematic strategy practiced by experienced hardrock prospectors. In particular, they sampled the gravel in the gulch for traces of placer gold, not to recover the material, but instead to find the point where the gold particles were being introduced into the drainage. Through digging and panning, they slowly progressed upward until the gold disappeared. This marked the point where the gold was eroding into the stream from its parent source, and the prospectors turned to soil samples taken from the gulch sides. Recovering gold well above the stream channel, the prospectors neared the source and began closely examining the gulch sides for any sign of a

[19] Nossaman, 1989: 86; Sloan and Skowronski, 1975: 15.
[20] Nossaman, 1989: 89.
[21] Ibid: 89.

mineral formation, vein, or fault. Possibly after encountering fragmented vein material lying on the ground, the party found that the gold came from a minor drainage on the gulch's east side, and after inspecting the bedrock outcrops, one of the prospectors finally found gold ore. Excited and optimistic, the party staked the find as the Little Giant but was reluctant to declare absolute success until the vein's content had been proven. The claim was the fourth in the region and the only gold vein yet found.[22]

By drilling and blasting, the prospectors drove a discovery cut into the vein and found, that the ore continued deep into the rock. The size of the discovery workings remains unknown, but it seems highly likely that the prospectors collected sacks of ore for assay. During the last month of summer 1870, French, Reese, and Johnson reluctantly packed their camp. Even though they were undoubtedly excited, the three prospectors understood that hard work was ahead if they were to make the claims legal and profit from their finds.

French, Reese, and Johnson wintered in Santa Fe, where they met the Dunn party. Dunn reported gold and silver discoveries near what became Rico. Based on French's recounts, Dunn planned his own visit to Baker's Park in 1871. While in Santa Fe, French also encountered William J. Mulholland, one of the 1869 Arizona prospectors who turned back in fear of Apache attacks. Mulholland was born in Ireland in 1837 and immigrated to Canada in 1847 to seek a better life. He went south in 1859, working as a carpenter before reaching Colorado in 1865, where he tried his luck at Buckskin Joe in Park County. When the boom there collapsed, he engaged in construction in Huerfano County before joining the rush to Elizabethtown, New Mexico. In 1869, Mulholland went to Arizona to prospect, where he encountered French and Reese. After abandoning French's expedition, Mulholland finally reached Santa Fe, where he accepted a position as carpenter for the government and worked with Thomas Blair.[23]

Blair was a western roustabout and skilled carpenter. He was born in Pond Mills, Ontario, probably during the 1830s and may have served as a mercenary in the Civil War. Restless after the war ended, Blair sought adventure in the West, working as a carpenter and prospecting along the way. In 1870, he found employment at Santa Fe as a government carpenter and worked with Mulholland.[24]

After meeting Mulholland and Blair, French realized that the two carpenters possessed the skills needed to develop the Little Giant. In particular, they had tools, knowledge of mechanics, the ability to build from scratch, and most importantly, adventurous spirits. The only resources that lacked were adequate capital for supplies, specific mining equipment, and materials. To interest the carpenters and several investors, French, Reese, and Johnson divided the Little Giant into six shares and offered one each to themselves, Blair, Mulholland, and merchant James H. Cook for $500 and a grubstake. French realized that $500 was not enough

[22] Nossaman, 1989: 89; Frederick Leslie Ransome, *USGS Bulletin No. 182: A Report on the Economic Geology of the Silverton Quadrangle, Colorado* (Washington, D.C.: U.S. Geological Survey, Government Printing Office, 1901) 19; *"The San Juan Mines" EMJ* (2/11/73); Sloan and Skowronski, 1975: 15.
[23] Nossaman, 1989: 93.
[24] Ibid: 94.

and approached William A. Pile, New Mexico governor, and Joshua S. Fuller, Santa Fe merchant, to offer them a deed to half of the Little Giant for a greater sum.[25]

In May 1871 French, Reese, Johnson, Mulholland, Blair, and Cook left Santa Fe to develop the Little Giant. They departed in secrecy and followed the Rio Grande River to its westerly headwaters. Certain that the party had not been followed, the six wealth-seekers pitched camp on the grassy floor of Cunningham Gulch, relocated the Mountaineer claim, and conducted additional prospecting. Afterward, the party made the short climb into Mason Gulch and immediately went to work.[26]

While French, Reese, and Cook began blasting ore from the vein, Blair and Mulholland most likely erected several cabins. Because the ore could not be economically shipped to one of the handful of mills in New Mexico or Colorado's Front Range, the party came prepared to build their own facility, based on the traditional Spanish arrastra. This simple apparatus consisted of a circular stone floor hemmed in by low sidewalls with a capstan at center and a beam that rotated around the capstan. A draft animal walked a track around the arrastra and pulled the beam, which dragged stones around the floor. As the stones ground the ore, an attendant added water and mercury, which amalgamated with the gold as it was freed.

The arrastra that Mulholland and Blair built, however, was more sophisticated to treat a larger tonnage of ore in less time. The Little Giant facility featured four drag beams linked to a side-shot waterwheel with a leather belt. The arrastra floor was relatively large at 15 feet in diameter, the sidewalls consisted of vertical planks, and the waterwheel was 18 feet in diameter. To take advantage of waterpower, Mulholland and Blair sited the arrastra on the floor of what came to be known as Arrastra Gulch. A dam and flume provided the water, which flowed through a ditch.[27]

When the apparatus was finished, the party gathered for the trial run and eagerly awaited the results. After the ore had been ground, they drained out standing water, shoveled off the sandy tailings, and grew excited over the dark gray amalgam lining the stone floor. They scraped the material into a leather bag, squeezed out the liquid mercury, and heated the pasty mass in a retort to drive off and condense the remaining mercury for reuse. When the retort's cover was cautiously removed, all marveled at the golden results of their year-long planning. They produced the first pure gold, or any metal for that matter, in the San Juans.

Isolation was ordinarily perceived as an impediment to mining, and yet, the French party treasured the fact that they had the Animas River drainage and its potential riches to themselves. Thus, they were pained when they saw another party of prospectors arrive in May, followed by two more in June. George Howard led the first party, and he too had direct experience with the San Juan Humbug. Howard spent the winter of 1871 in Elizabethtown, New Mexico, where he learned of the gold discoveries at what became Summitville. He assembled a party at Loma, on the Rio Grande River, and traveled into the mountains where they were turned back by snow. When the party reappeared in Loma, Howard learned of the French party's quiet escape and set

[25] Ibid: 94.
[26] Nossaman, 1989: 95, 97.
[27] Ibid: 102-3.

out after them only several days behind. Imitating French, the Howard party arrived in Cunningham Gulch, pitched camp, and prospected the area. Howard ascended the east flank of King Solomon Mountain, found a silver vein, and staked it as the Weminuche claim. Afterward, Howard joined the French group in Arrastra Gulch and staked several more claims.[28]

John Dunn brought the second party into Baker's Park. Disenchanted with the Dolores drainage and remembering French's excitement over Baker's Park, Dunn formed his group and came to the Animas drainage. The party consisted of George U. Ingersoll, David P. Quinn, Andrew Richardson, and Edwin Wilkinson. Ingersoll was born in Maine during 1847 and began life on the frontier as a reporter in the railroad town of Cheyenne in 1867. The following year, Ingersoll prospected south through Colorado and into New Mexico, and turned back north to Gilpin County, where he worked as a miner until 1871. There, he honed his knowledge of prospecting and mining gold. Rumors of strikes around the San Juans, particularly Summitville, drew him back south to Del Norte, where he joined Dunn's party.[29]

Like the two parties before him, Dunn and compatriots gravitated to the head of Cunningham Gulch, where they may have encountered French's Mountaineer claim. Nearby, they found another silver vein and claimed it as the Highland Mary. In Arrastra Gulch, the prospectors found a gold vein, named it the Sampson (which should not be confused with the Sampson Mine on Cement Creek), and began development. In imitation of the Little Giant operation, Dunn and partners built their own arrastra, probably relying on traditional animal power. Unlike the Little Giant arrastra, however, Dunn's facility was unsuccessful and became the first in a long series of mill failures that plagued the region for three decades.[30]

Ruben J. McNutt, Jim Pringle, George Rolbin, and Jack Munroe constituted the third prospecting party to arrive in the summer of 1871. McNutt had as much experience with the western frontier as anyone in Baker's Park. He was born on a farm in Albany, New York, in 1841, went west to California on the tail end of the Gold Rush in 1859 to find the placer fields mostly exhausted. To earn income, he worked as a miner at Placerville before joining the Fifth California Infantry in 1861 to participate in its Civil War march to New Mexico. After the war ended, McNutt remained on the plains as a scout amidst perennial conflict between settler and tribal interests before returning to New York. Unhappy, McNutt came to Colorado in 1870 and ended up at Loma, New Mexico, where he learned of the strikes in the San Juans.[31]

Pringle was another seasoned frontier prospector. He was born in Roxburghshire, Scotland, in 1838 and immigrated to the United States as a young man. Pringle spent a year in New York, followed by a brief sojourn in western Canada, and tried his luck in the California gold fields. When he arrived in 1857, Pringle found that organized companies dominated the available placer deposits, and, in need of income, shoveled gravel for one of those companies until he saved enough money to move on. Hoping to strike it rich at distant, inland placer strikes, he joined the rushes to Boise Basin and Montana in 1865. Still unsuccessful, he went to White

[28] Ibid: 98.
[29] Henn, 1999: 14; Nossaman, 1993: 39, 100, 121.
[30] Henn, 1999: 13-14; Nossaman, 1989: 100-101.
[31] Nossaman, 1989: 102; *Portrait and Biographical Record of the State of Colorado* (Chicago: Chapman Publishing Co., 1899): 1026.

Pine, Nevada, during its 1869 silver rush then prospected his way south through Utah to Arizona. When Pringle assessed his situation, he realized that Colorado was the only place of mineralogical significance he had yet to visit, so he traversed the dangerous southwest to the San Luis Valley in 1871. Impressed with the region's potential, he made a semipermanent home in Cañon City and spent the warm months prospecting. On his way to Cañon City, however, Pringle joined McNutt and partners.[32]

During June, the three parties of prospectors acknowledged that there was enough activity, to justify the organization of a mining district. Because the French party was the first in Baker's Park, the rest of the prospectors gave them seniority in terms of administration and appointed Miles T. Johnson as recorder. On June 15, 1871, they congregated around Johnson's tent and created the Las Animas Mining District around the main portion of the Animas River drainage. Initially, the district included the peaks and tributaries flanking the Animas River from the Continental Divide on the east, over to the west end of Baker's Park. As noted above, this original geographic entity was divided into smaller mining districts during the following ten years. Ultimately, the cluster of peaks and basins bounded on the east by Cunningham Gulch, on the north by the Animas River, and on the south by Whitehead Peak constituted the district's core.[33]

With a mining district formally designated, an estimated forty to fifty prospectors kept Johnson busy recording claims. Thomas Blair was among the prospectors who submitted information and, curious about the Mammoth Lode, he ascended Arrastra Gulch's west rim and found a more robust, parallel formation. Blair claimed the vein as the Aspen, which sparked only minor interest at the time because gold commanded the attention. This would change. The Aspen, like the other veins recorded by Johnson, featured silver and industrial metals, and none offered gold like the Little Giant. However, that mine was the only truly productive operation in the San Juans during 1871.

When the working season came to a close, the prospectors made preparations to leave. They had demonstrated that the mountains abounded with mineral veins, and in an attempt to regulate claim activity, created the first mining district. The prospectors also established a camp in Arrastra Gulch, which would serve as a base of operations for years to come. Of greatest significance, the first profitable mine and mill were brought into production, proving that mining could be successful.[34]

1872 was also significant for mining in the San Juan Mountains due to three factors. First, prospectors realized that Baker's Park was vast and untapped, and therefore offered high potential. Thus, when the French, Dunn, and McNutt parties returned in the late spring, other groups followed and increased the total number of individuals up to around 150. Second, these new prospectors were interested in silver as well as gold. The net result was that the p prospectors spread out, found silver veins of considerable richness, and began actual development of them. Third, the overall increase in activity, proof of ore, and success of the

[32] *History of the Arkansas Valley* (Chicago: O.L. Baskin, 1881) 755; *Portrait and Biographical Record*, 1899: 1102.
[33] Nossaman, 1989: 103.
[34] Nossaman, 1989: 104. Dollar conversions are derived from consumer price indexes on eh.net.

Little Giant Mine began to draw the interest of alert investors. Because the San Juans were remote, though, another rush was long in coming.

During 1872, Arrastra Gulch, Cunningham Gulch, and the Animas River valley continued to host most of the activity. The French party enlarged the camp in Arrastra Gulch, other individuals built cabins in nearby drainages, and George Howard pioneered the mouth of Cunningham Gulch. With silver now of interest, individuals began developing the Mountain Boy, Green Mountain, and other veins on the east side of Cunningham Gulch. With the Sampson gold mine not producing, the Dunn party joined the search for silver, targeting veins near Howard's discovery on King Solomon Mountain. Dunn ascended Cunningham Gulch's precipitous west wall into a glaciated hanging valley. The basin was crowded on all sides by North Star Peak, another peak to the south, and a connecting arête, or knife-edged ridge, between. In what became known as Dives Basin, Dunn, Ingersoll, Richardson, Quinn, and several others established a camp and fanned out across the ragged bedrock walls. Within days, the party located the Shenandoah vein, traced it northwest across the valley, and staked the extension with a series of claims that included the Dives and Shenandoah No.3. Satisfied, Dunn and partners returned to Arrastra Gulch. In imitation, Miles Johnson made the ascent and staked his namesake claim on the peak, and Henry B. Adsit, John Goodwin, and members of the Dunn party located additional properties.[35]

Prospecting partners Theophile Benjovsky and Martin Van Buren Wason were among the new arrivals in 1872, and they joined the small rush up to North Star Peak. Benjovski was born in Poland in 1854. Possibly in response to the Moose silver discovery of 1871 and Fairplay's reputation for placer gold, he decided to try prospecting the Mosquito Mountains. Discouraged, Benjovski tried his fortune at Summitville. During 1871, Benjovsky staked and sold a few claims there and formed a partnership with Wason.[36]

Wason could match almost anyone in terms of mining and prospecting experience. Born in New Hampshire or Vermont in 1823, he became a sailor, traveling to Japan, China, and India. He weathered Cape Horn several times and joined the California Gold Rush, during which he learned the basics of prospecting, placer mining, and the dark side of the mining frontier. Wason also spent much time in Central and South America where he served as a captain on a pearl boat, ranched in Argentina, and mined gold in Central and South America. He returned to California in 1870, acquired a small herd of horses, and drove them east into Colorado. Impressed by the Rio Grande River valley and its proximity to markets, he established a ranch. When gold was discovered at Summitville, Wason joined the small rush in 1871 where he met Benjovsky. The partners staked several unsuccessful claims, but with whetted appetites, continued on the following year to North Star Peak.[37]

In Dives Basin, the partners enjoyed a streak of good fortune. They identified one of the best silver veins, claimed it as the North Star, then followed it northwest with the North Star

[35] Nossaman, 1989: 124, 220.

[36] Allen Nossaman, *Many More Mountains: Volume 2: Ruts into Silverton* (Denver: Sundance Publications, 1993) 145-6.

[37] Nolie Mumey, *Creede: The History of a Colorado Silver Mining Town* (Denver: Artcraft Press, 1949) 81-2; Nossaman, 1989: 122; Nossaman, 1993: 99.

Extension claim. They also identified a spur south of the Shenandoah vein and staked the Spotted Pup claim. In so doing, Wason and Benjovsky had unwittingly laid claim to the best veins in Dives Basin.

Inevitably, reports of silver, word of the North Star excitement, and the success of the Little Giant Mine reached eastern investors who specialized in remote and unproven mining ventures. Emery Hamilton reasoned that, because the San Juans had just been opened, he could have his choice of prospects, but only if he personally spent time on the scene. Thus, in 1871, he left New York for Loma, New Mexico, a major departure point for prospectors. Because the Little Giant Mine was already a seemingly rich producer, it clearly offered great potential. When the French party came to town for supplies, Hamilton offered them immediate payment of $1,000 to each party member, the equivalent of $15,000 today, and another $4,500 to each by September 1, 1872.[38]

Hamilton's desire for a quick return, however, clouded his judgment, and he made a major financial error that proved costly. Instead of paying the outstanding debts to the French party, Hamilton used his capital to purchase a stamp mill. The plan was to replace the arrastra with the mechanized mill, process higher volumes of ore, and recover more gold in less time. Shipping the pieces from the East over the Santa Fe Trail and into the Rio Grande valley was relatively easy, but Hamilton was unable to secure a freighter willing to complete the last difficult leg to Arrastra Gulch. An entire working season passed, when Hamilton finally interested Martin Van Buren Wason in the project. While in Santa Fe, Wason learned of the mill, and since he was going back to his ranch on the upper Rio Grande, made a costly proposition to Hamilton to haul the pieces onward. Hamilton agreed, Wason purchased ten heavy wagons, and with Hamilton, freighted the first substantial cargo into the Animas drainage. Unfortunately for Hamilton, the trip consumed two months, placing him in the mining district at the end of September, too late for construction.[39]

Subsequently, Hamilton neglected to make the September payment to the French party, and they rightfully repossessed the Little Giant with other buyers waiting in the wings. In Hamilton's absence, French sold the mine to Samuel S. Wallihan, Sterling P. Rounds, and George W. Bishop of Wisconsin, and Dan Castillo of New Mexico. The four investors then organized the Little Giant Gold & Silver Mining Company, also known as the Chicago Company.[40]

Horrified, Hamilton attempted to pry his way into the new organization. When company officials arrived in Loma with supplies, he met with them and used the disassembled mill as a bargaining tool. Hamilton offered to trade the equipment for company stock and asserted that he would also pay Cook's share of the mine, which had not been transferred. After clashing with

[38] Nossaman, 1989: 109; Sloan and Skowronski, 1975: 15.
[39] Nossaman, 1989: 122; Nossaman, 1993: 99; Sloan and Skowronski, 1975: 15.
[40] Nossaman, 1989: 126; Ransome, 1901: 167; *"The San Juan Mines"* *EMJ* (2/11/73).

Wallihan, the rest of the owners consented and Hamilton was once again a force behind the Little Giant. Flush from the sale of the mine, the French party returned to the Las Animas district.[41]

The new owners of the Little Giant invested considerable capital to make their mine as well-equipped as any other of similar size in Colorado. The company appointed Mulholland as superintendent. In July 1873 he had a crew assemble the mill machinery on the valley floor. A Dodge crusher pulverized crude ore into small cobbles, a battery of stamps reduced the material to sand and gravel, and a ball mill pulverized the lot into slurry. With increased surface area, the particles flowed over amalgamating tables coated with mercury to leach out the gold. As was the case with the earlier arrastra, workers recovered the amalgam and drove off the mercury in a retort. The mine and mill were separated by around 500 vertical feet, which presented the logistical problem of transporting the ore efficiently. Ordinarily, burros would have packed the material down in canvas sacks, but the company instead built a single-rope reversible tramway. A bucket on a pulley rode a fixed-track cable spanning between the mine and station, where a worker winched the bucket up and lowered it down via a brake. Compared with the tramways built three decades later, the Little Giant system was simple and limited, but it was the earliest in western Colorado.[42]

Despite progress at the Little Giant, localized excitement over silver discoveries, and some claim development, there was little actual production in the San Juans. The vast distance to nodes of commerce and communication and the lack of treatment facilities rendered all but the richest ore uneconomical to produce. In addition, politics between the U.S. government and the Ute Indians, who depended on the natural resources of the region, exacerbated the isolation and threatened the fledgling mining industry.

Simply put, the prospectors were squeezed between the Utes, who did not want them in the San Juans, and the U.S. government, which recently outlawed activity there. During the 1860s, the Utes learned to mistrust newcomers due to interactions of intolerance and violence, and several times attempted to regain portions of their traditional territory. Aware that settlement and mining were inevitable in the territory, the government and the Utes agreed to the Hunt Treaty in 1868. Accordingly, the Utes would relinquish the central portion of the territory and remove to the west and southwest; in exchange, the government outlawed permanent settlement there. However, officials perceived the Utes as a single entity when, in fact, they belonged to at least seven bands. Secondly, for the sake of political convenience, the government recognized Ouray as spokesman for all Utes, when he actually held limited power. Lastly, the government ignored the fact that the lust for gold and silver overpowered respect for the law.[43]

As a result, settlement in the San Juans followed the problematic pattern wherein non-native settlers usurped native American lands. Prospectors infiltrated the mountains, the Utes responded, settlers felt threatened, and tensions rose. In hopes of preventing violence, the government passed an order during the spring of 1873 outlawing prospecting in the San Juans. Because unenforceable and against popular sentiment, the government attempted again to treat

[41] Nossaman, 1989: 127.

[42] Nossaman, 1989: 134; Nossaman, 1998: 311; Ransome, 1901: 19; *Rocky Mountain News* (7/20/73):4; Sloan and Skowronski, 1975: 15.

[43] Brown, 1984: 23; Nossaman, 1989: 79; E.F. Tucker, *Otto Mears and the San Juans* (Montrose: Western Reflections, 2003): 51.

with the Utes. With Otto Mears as mediator, the government met with Ouray and devised the Brunot Treaty in 1873. Mears and Ouray both understood that settlers would inevitably come, and that the Utes must leverage some agreement at least favorable to tribal interests. The Utes ultimately ceded the San Juans in exchange for annual interest on a $500,000 trust and a promise that the lands surrounding the peaks would remain theirs.[44]

The treaty revolutionized mining in the San Juans because they were now unquestioningly open. With the prospect of violence mitigated, prospectors were free to wander the San Juans, and businessmen and merchants felt that permanent lines of trade could be established with the growing, if still seasonal, population. Political stability instilled confidence among investors. Under these circumstances, the central San Juans saw more prospecting and, finally, ore production in addition to the Little Giant. Extreme isolation and difficult conditions were now the principal impediments to the blossoming of a mining industry.

In 1873, Arrastra and Cunningham gulches were still the hub of activity, largely because they had been proven to offer ore. What the Little Giant Mine featured in actual production, adjacent properties had in promotion. The Little Giant Extension, just developed but as yet unproven, was one example, for which capitalists offered an astounding $450,000 (around $7 million today). Prospectors continued to make rich discoveries in the gulches. When Thomas Blair developed silver ore at his Aspen Lode, prospectors hastened up to the ridge west of Arrastra Gulch and searched for similar veins. Robert McGregor found a parallel chute in what was becoming a complex series of narrow ore bodies and named the claim after himself. Several days later, Thomas P. Higgins and Z.H. Lawman, both of whom arrived in 1873, staked the nearby Susquehanna and began a tunnel downslope and east.[45]

As most of the prospectors who arrived in 1873 congregated around Arrastra and Cunningham gulches, some pioneer individuals turned their attention to other drainages where competition was lesser. Reuben J. McNutt and George Howard trekked into the high peaks on the north side of the Animas River, which were relatively unexplored. During the summer, they made several discoveries, which confirmed their suspicions that the peaks on the north side of the river held as much promise as those on the south side. At what became Lake Emma, at the head of Eureka Gulch, they found a particularly rich gold and silver vein and claimed it as the Sunnyside. The partners then crossed north over barren ridges and found another silver formation they named the Poughkeepsie. Aware that other prospectors would begin searching the area, McNutt and Howard organized the Eureka Mining District so their claims would be officially recognized. At the time, the Eureka district took in nearly the entire region on the north side of the Animas.[46]

Even though the northern peaks were largely unexplored in 1873, McNutt and Howard were not completely alone. Albert Burrows and Charles H. McIntyre established a camp in open

[44] Brown, 1984: 23; Nossaman, 1989: 144-145; Tucker, 2003: 51, 55.

[45] Nossaman, 1989: 179; *"The San Juan Mines" EMJ* 10/28/73.

[46] Nossaman, 1989: 139; Nossaman, 1993: 206; *"The San Juan Mines" EMJ* 12/2/73; Laurel Michele Wickersheim and Rawlene LeBaron, *Mine Owners and Mines of the Colorado Gold Rush* (Westminster, MD: Heritage Books, 2005) : 418, 429.

country at the headwaters of the Animas River. En route to the San Juans in 1872 or 1873, Burrow met McIntyre, who came from the Dakotas. With a party in tow, the partners followed Baker's old route up the Lake Fork of the Gunnison River and began their search in what became known as Burrows Park. The party then crossed west over the Continental Divide and were immediately impressed by the plentitude of mineralized veins at the headwaters of the Animas. Wasting no time, the party claimed a number of veins, including the Big Giant, Bill Young, Bonanza, Boston, Burrows, and Red Cloud. Exactly where the camp was located is uncertain, but it lay proximal to the Mineral Creek in the county's northeast reaches.[47]

While Burrows, McIntyre, McNutt, and other prospectors wandered the peaks, entrepreneurs familiar with the needs of mining prepared to profit from the region. Henry F. Tower and Wesley A. Stevens understood that every mining industry required lumber, so they established the first sawmill in the Animas drainage at Mineral Creek ascending north from Silverton. Their lumber was consumed almost as quickly as they could mill it.[48]

Reese, Blair, and William Kearnes claimed large tracts of land for ranching or platting a townsite. Adnah French was conspicuously absent from the group's plans. A true prospector, French realized a dream with the discovery of the Little Giant. Flush from its sale, French spent his money on luxurious living and died of alcohol poisoning during the summer. Reese filed an eighty acre homestead claim on the broad, open floor of Baker's Park, where a settlement was most likely to grow. Blair and Kearnes filed adjoining 160 acre homestead claims.[49]

Just as the Animas River drainage gained momentum in its transition from prospecting to mining, snow brought the working season of 1873 to an end. The year saw key elements for future growth. Mears and the U.S. government successfully negotiated the San Juans away from the Utes and formally opened the mountains for development. The resultant security encouraged a wave of prospecting, bold investment in minor claim development, and machinery for ore and lumber. By setting up their sawmill, Tower and Stevens began providing one of the most important commodities needed for the growth of industry. In addition, these lumbermen, and Martin Van Buren Wason, hauled in the first machinery and, in so doing, set a precedent. Mining would come to depend on machinery. The last significant factor was the actual production of silver ore from the Aspen and other claims, and gold bullion from the Little Giant. When these materials arrived in Del Norte and other commercial centers, they contributed to an ever growing interest in the San Juans.

In the spring of 1874, entrepreneurs put in place the final pieces necessary for a mining industry to blossom. Approaching the season with foresight, Donald Brown, aware of a nascent townsite in Baker's Park, recognized that the region's population was too small to support two competing locations. In an attempt to get ahead of Reese, Brown risked winter storms to cross over the range from Del Norte and locate the townsite claim of Bullion City at the mouth of Cunningham Gulch. Brown, Horton D. Chase, Theodore F. Braun, and others formed a townsite

[47] Brown, 1984: 96; Henn, 1999: 45; Nossaman, 1993: 176.
[48] Nossaman, 1989: 147.
[49] Nossaman, 1989:127, 152; Nossaman, 1993: 11.

company and filed the necessary papers. The location was well-chosen, because it offered water, open land, building materials, and lay at one of the most important crossroads in the entire drainage. The trail up Cunningham Gulch and over Stony Pass was the principal artery to points east, and another trail that ascended the Animas River to Cinnamon Pass was the second gateway. A third trail descended southwest into Baker's Park. Given such a strategic location, Bullion City was poised to receive most of the traffic flowing into the deep San Juans.[50]

Meanwhile, after planning a townsite with Blair and Kearnes, Reese spent the winter in Chicago and Cedar Rapids, promoting the mineral wealth of the San Juans and soliciting investment. Reese found a ready audience in George Greene, one of the founders of Cedar Rapids, a justice on the Iowa Supreme Court, and president of the Union Bank of Cedar Rapids. Reese boosted the handful of nascent mines and dozen proven ore bodies under development. Greene, who previously published a mining periodical, was experienced enough to see through fraudulent promotion. He nevertheless gathered from Reese that even though the region was not yet thoroughly explored, it was already an outstanding opportunity. Further, Greene understood that real profit could be made by treating the ore that others produced instead of investing in specific mines, and so he committed to financing a smelter. Reese returned to Colorado victorious with a key element for the mining district and a major anchor business for his townsite.[51]

When the working season of 1874 opened, Cunningham and Arrastra gulches remained the centers of activity. Some of the known veins now yielded ore, others were being developed, and prospectors found yet more. In Cunningham Gulch, Reese, Blair, and Mulholland prospected the high, barren, east side and found a startlingly rich silver vein that they staked as the Green Mountain. Over the course of several months, they drove a tunnel and produced enough ore to render the operation one of the region's most important. Dunn, Quinn, and Richardson returned to their Highland Mary claim on the west side of the gulch's head to conduct development work. King Solomon Mountain, between Cunningham and Arrastra gulches, also drew interest. W.S. Stratton was among those at work on the Cunningham side, where he staked the Silver Cross and Black Crook claims. Later in the 1890s, Stratton discovered the Independence Lode near Cripple Creek, and realized millions of dollars.[52]

In Arrastra Gulch, Blair, Ingersoll, and Higgins were at work on the Aspen ore system, and the Little Giant continued production. With the obvious veins now claimed, the prospectors who arrived in 1874 invested in searching inaccessible areas. Gregory and Brower picked their way along the gulch's shear, west wall, where, nearly opposite the Little Giant Mine, they found a clearly exposed vein. One of them claimed it as the Gray Eagle. But because the vein cropped out high on the cliff face, the prospectors had to scale the wall to determine the vein's orientation, measure the claim boundaries, and place corner monuments, all on uncertain footing. Gregory and Brower began production and shipped 1,200 pounds of high-grade ore to New York

[50] Nossaman, 1989:162.
[51] Nossaman, 1989:184, 207; Nossaman, 1993:20, 161.
[52] Nossaman, 1989:106, 169, 178, 261.

for processing. Meanwhile, the Black Hawk smelter in Gilpin County could have treated the material at a much lesser cost.[53]

In addition to hosting the region's first ore production, Arrastra Gulch also was the scene of the region's first serious conflict. After Emery Hamilton used his mill to win a prominent position in the Little Giant, Samuel Wallihan continued to protest Hamilton's involvement but found it difficult to dislodge the wily investor because the mill was now an important part of the operation. To maintain control, Wallihan and Bishop hired Gassy Thompson and crew to work through the winter, hold the property, and turn it over when Wallihan and Bishop arrived in the spring. When Hamilton learned that Wallihan and Bishop were to take physical possession of the property, he resorted to trickery. In Del Norte, Hamilton paid for four gunmen to seize and occupy the mine in advance of Wallihan and Bishop. They hastily made their way into Arrastra Gulch, met Thompson and claimed ownership without raising his suspicions. Leaving the gunmen at the mine, Hamilton accompanied Thompson to Del Norte to meet Wallihan and Bishop. Hamilton then filed claim amendments on the argument that the property had to be relocated when the Brunot Treaty conveyed the San Juans over to the Territorial government in 1873.[54]

Wallihan and Bishop arrived in Del Norte in June to meet Thompson and take possession of the mine, when Thompson innocently informed them of Hamilton's actions. The trio quickly figured out Hamilton's deceit and rushed to the Las Animas district to reclaim their operation, leaving Hamilton behind in Del Norte. Hamilton hit the trail to beat them to the Little Giant. Hamilton overtook the party and tried sneaking around but was noticed. Thompson responded by pursuing Hamilton, and they raced until Hamilton's horse proved to be have better endurance. Hamilton barricaded himself in the tunnel and ordered his gunmen to form a shield. Thompson in turn appealed to Miles Johnson, who called the miners' court into special session because claim jumping was a grave offense in any mining district. William Kearnes and Alexander Wilson armed themselves for battle and crept into the mine and confronted Hamilton. More armed miners arrived and the party threatened Hamilton with public hanging. Ultimately, they banished him from the region without reimbursement. Hamilton later continued to attempt to wrest control of the Little Giant through a series of lawsuits in distant courts.[55]

Meanwhile, the Little Giant failed by the end of 1874. During the summer, miners encountered an end to one portion of the gold-bearing vein after another, and the company operated the mill fitfully until the payrock was gone. Wallihan let a contract to have miners drive exploratory workings in search of an extension of the vein, but when profits evaporated and legal fees mounted, Wallihan suspended operations. Wallihan closed the mill and Arrastra Gulch quieted.[56]

[53] Nossaman, 1989: 178.
[54] Nossaman, 1989: 173-5.
[55] Ibid: 173-175.
[56] Nossaman, 1989: 175-6, 214; Ransome, 1901: 19; *Rocky Mountain News* (8/26/74): 4; Sloan and Skowronski, 1975: 15.

In 1874, outside of the Animas River drainage, the geographically expansive Eureka district boasted the most activity. The district featured the subsequently named mountains including, north to south, California, Treasure, Hanson, and Eureka, the peaks of which were the focus of considerable prospecting. The mountains were neatly framed by a circular arrangement of drainages, such as California around the north half, Eureka at the southwest edge, and the Animas River on the east side. Placer Gulch, which offered limited amounts of placer gold, descended northeast through the peaks.

The Sunnyside Vein, discovered the previous year by McNutt and Howard, drew the most interest, and prospectors traced it from what was later named Lake Emma, at the head of Eureka Gulch, at least one mile northeast into Placer Gulch. In advance of the other prospectors, McNutt and Howard had all of 1873 to examine the bold formation and claim what they thought was the best section, which crossed Hanson Peak and over to Placer Gulch. McNutt paid Howard for his share of the Sunnyside property and began shallow development in 1874. On the other side of Hanson Peak, prospectors staked additional segments of the vein, such as the Sunnyside Extension. Elsewhere, prospectors began work opening the Crispin, Niagara, Silver Wing, and Tom Moore.[57]

Because Eureka and California gulches were the two gateways into the cluster of peaks, prospectors established camps at the mouths of both drainages. McNutt's log cabin, built in 1873, became a magnet for prospectors at Eureka Gulch. Local speculators predicted that because of the strategic location, the camp would probably evolve into a formal settlement. They quickly organized the Eureka Townsite Company and platted a townsite of the same name. The founders lacked in promotion, however, and did little to secure businesses and residents. They, like the rest of the camp's residents, were busy prospecting.[58]

Albert Burrows was largely responsible for the Eureka district's second camp at the mouth of California Gulch. After the working season of 1873, Burrows remained fixated on the veins at the watershed between the Animas River, which flowed south, and Mineral Creek, which trickled northwest. In 1874, he led a party that included Henry E. Wood and E. Bradford Greenleaf back into the area, and pitched camp a short distance south. As with McNutt's cabin at Eureka Gulch, prospectors began to congregate around the camp, enlarging the settlement. The name of Animas Forks derived because the river began at the confluence of the three drainages there.[59] Burrows apparently maintained a second camp at the watershed, northwest of Houghton Mountain. The reason for the dual residence was that he, Charles McIntyre, and partners also developed the Red Cloud and other claims. Their camp was on the edge of a marshy meadow at treeline, and it was most likely Burrows' party that named the camp after the explorer.

With the Las Animas district busy and competition increasing in the Eureka district, frontiersmen went farther afield to unexplored territory in the northwestern river drainage. At least one group picked their way up Cement Creek, found many exposed mineral formations, and

[57] John Marshall and Zeke Zanoni, *Mining the Hard Rock in the Silverton San Juans* (Silverton: Simpler Way Book Co., 1996) 119; Wolle, 1995: 405.
[58] Brown, 1984: 87; Nossaman, 1993: 203.
[59] Nossaman, 1993: 184.

established a camp. Within several months around twenty individuals joined them, and the camp grew into a noteworthy collection of crude cabins and wall tents. Several prospectors developed the Porcupine and Gopher claims and actually began producing ore. Farther west, more wealth-seekers examined Mineral Creek, and on Sultan Mountain someone discovered the Hercules, which held great promise.[60]

Even though a number of veins throughout the river drainage were in development during 1874, the work qualified more as prospecting than mining. The operations were shallow, simple, and yielded only small tonnages of ore due to a lack of capital and efficient transportation. Despite the slow start to mining, Reese and the Greenes were confident enough to continue with their smelter idea. During the spring, Greene organized Greene & Company, gathered the components for a smelter and sawmill, and hired John J. Epley and Thomas E. Bowman to accompany them to Reese's new townsite. Epley was an expert with heavy machinery and Bowman was a formally educated metallurgist and assayer.[61]

Greene's son Edward arrived in advance of Epley and made preparations to break ground for the smelter where Cement Creek emptied into the Animas River. Part of the preparations involved establishing a supply business for the smelter and crew, which Edward did as Greene, Eberhart & Company. Seeing an opportunity to profit from retail to local individuals as well as from smelting, the Greenes opened a public mercantile, which was gladly welcomed as the first in lower Baker's Park.

Other entrepreneurs simultaneously saw the opportunity presented by the growing mining industry in the Animas River drainage. Two other parties constructed smelters during the summer of 1874 to compete with the Greenes. Christian Schoellkopf, Ashley Cooper, and Henry Remington constructed the Little Pioneer Furnace and the Little Dutch Smelter on flat ground just west of Arrastra Gulch's mouth. The facility was primitive and relied on an arrastra made of brick to crush silver ore, and a furnace to roast then melt the material. Schoellkopf, an ethnic German, likely based the furnace on designs he worked on in Swansea, Wales, smelting capital of the world. The choice of an arrastra for crushing was unusual since the Little Giant mill exemplified superior machinery requiring less manual labor. It therefore seems likely that a lack of capital was the reason for Schoellkopf's choice of a labor-intensive arrastra. Calder, Rouse & Company built the second facility, the Rough & Ready Smelter, on Cement Creek near the Greene operation.[62]

When the three smelters of various sizes were finished, the river drainage finally saw the last crucial component needed to bring the nascent mining industry to fruition. The Greene Smelter was perceived as the best facility and used ore from the Gray Eagle Mine for its trial run. After the furnace had been heated and charged with ore, a crowd gathered to see the silver matte, an unrefined blend of silver and industrial metals, pour out of the ports. They were not

[60] Nossaman, 1993: 169; Wickersheim and LeBarron, 2005: 397.

[61] Brown, 1984: 29; *"Mining News"* *EMJ* (8/14/80): 111; Nossaman, 1993: 15; Nossaman, 1989: 210; Sloan & Skowronski, 1975: 19, 46; Duane A. Smith, *Song of the Hammer and Drill: The Colorado San Juans, 1860-1914* (Golden, CO: Colorado School of Mines, 1982) 26.

[62] Nossaman, 1989: 211, 213.

disappointed, initially. But when Brown, Epley, and Edward Greene compared the results with the amount of metals that the ore was supposed to contain, they were embarrassed to find that the smelter recovered only a fraction. Schoellkopf and the Rough & Ready Smelter had similar disappointing experiences. Word quickly circulated that the smelters were failures. Disappointment pervaded, the backers of the smelters lost precious capital, and confidence in the region faltered. Greene & Company, however, refused to concede defeat and applied their capital and metallurgical expertise to identify a process that would work. One important factor was ultimately that the region's ore was more complex and resistant to treatment than first suspected.

Meanwhile, Reese continued to formalize and promote his townsite. Reese, Blair, and Kearnes interested William Mulholland, Francis M. Snowden, Nathaniel E. Slaymaker, and William Munroe in the venture, and organized the Silverton Townsite Company. Reese acted as president and Munroe, a surveyor, arranged the lots and streets on paper. Slaymaker, a lawyer who came to prospect, reverted to his former profession and administered the legal aspects. On slightly different dates, Blair, Snowden, and Slaymaker built the first three cabins in Silverton to anchor development. Greene & Company erected buildings, followed by prospectors who constructed a few more cabins. By summer, Silverton featured at least twelve residences and the Greene mercantile, while the smelter stood on the north fringe.[63]

While Silverton grew slowly and its role as a milling center was tentative due to the smelter failures, Bullion City saw nothing less than a boom. Donald Brown was correct in his faith that the mouth of Cunningham Gulch was an excellent location, and Bullion City quickly became the region's principal hub. During the spring, speculators and businessmen rushed to the townsite and claimed the best lots, while prospectors took up residence on the outskirts. The north side of Cunningham Creek offered the best land, and a small business district materialized there. John C. Sullivan and James N. Galloway opened the first blacksmith shop, Thomas Trippe established a surveying office, William Nichols formed an assaying business, and F.B. Hackett organized a law practice. All these men were experienced and provided the services necessary for the successful evolution of a mining industry. Trippe was born in Brooklyn in 1848, earned a degree in engineering and surveying, worked as a surveyor for a railroad, and came to Colorado in 1872. Nichols was an early arrival in Colorado, ran an assaying business in Clear Creek County, and closed shop to come to the Las Animas district. Due to his skill, he was later appointed Territorial Assayer for the San Juan region.[64]

Other entrepreneurs established businesses catering to the prospectors and miners. John and Amanda Cotton, the first woman to permanently reside in the river drainage, opened a mercantile-cum-restaurant. George Howard first sold liquor, followed by the formal saloons of George L. Wright and John Burrow. During the summer, additional businesses including another mercantile, boot maker, and bakery opened. Located at the crossroads of important transportation arteries, Bullion City attracted a livery and the first cattle herd as stock for a butcher.[65]

[63] Nossaman, 1989: 187.
[64] Nossaman, 1989: 160, 170-2; Nossaman, 1993: 214-5.
[65] Henn, 1999: 146; Nossaman, 1989: 171, 177, 185; Nossaman, 1993: 279; Sloan and Skowronski, 1975: 19; Wolle, 1991: 401.

As the business district began to take form, residents built cabins on surrounding lots and in a cluster near George Howard's establishment on the south side of Cunningham Creek. Based on this association, residents named their suburb Howards. During 1874, residents petitioned for a post office, which the Postal Service granted as Howardsville. The post office, the first in the drainage, furthered Howardsville's role as a commercial center.[66] To complete Howardsville's supremacy over Silverton, after the Brunot Treaty was signed, the Territorial Government realized that the considerable new tract of land would be prospected and homesteaded in time. Forecasting the demand for government administration, the Territorial Legislature divided the southwest quarter of Colorado into La Plata, Rio Grande, and Hinsdale counties in 1874. La Plata County encompassed the Animas River drainage with Hinsdale as its eastern neighbor. When the legislature surveyed for the best seat, they identified the largest, most promising town, Howardsville. George Howard offered his small cabin for the administrative building, and a second log cabin was rented as the court house. Howardsville's status as county seat was not to last, however, Reese and partners petitioned the Territorial Legislature and managed to have the seat transferred. The victory was important to Silverton, but the failed milling center still paled in comparison to Howardsville.[67]

Settlement and Establishment of Industry, 1875 – 1881

At the beginning of 1875, the San Juan Mountains possessed the ingredients necessary for a tangible rush, despite the smelter failures. Prospectors had proven rich silver ore and regularly made new strikes, the limitless mountains offered plenty of unexplored territory, the Animas River drainage featured several towns, and residents could live on site year round. The only key element missing was outside investment, and developments elsewhere in Colorado siphoned off the attention of capitalists willing to risk money in the frontier. In 1873, Richard C. Irwin, William J. Robinson, and James Pringle proved rich silver in the Wet Mountain Valley, southwest of Canon City. Their discovery incited the Rosita rush of 1874, one of Colorado's most important silver excitements of the mid-1870s. Concurrently, miners at Gold Hill in Boulder County realized that a dark material previously discarded as waste rock was actually telluride gold. Boulder thus saw its most intense period of prospecting since the initial gold rush of 1859. The development of the Moose, Dolly Varden, and other silver mines in the Mosquito Mountains stimulated a wave of prospecting and mining west of Fairplay. Montezuma in Summit County experienced a similar trend. Mining in Nevada also drew considerable share of investor attention. Remote, new, and unproven, the Las Animas district could not compete with these rushes. As a result, the mining industry grew slowly during the mid-1870s and may have even become static were it not for several important advancements in 1875.[68]

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[66] William H. Bauer, James L. Ozment, and John H. Willard, *Colorado Post Offices: 1859-1989* (Golden: The Colorado Railroad Museum, 1990) 74; Henn, 1999: 70; Nossaman, 1989: 184; Sloan and Skowronski, 1975: 19.

[67] Henn, 1999: 145; Nossaman, 1989: 158, 172; Nossaman, 1993: 214, 279; *Rocky Mountain News* (2/19/74): 4; Sloan and Skowronski, 1975: 17, 19; Wilbur Fisk Stone, *History of Colorado* Vol. 1 (Chicago: S.J. Clarke Publishing Co., 1918) 198.

[68] Weston, W. *"The San Juan Mines"* *Engineering & Mining Journal* (3/2/78):150-151.

The Greenes were behind the first fundamental development, which began when John A. Porter arrived at Silverton in 1875. Porter was born into privilege in Berlin, Connecticut, in 1850. Intent on a career in mining, Porter attended the Columbia School of Mines before studying metallurgy at the Royal Academy of Mines in Germany. Porter returned to the United States in 1872 and went to Eureka, Nevada, where he gained practical frontier experience as an assayer for the Richmond Consolidated Mining & Smelting Company. After several years, Porter moved on to Cherry Creek, Nevada, and served as assayer and assistant metallurgist, before establishing a consultancy. At the behest of investors, Porter traveled southeast through the Great Basin into the San Juans to report on the region's potential. Porter approached the San Juans from the south and ascended along the Florida River, through sedimentary geology rich with coal beds. As a mining expert and metallurgist, Porter took an interest in the coal, a resource always in demand, and noted the location for future reference.[69]

Edward Greene and John L. Pennington, business manager for Greene & Company, saw in Porter the expert who could solve the smelter's problems. Within a short time, Greene & Company secured Porter as chief metallurgist. Porter may have also sensed that Silverton was the gateway to a lucrative trove for capitalists.[70] Porter refitted the smelter. Repeating the sequence of events that preceded the 1874 failure, the furnace was blown in, charged with ore, and company officials impatiently waited to see what came out of the spouts. Not only was the material liquid metal, but also in the proportions necessary for the smelter to be an economic success. Due to Porter's acumen, the Greene Smelter was now open for business, which electrified the Animas drainage. The Rough & Ready Smelter showed promise anew as well. The owners came to an agreement, rallied, and fired up the facility. After the furnace generated a ton of matte, however, they resumed fighting and suspended operations, leaving Greene & Company with a monopoly. Even though the Greene Smelter was the only regional ore treatment facility, the company wisely secured contracts with mines for ore and even went so far as to lease the Aspen from Blair and partners, who were glad for the effortless income from royalty payments.[71]

The Greenes could not have expected their monopoly to last long. While Porter worked, the Crooke brothers engaged in similar activities in the Summitville Mining District, located southeast over the range. The Crookes were highly experienced, and Jonathan in particular was a New York City smelting and mining financier with a twenty-five-year year record. Instead of entering direct competition with the Greenes, the Crookes hastily built a smelter in the Lake City area to capture trade there. The mines of the Lake Fork drainage, however, were part of what the Crookes hoped would be a larger empire to include the Animas River drainage.[72]

Before the Crookes even completed their smelter, they aggressively solicited contracts for ore throughout the San Juans, initiating a trade war with the Greenes. To ensure reliable sources of ore, both companies either leased or purchased mines outright during 1876. The Greenes

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[69] Henn, 1999: 134; Nossaman, 1989: 270; *"Prominent Men in the Mining Industry"* EMJ (9/26/91): 213; Sloan & Skowronski, 1975: 46; Duane Smith, *Rocky Mountain Boom Town: A History of Durango, Colorado* (Niwot, CO: University Press of Colorado, 1992 [1980]) 9.

[70] Nossaman, 1989: 268; Sloan and Skowronski, 1975: 46.

[71] *"Mining Notes from Colorado, Missouri, Montana, Nevada, and Northern Carolina"* EMJ (7/29/76): 77; Nossaman, 1989: 267-8, 271; Nossaman, 1993: 153; Sloan and Skowronski, 1975: 19.

[72] Nossaman, 1993: 144; Smith, 2002: 5.

claimed Hazelton Mountain as their territory, leased the Aspen Mine, and invested $11,000 in properties elsewhere in the Animas drainage. In their home territory of Hinsdale County, the Crookes purchased the Ute and Ulay mines, and in the Animas drainage bought the Royal Tiger claim and an interest in the North Star Mine.[73]

The demand for ore and the superior returns provided by the two smelters finally fostered a long-awaited wave of intense mining, property transactions, claim development, and additional prospecting. Because the Las Animas district hosted more prospecting to date and featured the highest number of mines, however simple, it naturally led the way in ore production. Greene & Company did well with the Aspen, and independent parties drove tunnels from several directions to develop different sections of this ore system. Several prospectors pushed the Legal Tender Tunnel from a point downslope and north, and, striking the vein in 1876, found Greene & Company petitioning them for a lease. Higgins and Ingersoll continued to advance their Susquehanna Tunnel from Arrastra Gulch. In 1877, after penetrating 515 feet of rock, miners struck the ore formation, which featured a bonanza of silver; they named the vein the Victor. Higgins and Ingersoll renamed the operation the Ingersoll Tunnel and enjoyed significant profits. Nearby, James L. Briggs attempted to imitate the success with his Briggs Tunnel, which progressed slowly. The Gray Eagle, around the corner in Arrastra Gulch, produced and shipped to the Greene Smelter.[74]

Prospectors in the Animas district tried to profit from the smelting war by hitting the trail in search of new ore formations. A fortunate few found silver veins in areas that had been examined at least once already. In 1875 Howardsville assayer William Nichols prospected the north face of King Solomon Mountain a short distance above town, found a small system of veins, and claimed the apex as the Little Nation.[75]

Most prospectors, however, sought new ground in the district's remote reaches, where few others had yet been. Théophile Ressouches and Alfred Py chose Little Giant Basin, which was a glaciated, hanging valley on the east side of Arrastra Gulch. Ressouches and brother Louis were born in France and came to Denver in 1866. Laurent found employment as a premier gardener, but Théophile and Louis left for the San Juans when they were able and of age. The brothers arrived in the Animas drainage with little money and worked as miners until they saved enough to prospect. Théophile met Py, and the partners ascended into Little Giant Basin and made camp on the valley floor. In 1875, they examined King Solomon Mountain on the valley's east side, found a vein with a rich showing of silver, and claimed it as the Jura. But before the partners could develop the formation at depth, dwindling finances forced them back to work. The following year, they returned with Louis, staked the adjoining King Solomon, repeated the pattern in 1877 with the Mountain Queen (not to be confused with the Mountain Queen in California Gulch). When other prospectors learned of the discovery, they joined the Ressouches brothers, picked over the opposite side of the valley, and found a vein so large they named it the Big Giant.

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[73] Henn, 1999: 6; Nossaman, 1989: 313; Pangborn, 1878: 52.

[74] *"Mining News" EMJ* (5/12/77): 319; Nossaman, 1989: 313, 271; Nossaman, 1993: 118.

[75] Nossaman, 1993: 215.

At the same time that Ressouches and Py examined King Solomon Mountain, several independent prospectors made the dangerous ascent into the upper reaches of Arrastra Basin, a short distance south. During the first several years in the Animas district, prospectors on the floor of Arrastra Gulch undoubtedly gazed up and south at the imposing headwall and wondered what lay beyond. The wall was locked in ice and snow for all but several months of the year, which discouraged ascent. John Reed was the first prospector documented to satisfy his curiosity, and in 1876, he scouted a route up the headwall.

What he found was another hanging valley carved by glaciers from between Kendall Peak and Round Mountain to the west, and North Star and other peaks to the east. Their flanks, with 1,000 feet of relief, were as sheer and rugged as those in Dives Basin, which was the next valley to the east, and the peaks presented a lacework of veins and dykes that would have excited any prospector. At the valley's center lay a pristine glacial lake, and its outflow cascaded northward until it roared over the headwall into Arrastra Gulch. Examining the flank of Round Mountain on the valley's west side, Reed quickly found more than one vein that carried silver and industrial metals. He claimed two on Round Mountain as the Whale and the Round Mountain, and located the Silver Lake near the lake. Around the same time, another prospector working at the valley's head identified a huge fault and traced it southeast, where it featured a vein he claimed as the Buckeye. During the summer, both men excavated shallow workings to prove ore and retain title to the claims, then left for the season. When the prospectors returned the following year, Silver Lake Basin, as the valley came to be known, saw its first production, which was shipped by burro to the Greene Smelter. To the Greenes, the volume of ore was insignificant because the arduous and dangerous approach discouraged Reed and the other prospectors from packing much out and importing anything but the most essential materials, which limited production.[76]

In the Eureka district, the success of the Greene and Crooke smelters stimulated a wave of activity in 1875 and 1876. A greater number of wealth-seekers than ever climbed through the peaks and valleys in the district's center. Eureka and California gulches, and the peaks between, were thoroughly examined and most of the principal veins claimed. Prospectors also began to seriously explore the district's southern portion, including Minnie and Maggie gulches, soon realizing that the area was not as mineralized as the north side of the Animas River.

Even though rich ore had been proven in veins scattered throughout the district, there was little production because lack of capital retarded development. This began to change when handfuls of adventurous investors took an interest in the most promising properties, and tepidly fronted limited funds. Milton M. Engleman was one such individual, coming to the Animas River drainage in 1876 on the assumption that the region was on the brink of a boom. Engleman was born in 1842 in Carrolton, Illinois, and became involved in a men's clothing business in his hometown. Within a short time, Engleman was a partner, and through the business met Emma Thompson, who operated a millinery shop. Engleman and Emma married but enjoyed their life in Carrolton for only a short time before a change in the business partnership forced Milton to

[76] Nossaman, 1993: 35, 118; Ransome, 1901: 149.

examine other regions, and he targeted Colorado as a potentially lucrative market. An exploratory trip in 1872 confirmed his hopes, and Engleman established a clothing outlet in Canon City. When Engleman arrived in the Animas River drainage, he settled in Eureka and sent for Emma, and they brought with them dearly needed capital.[77]

The Englemans bought a share in the Eureka Townsite Company to open a mercantile and also acquired mining property. In particular, Engleman bought a half interest in the Sunnyside from Ruben McNutt, and Emma purchased interests in George Washington and Poughkeepsie No.2. Afterward, they had little left over for development of the claims, but managed to hire several miners who began sending down ore from shallow workings. Thus the Sunnyside assumed the role of one of the Eureka district's first productive operations, although the mine remained small for years.[78]

The Silver Wing was another important property, and it was among the earliest in the Eureka district to attract an organized company. In 1874, prospectors found the vein near the mouth of Burns Gulch on the east side of the Animas River valley, between Eureka and Animas Forks. Investors learned of the find, organized the Silver Wing Mining & Reduction Company, and purchased the group of claims. Nathan S. Culver, a physician in Colorado Springs, was a company principal, and used his success as a gateway for other mining investments. Matt France, the other principal, owned a ranch in Colorado Springs and came equipped with considerable experience from developing several mines in Clear Creek County. Because of his experience, the company appointed France as on-site manager, and under his guidance, a small crew of miners conducted development and began production.[79]

Probably because of the potential offered by as yet undeveloped claims, John Epley broke away from Greene & Company with the intent of building his own smelter in the Eureka district. The timing was questionable because few mines in the district produced enough ore to sustain such a costly enterprise, but Epley and Newton A. Foss interested H.C. Brown in the idea, and they allocated the necessary capital. In 1876, Brown, Epley & Company began construction in the Animas valley south of Animas Forks and made considerable progress before winter stopped work. Epley suddenly sold to his partners and moved to Ouray. Foss and Brown reorganized as the San Juan Smelting & Refining Company and resumed construction. When the facility neared completion, an avalanche destroyed it, and the company dissolved, leaving the local market for a smelter untested.[80]

Epley was not alone in assuming that the Eureka district was ready for an ore treatment facility, although productive mines were few in number. In 1875, Charles McIntyre organized the Dakota & San Juan Mining Company to develop the Red Cloud and other claims at Mineral Point and build a mill to treat the ore. The mill was not intended to produce gold bullion like the Little Giant nor silver matte as with the Greene Smelter. Instead, McIntyre planned a concentration facility to separate as much waste from the metalliferous material as possible.

[77] Nossaman, 1993: 205.

[78] Nossaman, 1993: 206; *"Mining News"* *MSP* (3/3/88): 141.

[79] *Colorado Mining Director, 1883* (Denver: The Colorado Mining Directory Co., 1883) 674; Nossaman, 1993: 250; Wickersheim and LeBarron, 2005: 425.

[80] Nossaman, 1993: 39, 193.

Following conventional concentration processes, machinery was supposed to crush the ore into sand and slurry, special appliances would achieve the separation, and the concentrates were to be shipped to a smelter for final processing. In so doing, McIntyre hoped to save the costs of transporting waste-laden ore and some of the fees that smelters levied for full treatment. McIntyre also planned to accept custom orders in addition to material from the Red Cloud to pay for construction, but the prospects at Mineral Point were not ready to support a mill. Thus McIntyre eyed Animas Forks as a better location. He projected that the mill would require a year to complete, and by the time it was ready, the district would be far enough along to keep the facility busy. In 1876, he interested E. Bradford Greenleaf in the project, secured investors, and began what was known as the Greenleaf or Dakota & San Juan Mill. Although the facility was small, it lent legitimacy to the small camp of Animas Forks.[81]

It was outside capital from Edward Innis that made the Highland Mary Mine, at the head of Cunningham Gulch, the most advanced operation in the Animas River drainage, if not the entire San Juans. Innis poured money into the property for reasons that defied logic and economics. Edward and brother George inherited a fortune and profitable businesses in New York: a wood dye plant, investment banks, the Pennsylvania & Erie Railroad, and the Poughkeepsie Bridge over the Hudson River.[82] Edward kept an advisor on retainer who guided him in business matters. Interested in the potential offered by mining, Innis consulted his advisor, who suggested that he examine the Las Animas district. What Innis kept to himself was that the advisor was actually a psychic medium. Rather than follow the criteria of most capitalists, legend has it that she chose the Las Animas district by placing her finger on a map and declaring that there lay a lake of gold awaiting discovery![83]

Confident in the seeress' advice, Innis journeyed to the Animas River drainage and surveyed the mines in production. It perhaps seemed reasonable to assume that a lake of gold in a region rich with silver veins would logically be the only gold mine. The psychic claimed that the lake of gold lay underneath a mountain in the area, but could not be specific about which one. Seeking further clarification, Innis examined several operations and consulted with Emery Hamilton, but did not divulge his source of advice. Hamilton informed Innis of extremely rich ore specimens collected from the Highland Mary claim, which Christian Schoellkopf had bonded for purchase. Innis quickly purchased not only the Highland Mary, but adjoining claims to the west for the exorbitant sum of $30,000.[84]

Innis then consulted with H.D. Whittemore to drive a tunnel into the lake of gold. Whittemore was an agent of the Ingersoll Rock Drill Company in New York City conversant with the new technologies of compressed air and rockdrills, although he was by no means an

[81] Nossaman, 1993: 176.
[82] Henn, 1999: 13; Nossaman, 1989: 259.
[83] *Denver Times* (7/10/01): 5; Nossaman, 1989: 261; *Rocky Mountain News* (9/14/58): 65.
[84] Henn, 1999: 15-6; Nossaman, 1989: 178, 261-2.

experienced mining engineer. Whittemore naturally made rock drills a centerpiece of the operation, which pleased the company he represented.[85]

So sure was Innis that he would realize his Holy Grail within a short time, he financed the construction of a small smelter at Howardsville in 1875. With the support of Hamilton, Innis attempted to pillage the idle Little Giant Mill not to save capital, but because he did not want to wait for machinery that otherwise had to be shipped from the East. Goaded, Innis sued Wallihan for possession and lost, forcing Innis to have mill machinery sent anyway. Completion of the smelter undoubtedly excited Howardsville residents, who looked forward to challenging Silverton as an ore treatment center.[86]

In 1876, Whittemore arrived at the Highland Mary with the rock drills and immediately put them to work driving the Innis Tunnel. Whittemore returned to New York, leaving a significant and lasting impact on the western mining industry. His introduction of rock drills to the mine in 1876 was one of the earliest commercial applications in the Rocky Mountain west. Not until the 1890s did the mining industry truly embrace rock drills, and ten years passed again before they were commonplace.[87]

A year after Innis began developing the Highland Mary, the lake of gold still eluded him, although he remained confident in the psychic's advice. Because progress was slow, Innis decided to approach from two directions, so he purchased the Little Giant Mine in hopes that it would lead to the gold. He consulted the psychic regarding the direction that the Innis Tunnel should take, but she often gave inconsistent directions. As a result, miners drove the tunnel until it was serpentine. When the miners penetrated perfectly fine, profitable veins of silver ore, they were astounded when Innis commanded them to ignore the veins and drill and blast onward to some unknown destination.[88]

The Highland Mary complex became a community hub by 1878, in part because Innis was generous at his residence known as the Whitehouse, which cost around $10,000 to build, or $175,000 today. The cost was for construction alone, as the land on which the log building stood was public. Innis took in the occasional guest, offered a few meals to prospectors and other mine owners, provided a polling place for elections, and obtained a post office under the name Highland Mary. Innis ordered a stamp mill with a battery of twenty-five stamps and hired Lewis Schantl, expert metallurgist, to replace Mosely. Schantl was to oversee construction of the mill, but quit within the year.[89]

As mining and prospecting gained momentum during the mid-1870s, many single men collected in the growing settlements. Silverton experienced the greatest change and mushroomed to 210 buildings by 1876. One new building housed the San Juan County courthouse when the Territorial Legislature carved out of La Plata County to administer the concentration of activity

[85] Henn, 1999: 16; Nossaman, 1989: 262, 319; Nossaman, 1993: 120.
[86] Nossaman, 1989: 264, 266.
[87] Nossaman, 1989: 319; Nossaman, 1993: 120.
[88] Nossaman, 1993: 120; Nossaman, 1998: 104.
[89] Bauer, et al., 1990: 72; *"Colorado Mines"* *EMJ* (10/19/78):278; Nossaman, 1993: 136, 252.

in the Animas River drainage. Designation as county seat ensured that Silverton would remain the dominant town. James Briggs took a break from his Briggs Tunnel on Hazelton Mountain and opened the first hotel in 1875. Four saloons opened. The community also erected a combination school, courtroom, and meeting hall.[90]

Howardsville continued to rival Silverton as the region's commercial and social hub. In 1876, Charles and John Pearson established a slaughterhouse and a stockyard to supply butcher shops and mines with meat. John, James, and Joseph Gunsolus ran pack trains to the surrounding mines. Charles Fischer and Henry P. Gill built western Colorado's first brewery, the Rocky Mountain Brewery (Gill & Fischer). In 1877, Edward W. Johnstone and Andrew Bigger both opened saloons. Johnstone was a family man and Bigger was a bully who shot a man in Del Norte and fled to Howardsville. He went to prison for subsequent murders after he left. Prostitutes set up several tents on the edge of town. The enterprise was unsuccessful, however, and the ladies failed to return the following year.[91] Individuals who did not gravitate to Silverton or Howardsville established residences in one of the six other settlements. On Hazelton Mountain, local prospectors and miners referred to their informal collection of cabins around the Aspen vein as Quartzville. A similar demographic maintained the small camp at the head of Cement Creek, the name of which remains unknown.

While Burrows Camp on Mineral Creek was also a primitive settlement, members of the original Burrows party actively guided its development into something more. In 1875, they named the collection of tents and cabins Mineral City and applied for a post office, but another town with the same title already existed. Thus, the community chose Mineral Point after a prominent quartz outcrop, which the Postal Service recognized. Ironically, Mineral Point featured offices for several mining companies before a single retail or service business opened. In 1875, McIntyre's Dakota & San Juan Mining Company established headquarters, and J.S. Buell and brother organized the Buffalo & San Juan Mining Company. The following year, entrepreneurs brought in a few businesses. Henry Ketchum and John Dowling ran a miners' supply store, Ehrenfried Steinbach an assay shop, and Albert Dyes a mine brokerage business. To accommodate travelers, B.F. Weeks and H.B. Perry served meals, and Perry's restaurant doubled as the Forest House, the first hotel at Mineral Point. The population, including all the prospectors scattered in the area, numbered around 75.[92]

Animas Forks, which began in a manner similar to Mineral Point, rapidly progressed due to a more diverse group of interests. Because the settlement was a gateway into the mineralized portion of the Eureka district, it naturally hosted prospectors. Miners lived in town as well, and worked on one of several properties in development within walking distance. Entrepreneurs chose Animas Forks because they were interested in the potential offered by the upper Animas River drainage but felt that Mineral Point was too small, remote, and harsh in climate. Animas Forks, located at treeline, was not much better. Even though the settlement was little more than a prospectors' camp in 1875, community activists confident in the future secured a post office.

[90] Nossaman, 1989: 238, 283; Nossaman, 1993: 12.
[91] Nossaman, 1989: 252; Nossaman, 1993: 215, 218, 219; *Rocky Mountain News*, (10/17/77): 2.
[92] Bauer, et al, 1990: 98; Nossaman, 1993: 176, 178, 179.

William Randall and Martin Codding built the first mercantile. Unlike Mineral Point, Animas Forks enjoyed a boom the following year. For those who called Animas Forks home, Henry Warren, William and Frank Stein, and Edward Suydam opened three more stores, and regional meat dealer Henry Helmboldt and another individual established two butcher shops. Lewis and Clara Mercer and Esther Ekkard ran boardinghouses for workers. The Mercers opened the Mercer House hotel and livery and Frank McGivern served meals in the Flagstaff House restaurant and bakery. In contrast to the stereotypes of western mining camps, Animas Forks featured only one saloon, which Albert and Anna Brendel tended. Specialized businesses also served the nascent mining industry. An assay shop and blacksmith provided services needed by prospectors, and several freight packers established headquarters. Charles McIntyre began building the Greenleaf Mill to receive ore from local mines.[93]

Curiously, Eureka lagged far behind Animas Forks in development, although it shared a similar function and geographic relationship with the mining district. In 1875, the townsite company secured a post office and cleared trees and stumps from the platted streets but neglected to follow with promotion. As a result, few businesses and residents chose Eureka. Founder Fred Blaisdell opened a tiny store, and in 1876, Henry O. Montague established a second, while Suydam moved his mercantile down from Animas Forks. Eureka had lodging, but no saloons or restaurants. It seems likely that Milton Engleman chose to settle in Eureka prior to his involvement with the Sunnyside because the vacuum in business afforded opportunity.[94]

The other settlement that drew some of the prospectors and miners was Niegoldstown, located in the Las Animas district where Stony Gulch opened into Cunningham Gulch. Reinhard Niegold, the eldest of four German brothers, came to the Las Animas district in 1872 to prospect, and brother Gustave, joined him within a year or two. Despite the tardy arrival, Gustave found a vein rich with silver and industrial metals south of Stony Gulch in 1874, and the brothers claimed it as the Philadelphia and Little Fanny. Two more brothers joined the Niegolds in 1876 and they began production according to the simple, labor-intensive methods commonly employed in the mining district. The brothers had select ore samples assayed in Howardsville, probably by William Nichols, and the reports indicated that the payrock featured as much as $1,100 in silver per ton. With visions of wealth, the Niegolds hired a crew to increase the output.[95]

Like Charles McIntyre, the Niegolds decided to build a concentration mill at the mouth of Stony Gulch instead of sending waste-laden crude ore directly to a smelter. In 1877 or early 1878, the brothers started the mill, and it worked at first. But as the ore increased in complexity with depth, the mill lost too much of the metal content and forced the Niegolds to ship the payrock to a smelter anyway. The bunkhouses for the miners and mill workers became the seed for a small settlement that the brothers modestly named Niegoldstown. Taking advantage of opportunity, the brothers decided to formalize the settlement and requested a post office, which the Postal Service granted in 1878. They also built a sawmill for their operation and sold the

[93] Nossaman, 1993: 186-9.
[94] Bauer, et al, 1990: 52; Nossaman, 1993: 203-205.
[95] Henn, 1999: 68; Nossaman, 1993: 40, 224.

surplus lumber, which was always in demand. The Niegolds' employees and a few prospectors and miners who moved into the settlement fostered enough demand to support a mercantile, saloon, and hotel, which may have been operated by the Niegolds. The town, however, remained small and primitive and never grew beyond a cluster of log buildings, even though it lay directly on the heavily traveled Stony Pass route.[96]

By 1877, both the promotion and proof of ore in the Animas River drainage created a sensation that spread through Colorado and onward to the greater mining industry. The region possessed a small smelting industry, despite initial failures, as well as a permanent population, formal settlements, and businesses. A leading mining journal noted:

> In the spring of 1872, when the San Juan excitement first began, few people regarded it in light of anything but a common mining stampede, which would shortly die out or prove to be only an ordinary furor over a fairly good mineral district. Instead of this, however, the five years that have passed since then have, in their results, not only upheld all but the most exaggerated of the assertions first made in regard to the wealth of the district, but have brought to light many new resources which are at present being developed with an energy equal to that found in any part of the West. In a word, San Juan is an undoubted success. Its mines are not myths, nor its rich ore products solely of the imagination.[97]

While the statement may have been slightly ahead of the actual situation in the San Juans, the Animas River drainage seemed to be headed for greatness. The cornerstone, of course, was mining, which continued to gain momentum. The Crookes and Greenes battled for sources of ore, and the Greenes retained their exclusive rights to Quartzville, Arrastra Gulch, and Silver Lake Basin. The Greenes had so many contracts and independent deliveries that metallurgist John Porter decided to add a second furnace to the smelter. North Star Mountain remained the domain of the Crookes, and they tightened their grasp on the productive operations there. In addition, the Crookes had a relatively easy time establishing a presence at Animas Forks and Mineral Point because of the easy route northeast over Engineer Pass and down Henson Creek to Lake City.

The Crookes' presence was as symbolic as practical because most of the operations around the Animas River headwaters were still being developed and only a few had just begun to produce ore in meaningful tonnages. Some of those that did generate ore were financed by outside investors, which was a noteworthy trend. Cleveland capitalists Alfred A. Hard and Harry L. Bull backed the Mastodon Mining & Reduction Company, which brought the Mastodon Mine into production. The Mastodon was on the Sunnyside Vein. Local prospectors developed the Mountain Queen, at the head of California Gulch, into one of the Eureka district's most important producers for the year. Small amounts of ore trickled from other mines such as the Columbia and Vermillion.[98]

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[96] Bauer, et al., 1990: 105; Nossaman, 1993: 85.

[97] *"The San Juan Mines"* *EMJ* (5/5/77): 291.

[98] *Colorado Mining Directory*, 1883: 650; Nossaman, 1993: 173; Ransome, 1901: 21.

Some of the mines saw more activity on paper than in the ground. C.H. Graham organized the Graham Silver Mining Company to speculate with claims in the area, and when he lost interest in 1877, Graham left. His partners William and Alexander G. Bowman bought in and reorganized as the Sioux City & San Juan Mining Company. Jonathan S. Buell established the Buffalo & San Juan Mining Company with a like intent and reformed it as the Colorado Mining & Land Company. Charles McIntyre ran short of funds for his mill in 1877; he subsequently found investors and included them as the Animas Forks Mining Company. None of these entities produced much in 1877.[99]

The Red Cloud, the only truly promising property at Mineral Point, was shallow but served as an anchor for one of the most important operations in the upper reaches of the Animas. It appears that in his effort to allocate capital, McIntyre sold the claim to Franklin Josiah Pratt, who represented a group of wealthy investors in Massachusetts. Instead of developing the vein from the top down through a shaft, Pratt promoted the idea of undercutting the formation at depth with a long haulage tunnel. Even though the Red Cloud was near Mineral Point, Pratt proposed driving the tunnel northward from California Gulch because this offered the lowest point of entry. The tunnel would have to penetrate around one mile of rock to reach the vein, and Pratt probably forecasted that the tunnel was likely to intersect other ore formations over this distance. If these veins were not claimed, then Pratt and partners could obtain rights, and if they were, then the owners could work them from bottom up through the tunnel and pay a royalty. Such a scheme made the tunnel attractive in theory, and the investors provided Pratt with the funds to start. Pratt then commissioned what was known as both the Bonanza and the Mineral Point tunnel in 1877, and the following year, organized the Mineral Point Tunnel Company. Animas Forks benefited as the nearest commercial and communication center, and Mineral Point, where the target vein was located, received some publicity as well.[100]

Previously quiet portions of the county finally began to see significant claim development and some production in 1877 and 1878. This deeply interested the Greenes because these areas lay to the west of the Eureka district and within their territory. One of the most remote was Poughkeepsie Gulch, which was a drainage to the north of Cement Creek. There, prospectors made a number of discoveries in 1875 and 1876, designated the Poughkeepsie Mining District, and developed their claims. Ruben McNutt and George Howard, who already extracted payrock from their Poughkeepsie Mine, were probably principals in the district's creation. By 1877, partnerships had the Alaska, Bonanza, Columbia, Forest, and Red Roger mines in limited production. Packtrains carried the ore in sacks south over Poughkeepsie Pass and down Cement Creek to the Greene Smelter. Sale of the Old Lout Mine for $10,000, even though it was shallow, caused a stir and stimulated a small rush to the district.[101]

The center of new activity that was nearest the Greenes lay on Sultan Mountain, which loomed west of Silverton. In 1876, several prospectors found a lengthy vein they named the Empire, and within a short time, other prospectors identified several parallel formations

[99] Nossaman, 1993: 191-2; Wickersheim and LeBarron, 2005: 371, 382, 426.
[100] Nossaman, 1993: 121; Wickersheim and LeBarron, 2005: 376.
[101] Ransome, 1901: 192; *Silverton Standard* (10/20/17): 1; Wickersheim and LeBarron, 2005: 370, 376, 418.

including the Hercules, Little Dora, and North Star. Simultaneously, parties began driving tunnels to develop the veins, and all but one of the operations were small. Knight, Slocum & Company began work on the Hercules, and John Williams started his tunnel toward the North Star. The most significant endeavor was the Diamond Tunnel, which the Silver Producing Mining Company pushed to undercut the Hercules and other veins. Ironically, all but the well-funded Diamond Tunnel began minor production by 1878.[102]

In 1877 and 1878, the Crookes and Greenes no longer competed only with each other for the ore produced by San Juan County's young mining industry. Each faced potential rivals in their home territories, and some of the threats were serious while others were not. In Hinsdale County, three new plants posed the possibility of diverting some of the ore that the Crookes relied on. The Ocean Wave Smelting & Mining Company built a smelter in Lake City, George Lee started the Lee Smelter at Capitol City, and both of these made the Crookes uneasy because they were relatively efficient. The Van Giesen Lixiviation Works at Lake City, however, was not much of a threat because during its brief life, the mill proved to be a failure.[103]

In San Juan County, five organizations built facilities that made the Greenes wary. In 1876, James H. Winspear began promoting a smelter he proposed for Eureka, formed the Eureka Reduction Works the following year, and convinced investors in Ohio to provide him with money. He saw the smelter completed by 1878, sought contracts for ore, and apparently purchased an interest in the North Star Mine on North Star Peak for its payrock. When Winspear started the plant, however, it proved to be a complete failure due to mismanagement, debt, and inappropriate processes. The Greenes were relieved, and Winspear quietly escaped his creditors and left for Rosita.[104]

W.G. Melville paralleled Winspear in terms of both timeframe and outcome, but his method for recovering silver differed. In 1876, he organized Melville & Summerfield and built a lixiviation mill at Silverton. Developed in Europe, lixiviation was specific to silver and used chemicals and water as a solvent to leach the metal out of roasted payrock. While lixiviation had been proven to work with simple silver ores, it was no match for the complex material in the Animas drainage, and the mill's immediate failure in 1877 sent Melville back to the drawing board. He tried again in 1878 with the same result and, like William H. Van Gieson at Lake City, suspended operations.[105]

Thomas P. Medly, Lorenzo Dow, and J.H. Earnest Waters planned another lixiviation mill in Cement Creek that would intercept the ore that passed from mines in that canyon and the Poughkeepsie district to the Greene Smelter. Melville had not yet demonstrated that lixiviation was inappropriate for San Juan silver, and also failed to run adequate tests to prove that the process would work. This seems curious because two of the three principals had considerable experience in the mining industry.

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[102] Nossaman, 1993: 147-8; Ransome, 1901: 251; *Silverton Standard* (3/12/10): 1; Wickersheim and LeBarron, 2005: 397, 425.

[103] *"Mining News" EMJ* (7/14/77): 30; Pangborn, 1878: 52; Lee Scamehorn, *Albert Eugene Reynolds: Colorado's Mining King* (Norman, OK: University of Oklahoma Press, 1995)178; *Silver World* (10/5/78).

[104] Nossaman, 1993: 23, 210, 252; Pangborn, 1878: 54; Ransome, 1901: 21.

[105] *"Mining News" EMJ* (7/14/77): 30, Nossaman, 1989: 316; Nossaman, 1993: 39, 116; Pangborn, 1878: 52.

Waters was born in Parsonstown, Ireland, in 1851, son of prominent physician John Waters. Interested in mining and not medicine, he received a formal education at the Royal School of Mines in London and the School of Mines at Freiberg, Germany. In 1872, Waters became an apprentice in the machine shops of John & Henry Gwynne in London for practical experience with machinery. Ready for the field, Waters traveled far and wide. Under the employment of a London investment syndicate, he traveled to Gilpin County in 1873 and examined mines there, then went to Japan where the imperial government hired him to serve as State Mining Engineer and build the Japanese Imperial Mint. In 1875, Waters resumed his practice as a consulting engineer and examined mines in the Lake Superior area and Mexico, then came to Colorado and joined the Leadville rush in 1877. He spent the next four years primarily in Leadville and the San Juans, where he made his mark.[106]

Dow, much older than Waters, was born in Maine in 1824, received a formal education at Wesleyan University, and moved to Topeka, where he was elected mayor in 1859 and then to the state supreme court. Dow traveled widely, and on a visit to Europe during the early 1860s, became fascinated with mining and engineering. He became an expert with explosives, brought one of the first diamond drills for mining from Europe to the United States, and became involved with several mining companies.[107]

The San Juan Lixiviation Company, which the trio established in 1877 with British backing, was Dow's latest venture. The group sited the new mill at the confluence of the South Fork and main fork of Cement Creek, and named the associated settlement Gladstone, after the British prime minister who held office at that time. The company began operations in 1878 and, along with Melville at Silverton, immediately ran into trouble. To obtain capital for the improvements deemed necessary, Dow and Waters reorganized the firm as the San Juan Reduction Company and managed to win 200 pounds of silver from Poughkeepsie district ore. That small amount was the crowning achievement, and the company spiraled into bankruptcy in 1879.[108]

Charles McIntyre's Greenleaf Mill was not much of a threat to the Greene Smelter either. David Nevin, brother of the inventor of the Nevin jig, a concentration apparatus, designed the mill and saw it completed in 1877. To his embarrassment, the jigs, which used water currents to separate heavy metalliferous particles from light waste, proved to be only moderately successful on the complex ore of the upper Animas. Thus, the mill operated intermittently, may have been refitted, but drew away no business from the Greenes.[109]

Edmund T. Sweet and Oliver Matthews opened the only facility that presented the Greenes with competition. Even then, the threat was limited because the new plant filled a specific niche. Specifically, Sweet and Matthews erected an ore sampler in 1878, which catered to small mines with sporadic production. A sampler was a combination assay house, smelter, and ore buyer, and it specialized in providing assays, testing batches of complex ore to identify the

[106] Nossaman, 1993: 170; *"Obituary"* EMJ (5/13/93): 444; *"Prominent Men in the Mining Industry"* EMJ (8/22/91): 213; Clark C. Spence, C. *Mining Engineers and the American West* (Moscow, ID: University of Idaho Press, 1993) 8.
[107] Nossaman, 1993: 170.
[108] *"Colorado Mines: San Juan Region"* EMJ (10/19/78); Nossaman, 1993: 170; Ransome, 1901: 21; Smith, 1982: 27.
[109] Nossaman, 1993: 187.

best treatment methods, and buying small lots of ore from outfits that needed immediate income. At the sampler, the purchased ore was segregated into piles by composition and when enough of a single type had accumulated, the batch was smelted in a custom run. Ordinarily, samplers posed no immediate threat to smelters such as Greene & Company although the smelters, set up for large volumes of specific ore types, were unwilling to make process adjustments just for the small, specialty batches. Sweet and Matthews, however, did have some impact on the Greenes, who wanted every pound or ore that they could secure. Instead of building a facility anew, which would have been costly, Sweet and Matthews refitted the idle Rough & Ready Smelter. Because the Animas drainage possessed an array of small mines with complex ore, the Sweet Sampler enjoyed success from the start.[110]

To simultaneously nurture and profit from the growth of mining, local investors and community activists backed the development of a primitive infrastructure in the county. Because the industry depended on the movement of supplies, ore, and people, improvements to the transportation system were among the most important.

Prior to the smelting war, the Animas River drainage lacked formal roads, and horses, mules, and burros were the principal movers of materials and people. Given the reliance on draft animals, it comes as no surprise that the original transportation system in the Animas River drainage consisted of a network of pack trails. As alluded to in the pages above, several well-beaten artery trails entered Baker's Park from the east over Stony, Cunningham, and Cinnamon passes, and from the south over Molas Pass. From the commercial and transportation hubs in the county, more packtrails extended up all the major valleys and gulches to the centers of mining. The trails naturally followed the paths of least resistance and fewest obstacles and usually wound along the flattest ground. Feeder trails branched off the main routes and zigzagged up to nearly every mine and prospect of note, and because these were the responsibility of the users, they tended to be well-constructed. By winter, these trails became impassable, however, and all but the most daring and resourceful on snowshoes attempted to follow only the principal routes out of the region. For a mining district with aspirations of notoriety and fulltime ore production, this simply would not do.

Otto Mears, pathfinder of the San Juans, understood this problem and foresaw great profit in toll roads. During the 1870s, he hired crews to grade a network of roads from the San Luis and Arkansas River valleys west toward the San Juans and the Gunnison area. The fathers of Lake City, including the Crookes, realized that roads were necessary for their well-being and graded several trunk lines in the eastern San Juans. The principal interests in the Animas River drainage, however, were slightly less developed.

Most of the goods consumed in the drainage came from shipping points in eastern Colorado and so it would seem logical to improve the Stony and Cinnamon pass trails first and establish links with the Lake City and Otto Mears' road networks. Instead, Dempsey Reese and lumberman Henry F. Tower commissioned the first toll road, which took a route south and down the Animas River canyon to Hermosa and Animas City in 1876. Reese and Tower's direct

[110] Nossaman, 1993:153.

experience with the region's weather superseded geographic distances. They understood that wagon roads over Stony and Cinnamon passes would become blocked by snow while the Animas River valley route, although much longer, was serviceable most of the year. Further, a road graded by the Park View & Fort Garland Freight Company already linked Conejos, in the San Luis Valley, with Animas City and provided the essential connection with eastern Colorado. Reese and Tower saw their road carrying traffic by 1877 and began to recover the construction costs by charging a lofty $6 for teams and $6 round trip for stages, which equates with about $100 today.[111]

An embarrassment to the Greenes and other Animas River drainage interests, Lake City investors apparently completed a road to Animas Forks before they did. The Lake City interests widened the trail over Cinnamon Pass, obviously to encourage residents to conduct business in Lake City. In 1875, the Animas Forks Toll Road Company began a road from Silverton up to Animas Forks, but the project took two years because it was under-funded. The road was poorly engineered and a bog in places, but it granted the desired shortcut over the range to Otto Mears' eastern network. San Juan County now had two routes that could accommodate wagons, which lowered the cost of both mining and living. Because wagons carried freight in some volume, they were able to haul larger loads into the county at lower rates than the pack animals.[112]

Several areas of mining in the county were important enough to justify the construction of rough but negotiable spur roads. In 1876, the Innis brothers assumed that a toll road would be graded over Stony Pass and funded the first segment from Howardsville to Stony Gulch. Probably at the behest of the Greenes and Blair's party, the county graded a road up Hazelton Mountain to the Aspen vein system in 1877, which increased the volume of ore packed to the Greene Smelter. In 1879, local investors funded a toll road up Cement Creek, over Poughkeepsie Pass, and into the Poughkeepsie district, whose miners were glad to now ship ore by wagon to the Greene Smelter.[113]

Communication with the outside world was necessary for the success of mining in San Juan County, and it saw great improvement during the mid-1870s. The mail, newspapers, and word-of-mouth were the principal sources of information. In the early 1870s, someone from the Animas River drainage had to fetch the mail from Del Norte, where the nearest post office lay. By 1875, post offices at Animas Forks, Eureka, Highland Mary, Howardsville, Mineral Point, and Silverton served the county, and a carrier delivered the mail at regular intervals. Newspapers were an indispensable institution, and county residents had a choice of several, which they read, reread, and passed on to others. The *Rocky Mountain News*, published in Denver, usually covered important national and territorial stories as well as cultural topics, but because it arrived by post, the news was usually outdated. In 1875, John R. Curry established the *La Plata Miner* in Silverton, which became the *Silverton Miner* in 1879. Curry's paper, the first in the Animas River drainage, covered local news, extracted stories from Denver and eastern publications, and served as a promotional voice for the region.

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[111] Nossaman, 1993: 87; Nossaman, 1993: 294; Pamgborn, 1878: 50

[112] Nossaman, 1993: 95, 113; Sloan & Skowronski, 1975: 21.

[113] Nossaman, 1993: 98, 113; Ransome, 1901: 21; *"San Juan Silver Mines"* *EMJ* (12/20/79): 452; Sloan & Skowronski, 1975: 21.

To keep pace with new construction, several firms erected additional sawmills at the timber stands. In 1876, Greene & Company merged its logging operation with Tower & Stevens on Mineral Creek (north of Silverton), and Melville & Summerfield set up another sawmill in the same area. After the company finished its lixiviation mill, it began selling the lumber in Silverton. H.F. Schenk brought a third sawmill into the Cement Creek drainage, previously untimbered. The San Juan Reduction Company erected a fourth sawmill at Gladstone in 1878.

In 1878 and 1879, several trends and forces set in motion events that permanently changed the social, industrial, and economic landscapes of San Juan County. One of the trends had to do with the value of silver. In 1878, the Federal government passed the Bland-Allison Act, which was, in essence, a massive subsidy for the silver mining industry. Initially, the government declared that the federal treasury would recognize a gold standard to the exclusion of silver. Concerned over the impact to silver mining, western senators and representatives drafted the Bland-Allison Act, which reinstituted the partial monetization of silver and required the government to buy the metal at an average of $1.20 per ounce, or around $21 today. Previously, silver fetched $1.15 per ounce, and the increase in value, coupled with the stability imparted by the Act, instilled considerable confidence among investors, mine owners, and ore buyers. This should have generated considerable interest in the Animas River drainage, where rich silver ore had been proven at a number of mines in need of development.[114]

A conspiracy of factors, however, prevented interest from taking hold. First, Colorado hosted two of the most significant booms in the West in 1878 and 1879, which captured the attention of investors. The first was Leadville and the second was Silver Cliff, ironically in the same area as Rosita, whose boom distracted investors from the Animas drainage in 1874. Second, the wave of mill and smelter failures in the San Juans and San Juan County specifically, clouded the region's reputation among individuals knowledgeable about sound mining investment. The ore could be profitably treated, as the Greenes, the Crookes, and Sweet's Sampler demonstrated, but investors instead focused on the failures. Third, the Meeker Massacre resulted in considerable caution. The Brunot Treaty granted various bands of Ute Indians title to the lands surrounding the San Juans, and following the established pattern, settlers encroached on the territory anyway, and the Utes were moved several times. The Southern Utes quietly settled on a reservation in southwestern Colorado. Nathaniel Meeker, in charge of the White River agency in northwestern Colorado, tried to force the Northern Utes into an agricultural lifestyle. As tensions between the Northern Utes and Meeker escalated, Meeker sent a communication to the army, which headed for the White River area against warnings by the Utes. The Meeker Massacre ensued. Subsequent virulent hysteria developed, although the settlers themselves had ultimately been the perpetrators. With the resultant Ute removal of 1881, however, the tribe was left with only two reservations in the state.

[114] Joseph King, *A Mine to Make A Mine: Financing the Colorado Mining Industry, 1859-1902* (Texas A&M University Press. 1977): 92; *Report of the Director of the Mint* (Washington, D.C., Government Printing Office, 1894) 20; Glenn O. Saxon, *Colorado and Its Mining Industry (1859-1959)* (New Haven: Yale University, 1959) 7, 8, 14, 16; Smith, 1982:92; Smith, 1994: 148.

For San Juan County, these factors proved to be very troublesome. Why, investors reasoned, should they risk capital on an underdeveloped and remote region where the climate was uncertain and problematic, when Leadville, Silver Cliff, and other booms held great potential? As a result, the mining industry in the drainage remained static and many of the small operations even ceased as their high-grade ore gave out. Production figures for the county reflect the downward trend. In 1876, the county's mines produced $56,000 in silver, $5,000 in gold, and $15,000 in lead. By 1879, the value dropped to $35,000 worth of silver, $6,000 in gold, and $20,000 in lead.[115]

Competition between the smelters and mills, built on the expectation of an increase in ore production, intensified and the vulnerable ones closed. In a move that stunned the Animas River drainage, the Greenes decided to suspend their operations at Silverton in 1879. Financial troubles, emotional exhaustion, and the distance of the Greenes from Silverton were partially responsible, but competition and ore that grew increasingly complex and difficult to treat were the major underlying reasons. The physical frailty of George Greene, the engine behind the business, certainly contributed as well.

Caught by surprise, the county's miners tried to assess how the smelter's closure would impact them. Other mills and smelters existed at Lake City and Ouray, but the costs of shipping ore over the mountains consumed most of the profits. Sweet's Sampler and the San Juan Reducing Company lixiviation works at Gladstone were able to process some of the ore, but the mining companies relegated themselves to producing only the highest grades of ore. As the county subsided into a depression, many wage laborers left, but visionary mine owners and business interests held fast because an end to their problems was already in sight.

William J. Palmer, William A. Bell, and other principals with the Denver & Rio Grande Railroad clearly saw the inevitable growth of southwestern Colorado and the potential offered by mining in the mountains. They began grading a line in 1876, spent three years traversing south around the San Juans, and established the town of Durango as a terminal. The track required several years to finish, but assurance of service in the near future increased optimism and confidence in San Juan County. The close proximity of the railroad would bring immeasurable benefit because trains could carry greater volumes of freight at much lower rates than wagons. Not only would this reduce the cost of living in the county, but also ore could be shipped to the large smelters in Black Hawk, Golden, Denver, Pueblo, and Leadville. Further, these facilities were prepared to profitably treat the district's complex ore.

While the residents of San Juan County were certainly excited about the Durango railhead, few thought that the Denver & Rio Grande would bear the exorbitant costs of grading a spur up the Animas River to Silverton. Palmer and associates, however, quietly made arrangements for exactly that. They envisioned Durango as the hub of an empire that would capture the two surest and most profitable aspects of mining, transportation and smelting. As track gangs pushed toward Durango in 1880, Palmer contacted John Porter, who had returned to

[115] Henderson, Charles W. *USGS Professional Paper 138: Mining in Colorado: A History of Discovery, Development, and Production* Washington, D.C., 1926, U.S. Geological Survey, Government Printing Office:216.

Eureka, Nevada, in 1877 and explained his strategy. He planned to build a massive smelter in Durango, capable of treating the most resilient ores the San Juans had to offer and at rates that would undercut the facilities in the mountains. A railroad to Silverton would carry ore down and send supplies and coal up, and similar lines to other portions of the San Juans were to be considered. In so doing, the Denver & Rio Grande would dominate the freight and smelting business with the investors as beneficiaries. Palmer offered Porter the position of chief metallurgist and manager of the smelter, which Porter accepted.

As a first step, Palmer, Bell, and associates organized the New York & San Juan Mining & Smelting Company in 1880 and, through Porter, secured the Greene Smelter. Porter then hired Thomas Bowen and John Pennington as metallurgists, and began securing contracts for ore at highly competitive rates. Porter had the Greene equipment freighted down to a site on the lower Animas at Durango, then unloaded. At the same time, the company came to an agreement with Edmund Sweet where Sweet would serve as ore buyer if he agreed not to expand his sampler into a smelter. To ensure a constant supply of ore, the company surveyed the best mines in the Animas River drainage and came to the conclusion that the Aspen, Ingersoll, Legal Tender, and the other mines on Hazelton Mountain offered the greatest potential. In 1880, the company approached Blair, Ingersoll, Higgins, and the other claim owners with an offer of $60,000, or $1,073,483 today, for their interests.[116]

News of the project traveled fast in the San Juans, and the inhabitants of San Juan County learned not only that they were to have direct rail service, which was a benchmark for any mining region, but also a new smelter. The greater mining industry had finally accepted San Juan County as legitimate, which stimulated attention. Prospectors returned, investors examined proven properties, optimistic individuals cautiously invested in new properties, however, and existing companies and successful mines saw greater development. Curiously, the county's production figures continued to fall instead of rise. In 1880, the existing companies generated only $13,000 worth of silver, $6,000 in gold, and $21,000 of lead. The reason for the trend was that, instead of shipping ore to the distant smelters at high costs, the mine owners engaged in some production, much underground development, and patiently waited for Palmer and Porter to finish the railroad and smelter. By 1882, the owners deposited around 1,200 tons of payrock at the future railroad depot in Silverton and stockpiled more at their mines.[117] The dismal production figures belied an overall increase in activity among the county's mines, although the industry remained depressed. Mine owners in particular benefited from the wave of confidence and either invested capital developing their properties or sold to one of a number of new companies.

In the Las Animas district, most of the owners were unwilling to sell because they knew their mines were valuable and would only become more so. Instead, owners self-funded development and improvement. The Aspen complex remained one of the district's most important mines, and the New York & San Juan company consolidated the 4,000 feet of

[116] *"Mining News"* EMJ (3/27/80): 222; Nossaman, 1993: 295-296; Nossaman, 1998: 39, 58; Smith, 1992:18.
[117] Henderson, 1926:216; Nossaman, 1998: 180.

disparate workings into a single operation. Foreman C.M. Osman kept a crew of thirty-five miners based in Quartzville busy driving development workings and stockpiling ore in anticipation of the railroad's arrival.[118]

North Star Peak and Dives Basin remained the Las Animas district's other key center of ore production. During the summer, Martin Van Buren Wason, Theophile Benjovsky, George Ingersoll, and others maintained production from the Shenandoah and Dives mines, as well as several surface operations. In complete control of the North Star, the Crooke brothers became unsatisfied with the seasonality of operations and decided to consult with a professional mining engineer in 1880. At this time, Ebenezer Olcott arrived in Lake City at the Crookes' doorstep.

Olcott came from a wealthy New York family, and from an early age was interested in mining and had the opportunity to enter the industry from the top. Olcott studied engineering and metallurgy at Columbia School of Mines in New York, graduated in 1874, and took a job as a chemist for the Ore Knob Copper Company in North Carolina. In 1875, he accepted a position as superintendent of the Pennsylvania Lead Company, and then jumped at an offer the following year to work as an engineer for the Orinoco Exploring & Mining Company in Venezuela. In 1879, Olcott returned to the United States, established a consulting practice, and easily secured several important clients due to his experience. D. Willis James of Phelps, Dodge & Company was one of Olcott's best clients, and Olcott quickly packed his bags when Willis requested a survey of a number of significant mining districts in the West. Olcott started in Colorado and perused Leadville, Silver Cliff, and Caribou, before heading to Lake City in 1880 specifically to examine the Crooke Mining & Smelting Company.[119]

The Crookes were open to showing Olcott the North Star Mine in hopes of securing additional investment. The North Star was probably unlike anything that Olcott had yet seen, and during his visit, he was immediately impressed by the harsh environment. Seemingly as an act of fate telling him that the North Star was to play a role in his future, Olcott was literally struck by a small lightning charge, which electrified him all the more. When Olcott returned to Lake City, he and the Crookes came to a mutual understanding. They realized that Olcott had what it took to bring the mine into substantial production, and Olcott saw the Crookes and the mine as an exciting physical and management challenge. Olcott negotiated a sound deal with the Crookes that included a $25,000 investment in the North Star from Willis and associates in exchange for a monthly salary of $500, or $8,946 today, plus expenses.[120]

While the North Star was arguably more difficult to work than nearly all the other mines in the county, it exemplified the typical operation above treeline. Olcott kept a crew of eight miners busy developing the North Star vein through three levels, with the lowest tunnel as the principal point of entry. Each tunnel had one small blacksmith shop and either a platform or bin in which the miners stored sacked ore for shipment by burro. The living quarters were within a crude boardinghouse integral with the tunnel house and blacksmith shop at the lower level.

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[118] *"Mining News"* EMJ (12/11/80): 384; Nossaman, 1998: 99, 202.

[119] Nossaman, 1998: 18; Duane A. Smith, *San Juan Gold: A Mining Engineer's Adventures, 1879-1881* (Montrose, CO: Western Reflections, 2002) 6.

[120] Nossaman, 1998: 18; Smith, 2002: 29, 115.

Though the operation was seasonal in theory, winter came early at 13,000 feet and presented the crew with considerable challenges. As the temperatures plummeted and the winds picked up in fall, the miners may have grown claustrophobic in the cramped quarters. The interior was more like a ship than a boardinghouse. The miners spent nearly all their time in one large room when not at work because the outside was intolerable. They slept in a set of bunks three tiers high, warmed themselves around a single stove, ate meals together, and competed for the few pieces of furniture during leisure. Sacks of provisions were suspended from the ceiling, boxes were stacked along the walls, and tools leaned against the corners. On windy nights, warm air promptly left the drafty building and the stove was insufficient for heat. Damp rags froze and workers could see their breath. The crew simply had no escape from each other, the ambiance of mining, or the cold. But like their counterparts elsewhere in the county's high mines, they labored until Olcott called an end to the season in November or December.[121]

On the opposite side of North Star Peak in Little Giant Basin, the positive climate of 1880 and 1881 fostered not only prospecting, but also the development of several of the ore veins discovered earlier. Prospectors searching the rock formations at the gulch's head found a rich vein that carried silver and industrial metals exposed at the surface and claimed it as the Potomac. They had no trouble finding buyers, who organized the Potomac Silver Mining Company and immediately began development. As early as 1879, prospectors were driving a tunnel south into a cliff on the floor of Little Giant Basin to undercut the Big Giant vein at depth. They erected several buildings including a tunnel house to support activity underground and, in 1880, found investors who furnished capital for major development. A small crew of miners drove the tunnel to the impressive length of 400 feet where they struck a vein laced with gray copper and silver ore. Excited, the investors increased the crew to seven miners who began extracting and stockpiling the ore. Down the gulch to the north, a party of prospectors hoped for the same result and pushed an exploratory tunnel toward the Black Prince vein.[122]

The King Solomon Mine was Little Giant Basin's most important operation, although it, like most of the producers in the Las Animas district, remained small, shallow, and labor-intensive. In 1879, the Ressouches brothers realized that their King Solomon would never pay in desirable quantities without capital for development. Despite the regional economic slump at the time, they interested Robert Hook, a lawyer who practiced in Silverton during the warm months and in Chicago during the winter. Hook convinced other investors in the Windy City of the King Solomon's potential, and together they organized the Solomon Silver Mining Company to work the property. The Ressouches brothers retained a significant share of the company and probably personally oversaw development in 1880 while Hook acted as superintendent.[123]

Once the King Solomon began proving its potential in 1881, the Ressouches and Hook elicited additional money from the Chicago investors to pay for an expert engineer capable of increasing production. The nationalistic Ressouches brothers had an individual in mind, who was Victor Vincent, a fellow Frenchman. While Vincent actually had little direct experience with

[121] Smith, 2002:115.
[122] *Denver Republican* (9/24/81):5; *"Mining News" EMJ* (2/21/80):137; *"Mining News" EMJ* (3/13/80):189; *Rocky Mountain News* (10/19/79):4.
[123] Nossaman, 1993:23; *Rocky Mountain News* (8/26/79):5.

mining, he was an accomplished engineer in France, as well as a talented artist. Vincent had aspirations of becoming a well-practiced American mining engineer and came to the Animas River drainage in the late 1870s. Hoping that the King Solomon would be his first step in a career, Vincent convinced the Ressouches to hire him. During the year, Vincent was given charge of a crew of sixteen, who increased development of the vein while bringing ore to daylight.[124]

Within the Las Animas district, the movement of prospecting and claim development crept over to the northwest face of Kendall Mountain above Silverton. After the sale of the Ingersoll Tunnel, Thomas Higgins pursued other interests, including backing his wife Mary Anne in a lease on the Grand Central Hotel in Silverton in 1881. He also invested in two highly promising claims staked in Swansea Gulch during the late 1870s. One, the Lackawanna, was within a short walk from Silverton and consisted of a group of claims that covered several veins on the gulch's east side. The other, the Scranton City, lay at treeline at the base of a cliff on the gulch's west side. In light of the coming railroad and the smelter in Durango, Higgins sensed that the time was right to bring the claims into production and hired several miners to work with him in initial development. At the same time, prospectors were at work driving tunnels and sinking shafts into six other claims on Kendall Mountain.[125]

The Eureka district, and especially the core area around California Gulch, drew more interest among new investors than perhaps any other portion of San Juan County. Capitalists local and distant organized at least ten new companies, which developed seven mines into substantial operations and speculated on numerous other claims. In addition, the six companies and partnerships already in production during the late 1870s continued to conduct development and store their ore.

Increased activity fostered the growth of Eureka and Animas Forks, which evolved from tenuous camps into small towns with business districts. By 1880, Eureka had a population of around 125 residents, although less than half lived in the town year round. A full assemblage of businesses satisfied their needs, as well as those of individuals who came to find work or examine the surrounding mines for investment. Thomas G. Andrews and Peter Tallman opened a combination restaurant and hotel. H. Bert Clifford ran another, while the wives of local investors kept several boardinghouses. Tallman also tended a mercantile that competed with Engleman's store, and Henry Helmboldt established a branch meat market. Tallman and Andrews served liquor in their hotel, and other entrepreneurs opened two saloons in 1881. That year, the townsite company also formally platted and surveyed Eureka. While Winspear's smelter was silent, the sawmill was not and produced construction materials desperately needed.[126]

Several individuals noteworthy in Colorado's history claimed Eureka as home. One was James R. McKinney, who arrived in Eureka in 1879 to direct the Moline Silver Mining Company

[124] Nossaman, 1998: 307.

[125] *"Mining News"* EMJ (8/13/87): 119; Nossaman, 1993: 38; Nossaman, 1998: 44.

[126] *Colorado Business Directory* (Denver: 1879); J.A. Blake: 196; *Colorado Business Directory* (Denver: 1881); J.A. Blake: 168; Nossaman, 1993: 211, 125; Susanne Schulze *A Century of the Colorado Census* (Greeley: University of Northern Colorado, 1976): 1880-5.

for investors in Illinois. The company developed the Confidence prospect in Eureka Gulch and the Sultana Mine on Sultan Mountain. The venture was largely a failure, although the Sultana produced in later years, and McKinney sought income by opening a livery stable in Eureka. He ran the business for several years before moving to Colorado Springs, where he became involved with the Exchange National Bank. Through this organization, McKinney invested in Cripple Creek when that district boomed and realized a huge fortune. He reinvested some of this in Colorado's beet sugar industry, which assumed a prominent role in national production.[127]

Theodore B. Comstock opened an assay shop in 1879. Described by peers as overly energetic, Comstock was born into an upper class family in Cutahago Falls, Ohio in 1849 and immediately embraced the sciences. He gravitated toward geology at Cornell University, establishing the school's renowned geological department. In 1873, Comstock combined a lust for adventure with his penchant for science and joined Captain W.A. Jones' exploratory party to Yellowstone in 1873, producing the first geological report of the area. He subsequently led his own expedition into Canada's Northwest Territory and made some of the first scientific observations of the far north. Afterward, Comstock decided to use his geological knowledge for profit and came to the Animas River drainage to examine the possibilities of establishing an ore treatment facility, knowing that this would be difficult due to the complexity of the ore. He solved some of the region's treatment problems and later moved to Arizona, founded the University of Arizona School of Mines in 1891, and maintained a consulting practice as a mining engineer.[128]

Animas Forks did not grow quite as dramatically as Eureka, in part because the town was already established. A basic business district included several mercantiles, a drugstore, several lodging establishments, a blacksmith, and an assayer. Animas Forks also boasted two ore treatment facilities and a sawmill. One of these was Charles McIntyre's Greenleaf Mill, which ran intermittently because not well-suited for the district's ore. The other was Eclipse Smelter, which James Cherry built in 1880 as part of one of the district's promising new ventures. Cherry and fellow investors organized the Eclipse Mining & Smelting Company with a plan of buying several proven properties and building the smelter to treat the ore. Like McIntyre, Cherry also forecast treating custom lots from local outfits to increase income. He purchased the Eclipse, Red Cross, and Mountain Queen mines at the head of California Gulch, the latter of which had been ready to provide ore since 1877. In 1880, Cherry erected the smelter in the Animas drainage several miles south of Animas Forks, testing Mountain Queen ore in 1881 with complete success. At least, this is what the eastern investors believed. The smelter actually had great trouble with the complex ore, and Cherry realized that he would need more capital to refit the facility. However, without informing the investors, Cherry had applied some Eclipse capital and most of the proceeds from the test run to another mining scheme that collapsed. In 1881, the

[127] Carl Abbott, Stephen Leonard, and David McComb, *Colorado: A History of the Centennial State* (Niwot, CO: University Press of Colorado, 1994 [1982]): 181; *Colorado Mining Directory*, 1883: 654; Nossaman, 1993: 336.
[128] Nossaman, 1998: 210; *"Obituary" EMJ* (8/7/15): 243; Spence, 1993: 58.

multiple failures came to a head. As the investors discovered the truth, Cherry disappeared and the smelter abandoned like so many other failures.[129]

The Eclipse was one of two monumental failures that gave remote investors pause. The other was the Bonanza or Mineral Point Tunnel. Franklin Pratt, a businessman, but no mining engineer, underestimated the cost of boring a mile-long tunnel in the San Juans. The operation started well, and Pratt took the highly progressive approach of using rock drills to expedite the drilling and blasting process. In 1878, Pratt lured drill expert Whittemore away from the Highland Mary to install a compressed air system at Mineral Point. The system was the second in the county and among the earliest in Colorado. As noted above with the Highland Mary, rock drills and air compression were new technologies in the late 1870s, and became indispensable for mining around twenty years later. The system and general expenses of operating in the San Juans consumed $300,000 to $400,000 by 1880, which placed Pratt in a difficult position. He had a tunnel only 1,000 to 1,500 feet long to show for such an astounding cost, with triple the distance yet to go. The Mineral Point Tunnel Company went bankrupt in 1881, and the Silver Peak Mining Company of London bought the property and continued work. They suffered a similar fate and suspended operations in 1884.[130]

Despite the failures, a number of investors maintained a general sense of confidence in the operations around Animas Forks. In Placer Gulch, Rasmus Hanson discovered what he thought was an extension of the Sunnyside Vein, which he named the Sunnyside Extension. L.C. Osborne may have grubstaked Hanson because Hanson granted him a share of the claim. The Mastodon Mining & Reduction Company continued developing the adjoining Mastodon, and nearby, the Gordon Mining Company developed the Sound Democrat. This promising property was under female directorship, rare in western mining. In 1881, Canadian Martha A. Gordon organized the company to speculate.[131]

Eureka enjoyed its share of mining ventures during 1880 and 1881. Mercantile owner Milton Engleman received news that miners struck rich gold ore in the Sunnyside on the east shore of Lake Emma, named for his wife. The word was welcome, but the operation uncertain because of conflict among the owners. In particular, when Engleman began development during the late 1870s, he offered interests in the property to his in-laws for capital. They squabbled over profits, control, and ownership, which poisoned the relationships between Emma, Milton, and the family. Barely in control of the Sunnyside, Engleman ordered the ore to be stockpiled instead of sold. On California Mountain above the Sunnyside, Ruben McNutt discovered rich ore in his Washington claim and sold to the Colorado Mining, Smelting & Investment Company.[132]

In 1881, several new companies began work in Picayune Gulch, east of Lake Emma. Chicago investors established the Treasure Mountain Mining & Milling Company and developed the Pacific on Treasure Mountain. New York capitalists organized the Great Animas Gold & Silver Mining Company with two purposes. One was to speculate with hardrock claims and the

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[129] Marshall and Zanoni, 1998: 142; Nossaman, 1998: 111-4, 203-4; *"San Juan Mining News" EMJ* (9/11/80): 170.
[130] *Colorado Mining Directory*, 1883: 672; Nossaman, 1993: 194; Nossaman, 1998: 98.
[131] *"Mining News" EMJ* (8/7/80): 93; *"Mining News" EMJ* (7/19/90): 81; Nossaman, 1993: 202; Nossaman, 1998: 106.
[132] Nossaman, 1993: 206; Nossaman, 1998: 124; *"San Juan Mining News, Colorado" EMJ* (10/2/80): 2.

other was to operate what may have been the first large-scale placer mine in the county. In particular, the company began processing the gold-bearing gravel of Picayune Gulch with hydraulic placer methods. Around one mile up the Animas River canyon from Eureka, the Silver Wing Company continued to drive a deep tunnel to undercut its claims at depth. Miners did so with rock drills, marking another early use of the machines in the San Juans.[133]

The Mineral Point district finally saw its first serious activity since the mid-1870s. Because the region was near Hinsdale County, the few productive mining outfits in the district did not wait for the railroad to arrive at Silverton and instead shipped to the Lee and Crooke smelters. The Polar Star on Engineer Mountain was the largest, and because the Crookes owned the mine, the ore naturally went to the Crooke Smelter. The Red Cloud was the other major operation at Mineral Point. In 1879, E.B. Greenleaf's Mineral Mountain Mining Company bought the Red Cloud and adjoining claims from Pratt, possibly when he needed capital to save the Mineral Point Tunnel from going bankrupt. The company then invested in a concerted development campaign. James Trezona, a Cornish miner with extensive experience in California, Nevada, and Michigan, hired thirty miners and sank several shafts on the Red Cloud Vein with steam equipment. The company was rewarded at the end of 1880 with a rich strike and sustained production.[134]

Most other operations in the Mineral Point district were little more than prospects. Chicago interests established the Palmyra Mining Company and installed one of the district's first steam hoists and sank a shaft. The Colorado Mining & Land Company, the Chicago & San Juan Mining Company, and other interests developed other prospects.[135] James K. Herring oversaw development of the Maid of the Mist on the divide between Mineral Point and Poughkeepsie Gulch. Herring earned minor fame in 1883 as groom in North America's highest-altitude wedding to Mary Beck at Mineral Point. Herring purchased a share in Sound Democrat Mine and served as superintendent at the Red Cloud under Trezona. In 1880, he was given charge of the Maid of the Mist.[136]

As can be expected, the town of Mineral Point enjoyed a growth due to activity in the district. The town center was a cluster of around forty cabins, a mercantile, butcher, saloon, and blacksmith. A boardinghouse provided accommodations for local miners, while visiting dignitaries chose between the Forest House and Mineral Point hotels. The population was around 200, but this included the workforce scattered amid surrounding mines.

The Poughkeepsie Mining District deviated from the sluggish trend in the rest of the county and saw major activity between 1879 and 1880. Firstly, in terms of location, Lake City and Ouray were almost as easy to reach as Silverton. Thus when the Greene Smelter closed, the

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[133] *Colorado Mining Directory*, 1883: 637, 678; Nossaman, 1993: 250.
[134] *Colorado Mining Directory*, 1883: 653; *"Mineral Point Mines, Colorado"* *EMJ* (9/4/80): 155; *"Mining News"* *EMJ* (8/28/80): 143; *"Mining News"* *EMJ* (11/27/80): 351; Nossaman, 1998: 117.
[135] *Colorado Mining Directory*, 1883: 624, 660, 663; *"Mineral Point Mines, Colorado"* *EMJ* (9/4/80): 155; "Mining News" *EMJ* (11/27/80): 351; Nossaman, 1998: 119.
[136] Henn, 1999: 47; *"Mineral Point Mines, Colorado"* *EMJ* (9/4/80): 155.

mining outfits found it economical to pack their ore, however small the production, to the Lee or Crooke smelters in Hinsdale County or to the Windham and Norfolk & Ouray smelters. Either trip remained protracted, however, and therefore costly.

Secondly, Horace Tabor's interest in the district stimulated confidence that, in actuality, may have been disproportionate with the prospects. In 1878, Alfred Hard, a principal with the Mastodon Company, purchased the Alaska Mine in Alaska Basin, which descended northeast into Poughkeepsie Gulch. He convinced Tabor to provide capital for development, and they organized the Alaska Consolidated Mining Company. Tabor was a national celebrity through his fortune made at Leadville and a romance with the diva Baby Doe. The Alaska proved rich, and Tabor announced that he would finance a concentration mill in Cement Creek. While the mill was never built, the success of the operation, its association with Tabor, and his personal examination of the mine made a news sensation.[137]

By 1880, the district featured nine mines in production. Of these, only the Alaska, Bonanza, Red Rogers, and Old Lout were well-developed, the rest shallow and small operations. Two prospectors staked the Bonanza in 1877, which the Kalamazoo Bonanza Mining Company bought in 1879, driving the Bonanza Tunnel, and sinking a shaft. The Old Lout yielded small amounts of ore from 1877 until 1879, when it saw substantial development.[138]

Business entrepreneurs arrived in the district on the heels of Tabor and the swarm of prospectors that followed. As early as 1877 or 1878, freight packers traveling between Silverton and Ouray maintained a camp on Lake Como, which became the seed for a small mining hamlet. William Boot took time from his Mineral Point mercantile to open the first store and saloon in 1879, and others established a restaurant. The Poughkeepsie post office established in 1880, when Lucius B. Kendall began printing the *Poughkeepsie Telegraph* newspaper.[139]

Kendall was overly optimistic about the future of Poughkeepsie, however, as the boom died within a year. In 1881, the Alaska went bust, Tabor lost interest, and most prospectors were unsuccessful. Nearly all the nascent mines were quickly exhausted. When the prospectors, business owners, and most of the mining outfits left for winter in 1881, they did not return. Poughkeepsie lost its post office, although the store may have opened seasonally for several years afterward. The Poughkeepsie district would not participate in the boom that swept the rest of San Juan County when the railroad arrived in 1882.[140]

The Early 1880s Boom, 1882 – 1885

In 1881, the Denver & Rio Grande Railroad prepared to lift the mining industry of San Juan County out of its slump. The railroad was not motivated by altruism, however, and stood to gain huge profits. The carrier organized the subsidiary Denver & Rio Grande Extension and

[137] *Colorado Mining Directory*, 1883: 611; Frank Fossett, *Colorado: Its Gold and Silver Mines, Farms and Stock Ranges, Health and Pleasure Resorts* (New York: C.G. Crawford, 1880): 528; Henn, 1999: 59; Nossaman, 1993: 173, 250.
[138] *"Mining News" EMJ* (8/7/80): 93; Nossaman, 1998: 118.
[139] Bauer, et al., 1990: 116; Nossaman, 1993: 226.
[140] Bauer, et al., 1990: 116; Henn, 1999: 59; Nossaman, 1998: 101.

began grading a narrow gauge line up the Animas River canyon from Durango to Silverton, despite the challenges construction presented.

In the summer of 1882, the first formal train arrived in Silverton bearing capitalists and dignitaries. It was greeted by jubilant spectators, as well as 1,200 tons of ore that had been stockpiled in anticipation of the railroad's completion. Finally, the county had an all-season link with the outside world and New York & San Juan Smelter, the largest ore treatment facility in southwestern Colorado. The railroad was revolutionary for day-to-day life, business, and mining. Commerce exploded because a wider array of goods became readily available at a much lower cost,. During the mid-1870s, residents paid as much as $400 per ton of freight from Denver, a cost which fell as low as $100 when the Denver & Rio Grande established its railhead at Durango. The Denver & Rio Grande Extension, also known as the Silverton-Durango railroad, reduced the cost to $16 per ton, which tumbled to $12 when regional business interests protested the rates. The railroad also opened the county to affluent capitalists who could travel more comfortably and stay in one of the hotels in Silverton.[141]

At the same time, John Porter and Thomas Bowman brought the New York & San Juan Smelter, popularly known as the Durango Smelter, into action. The smelter was large enough to process ore in economies of scale, which allowed the New York & San Juan company to undercut smaller facilities in the mountains. The combination of rail service and the discounts offered by the Durango Smelter dramatically reduced mining overhead. Whereas freighting outfits charged $35 to $40 to haul a ton of crude ore to the Front Range for treatment, a mere $12 would send the same material to Durango. Delighted, mining companies reassessed the worth of their properties because abundant medium-grade ores were now profitable to produce.[142]

While popular history claims that the discount service offered by New York & San Juan crushed the local smelting industry, this was not completely true. Smelters continued to operate in Lake City, Ouray, and Telluride because the cost of freighting the ore over to Silverton for shipment remained high, and in Silverton, the industry did not collapse; it merely adjusted. The complex ore and numerous small mines in the county guaranteed a market for a few custom independent smelters and samplers.

As early as 1881, Seth R. Beckwith forecasted the need for a local smelter in the vacuum left by the removal of the Greene facility. He, Edward C. Dean, Lemon G. Hine, and Almon M. and Henry H. Clapp organized the Martha Rose Smelting & Mining Company in hopes of filling what was a void, despite the presence of the Durango Smelter. Beckwith was an experienced metallurgist who had surveyed mining districts in Arizona, Nevada, and Colorado. With British capital, Beckwith and Arthur Macy, another metallurgist, began construction of the Martha Rose Smelter on the northwest edge of Silverton in 1882. They competed aggressively with the New York & San Juan for ore contracts and locked in the Potomac, Silver Lake, Gray Eagle, and a few nascent operations in the Ophir area.[143]

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[141] *"Mining News"* EMJ (12/30/82): 350.

[142] *Report of the Director of the Mint*, 1882: 545; Henderson, 1926: 11; *"Mining News"* EMJ (9/16/82): 151; Nossaman, 1998: 215; Smith, 1992: 27.

[143] *Report of the Director of the Mint*, 1882: 545; *Colorado Mining Directory*, 1883: 650; Nossaman, 1998: 204, 206; *Rocky Mountain News* (5/10/82): 2.

Beckwith started the smelter in September, confirming claims that the Animas River drainage's mining industry was prolific enough to support both a local facility and the Durango Smelter. After a successful trial run, Beckwith and Macy ordered their workers to dig into the 1,000 tons of stockpiled ore. Like most smelters, the Martha Rose furnaces had to be stopped periodically to remove slag and input more ore, but after the third or fourth day, no new charges were added. The operation stalled due to financial, legal, and management issues and the owners spent additional money suing each other over the problems. Even though the Martha Rose was an engineering success, it became a financial failure soon idle.[144]

Ore samplers, however, continued to serve the needs of the small mines that yielded complex payrock. Although the New York & San Juan certainly wanted the business, their small difficult batches of ore were ultimately not financially feasible due to the adjustments and interruptions required for custom treatment. As a result, Sweet's Sampler thrived. Sweet also wisely adapted to the railroad and Durango Smelter combination by expanding the sampler's niche, but within the terms of his arrangement with the New York & San Juan Company. In addition to providing custom treatment, Sweet bought ore, tested it to identify the best smelting methods, segregated the payrock, then brokered shipments to the Durango Smelter. This strategy was so effective that, in 1883, Germans Edward G. and Gustavus H. Stoiber came from Leadville to open their own sampler near the Martha Rose.[145]

The rise of concentration mills in the Animas River drainage was another response to the New York & San Juan. As aforementioned, concentration mills were not intended to produce matte or refined metals, but merely separated the metalliferous ore content from waste. By concentrating the ore, mining companies could avoid shipping waste-laden payrock to the Durango Smelter and the fees levied for full treatment. The concentrating process began when crushers pulverized crude ore into gravel, following which Cornish rolls, pan grinders, stamp mills, and ball mills gradually reduced the gravel further into particles ranging from sand to slurry. Screens segregated particles by size, followed by concentration in jigs, vanners, and other appliances using gravity and water currents. While the process seems simple, it was nothing of the sort. The character of the ore's host rock, the chemical compounds of the metals, and the different types of metals conspired to render concentration in the Animas River drainage a science fraught with difficulty and the potential for failure. Particle size, the behavior of crushed material and metals, and the specific gravity of the rock types required calculation, experience with machinery and metallurgy, experimentation, and outright cunning to win them from the host rock.

Few metallurgists and engineers in the Animas River drainage possessed all these abilities, but several persevered during 1882 and 1883 to make concentration a viable adaptation to the changed circumstances of the ore treatment industry. Although the Niegolds pioneered ore concentration at Niegoldstown, Theodore B. Comstock developed truly effective methods using his assay shop in Eureka as a front to understand the character of the county's ores. When the

[144] *Report of the Director of the Mint*, 1882: 545; *"Mining News"* *EMJ* (12/30/82): 351; Nossaman, 1998: 206; *Rocky Mountain News* (10/17/82): 6.
[145] Henderson, 1926: 49; Warren C. Prosser, *"Silver Lake Basin, Colorado"* *EMJ* (6/20/14): 1229; Sloan and Skowronski, 1975: 29.

railroad arrived in 1882, Comstock applied his knowledge and understanding of scientific processes to complete an efficient sampler in Silverton. What separated Comstock's facility from the Sweet and Stoiber samplers was that, in addition to small-batch sampling, the Comstock Sampling Works also included a complete concentration process that separated metalliferous material from waste without smelting. Comstock contracted with the North Star on Sultan Mountain and other mines for ore, enjoyed early success, and shipped the products to smelters in Denver, Omaha, and St. Louis for final refining. He carefully avoided doing business with Sweet and New York & San Juan because they were now staunch competitors.[146]

Comstock's precedent of concentration began to take hold in the region, and the county saw construction of three mills in 1882 and five more facilities the following year. Late in 1882, George Ingersoll erected a small mill at Green Mountain Mine in Cunningham Gulch. The Green Mountain Mill proved a success probably because the Green Mountain ore was fairly straightforward. The other two mills treated custom ores solicited from mines in the Las Animas and Eureka districts. The Solomon Silver Mining Company built one of the two custom mills in the western portion of Howardsville. J. Woodbury Jones built the Middleton Mill at a new settlement between Eureka and Howardsville. Jones and New York investors organized the Uncompahgre Mining & Smelting Company and built the mill to process ore from both their Uncompahgre Chief Mine and other contributors. The Solomon Mill was an outright failure even though it featured adequate equipment. The mill's simplicity, juxtaposed with complex ore and improper adjustments were to blame. The Middleton Mill proved only partially successful because it was tailored for ore in the district's northern reaches, which differed greatly from material produced elsewhere. Thus the mill treated payrock produced from a relatively narrow geographic area.[147]

Of the five mills erected in 1883, three were for in-house use while the other two accepted custom ore. Milton Engleman financed one of the in-house mills at the Sunnyside Mine, despite a conflict with his extended family. Engleman hired John H. Terry to build the facility at Eureka in 1883, with Terry fresh from milling the complex gold ores of Gilpin County. Terry was Comstock's equal in designing an effective process, in part because the Sunnyside ore was similarly complex gold compound that resisted traditional methods. Terry built a ten-stamp mill at Lake Emma which used mercury to amalgamate with free-gold and concentration machinery to recover the material that would not amalgamate. The mill produced concentrates and some gold bullion, which the Englemans in turn used to fund their legal squabbles.[148]

Comstock built the other successful in-house concentration mill at the North Star Mine on Sultan Mountain. When planning his sampler, Comstock forecast that the North Star Mine would become one of his largest clients due to proximity and the affinity of his process to North Star ore. Further, the mine was on the brink of becoming a major producer. In 1881, eastern investors organized the Sultan Mountain Mining Company, purchased the North Star, and hired Oliver Posey as manager. Posey drew John Williams and the Sultan Tunnel into the company

[146] *"Mining News"* EMJ (8/26/82): 112; Nossaman, 1998: 210-3.
[147] *Colorado Mining Directory*, 1883: 679; *"Mining News"* EMJ (12/30/82): 350, *"Mining News"* EMJ (12/29/83): 401; Nossaman, 1998: 262.
[148] Marshall and Zanoni, 1998: 119; Ransome, 1901: 176.

and began production. In 1882, Comstock offered to build a concentration mill adjoining his sampler and lease the facility to the North Star. Posey agreed, and Comstock's mill began in earnest in 1883.[149]

Gladstone, largely idle since the lixiviation mill failure of 1879, hosted the county's third in-house concentration plant. Theodore Stahl operated an assay shop in Howardsville during the late 1870s and became involved with the Gladstone Mining & Reduction Company, which attempted to restart the lixiviation mill in 1881. Although the operation was a failure, Stahl became aware that prospectors had found an unusual vein on Bonita Mountain that featured a combination of silver and bismuth. They claimed it as the Sampson, which Stahl purchased in 1882 to recover the metals, especially the bismuth. Satisfied by his assay experiments, in 1883 Stahl organized the Southern Colorado Bismuth & Silver Mining Company, allocated investors, and began development of the Sampson. He built a surface plant at the mine, a concentration mill near Gladstone, and the second tramway in the San Juans linking the two. During 1883, Stahl's miners made a rich strike that ordinarily would have elated owners, but in fact confounded the operation. In particular, they encountered gold, and exploration revealed that with depth, the gold content increased while the silver and bismuth decreased. Whereas Stahl thought he had a silver and bismuth mine, the Sampson turned out to be a gold mine. He produced some ore and shipped it to distant smelters in hopes of enough income to refit the mill. Regardless, the Sampson Mill drew the first substantial population to Gladstone in years, and the workers filled the available housing.[150]

Like the in-house mills, the custom concentration plants built in the county in 1883 met with mixed success. Cherry's idle Eclipse Smelter below Animas Forks was one custom facility converted from a failed smelter with limited success. As with the Middleton Mill, the metallurgist found the ore differed in character depending on the source, and batches from different portions of the Eureka district must be treated variably. After three years of experimentation, intermittent operations, and constant adjustments the Eclipse investors withdrew.

The other custom plant was the product of an entirely new center of activity in the county's northwestern portion. As early as 1874, prospectors found mineralized veins along both sides of the main and middle forks of Mineral Creek, but because the formations were scattered and offered largely low-grade ore, the drainage attracted only minor attention. The Silver Crown on Mill Creek, western tributary to Mineral Creek, was the most promising mine during the late 1870s and saw some development. At the same time, prospectors examining Red Mountain Creek on the north side of Red Mountain Pass found deposits of silver ore. In 1881, John Robinson prospected the east side of Red Mountain Creek and staked the Guston, and John H. Haynes located the Congress. These were promising discoveries, and yet, from outward appearances, were too low in grade to generate serious interest. However, these initial assessments proved deceiving. Convinced that it was only a matter of time before they found a significant vein, Robinson returned in 1882. Near camp, they discovered rich samples of float,

[149] *Colorado Mining Directory*, 1883: 658; *"Mining News" EMJ* (10/21/82): 217; Nossaman, 1998: 202, 213.
[150] Bauer, et al., 1990: 62; *"Mining News" EMJ* (9/22/83): 187; *"Mining News" EMJ* (10/13/83): 235; Nossaman, 1998: 310.

chunks of ore broken off a parent vein and scattered on the ground by erosion. The party traced the float to its source and unearthed a vertical stock of ore they named the Yankee Girl. The find was so large and pure that it incited a true rush to Red Mountain valley. The event was at first a local, and quickly a statewide phenomenon. When Robinson and Haynes turned their attention back to the Guston and Congress, they found that at depth, these ore bodies were as significant as the Yankee Girl, which further fueled the rush.

By 1883, prospectors organized the Red Mountain Mining District, established several camps, and staked hundreds of claims. The district extended north from Red Mountain Pass and encompassed the valley on the west side of the Red Mountains, which lay mostly in Ouray County. The Mineral Creek district was to the south and the Poughkeepsie district to the east, both in San Juan County. The Red Mountain district developed quickly due to the proximity over Red Mountain Pass of commercial centers, communication systems, and transportation routes.

Just as San Juan County residents laid the foundation for the Red Mountain rush, they were also poised to profit from the event. The county was the main port of entry into the Red Mountain district, and Silverton the starting point for two routes. One logically followed the main fork of Mineral Creek to the base of Red Mountain Pass, where a settlement known as Sweetville began to grow in 1882. E.T. Sweet's saloon was the first business and became a seed for the camp. C.P. Mallett opened a restaurant, followed by William Emerson's butcher shop and Frank W. Barnes' lumberyard. The rival camp of Chattanooga materialized adjacent. In 1883, the two camps merged under the name of Chattanooga and one secured a post office. Afterward, T.E. Guerin started the Enterprise Restaurant, prospector Charles Robinson and Benjamin Brown opened mercantiles, and J.W. Shields erected a hardware store. Chattanooga was ready to serve the basic needs of prospectors and investors in the Red Mountain district.[151]

Other entrepreneurs completed key infrastructure that deepened the relationship between the Red Mountain district and Chattanooga. In 1883, the San Juan County commission awarded George W. Seaman a contract to grade a wagon road from Chattanooga. At the same time, Silverton pioneer Henry Adsit, George H. Brown, and James Downey organized the Red Mountain Sampling & Concentrating Company and built a custom mill at Chattanooga. This was San Juan County's second concentration facility built in 1883 and apparently modeled after Comstock's dual flow path. The intent was to provide processing for the Red Mountain district's low-grade material. The same year, the Mineral Creek Concentrating Company prepared to build a mill at Chattanooga, although it may have been the same facility.[152]

The other route from Silverton into the Red Mountain district ascended Cement Creek, from which prospectors crossed west over several passes between the Red Mountain peaks. The traffic increased business in the Gladstone mercantile, which already did a sound trade with the Sampson miners. But Gladstone failed to grow, and entrepreneurs established two nearby and competing settlements in 1883. The most promising was Del Mino, which George W. Bachman and William Bowman started at the mouth of Prospect Gulch. Other businessmen founded Vernon at the mouth of Georgia Gulch a short distance south of Del Mino. During 1884, Mineral

[151] Bauer, et al., 1990: 32; Nossaman, 1998 :278-9.
[152] *"Mining News" EMJ* (8/25/83): 119; Nossaman, 1998: 289, 291.

Creek became the most popular route, and traffic in Cement Creek declined and neither hamlet survived. Del Mino's buildings were moved to Gladstone.[153]

In stark contrast, Silverton literally boomed due to the railroad, its role as Red Mountain gateway, and as the center of the county's growing mining industry. Thomas Blair and Dempsey Reese saw their quiet hamlet evolve into a noisy hub of industry, freight, commerce, finance, and communication. By end of 1882, Silverton had eleven telephone subscribers. In 1883, the San Juan County Bank was formally chartered as the First National Bank of Silverton. Green Street became the commercial district and its side streets offered diverse businesses and services. Silverton hosted the first mining business exchange in the San Juans. Cushing M. Bryant, a successful metallurgist from Boston, opened Bryant's Mining Exchange in 1882, as a clearinghouse stocked with reference books and periodicals as well as access to investments. In 1883, Henry Adsit, Edmund Sweet, W.G. Melville, and other investors organized the Silverton Electric & Gas Light Company, although they did not immediately act.[154]

As the county's main point of contact with the outside world, Silverton was the principal cultural center. John and Amanda Cotton ran Cotton House, a community performance and celebration hall of sorts. The saloon was one of the most important social institutions in any mining camp, and Silverton featured around thirty, as well as two dance halls, mostly on Blair Street. The saloons in Silverton served as communication centers, public meeting halls, and entertainment centers. Silverton's residents even finally found time for God during the early 1880s. The Congregational Church Society built the first church in 1881, and the Catholics built their church in 1883. Many of Silverton's residents brought the tradition of fraternal orders with them, which was another important institution on the mining frontier. Fraternal orders provided social contact, assistance, guidance, death benefits, and even a primitive form of unemployment support. Men joined the Masons, the Odd Fellows, the Order of Eastern Star, and the Woodmen of World, while some women belonged to the Women of Woodcraft and the Rathbone Sisters.[155]

These and other organizations served as surrogate families for the few residents bold enough to winter in the county, and the organizations hosted holiday celebrations. Silvertonians and regional residents made sure that they enjoyed every holiday to the fullest and orchestrated social events on the slightest pretense. In 1876, young men established a baseball league and the older residents organized dances that drew men from miles away. Summer was a time for the Animas River drainage residents to celebrate their mining culture and, starting in 1882, miners' contests became a part of every July Fourth event.

A few visionary residents, mostly from Silverton, continued Dempsey Reese's low-level promotional campaign during the early 1880s, although by now, Silverton earned a name in the greater mining industry. As a showing of local pride, some of the mine owners in the Las Animas district contributed show-quality ore specimens for presentation and a contest at the

[153] Bauer, et al., 1996: 43; Nossaman, 1998: 289.
[154] Nossaman, 1998: 38, 68, 302, 236, 304, 306.
[155] Ronald Brown, *Hard Rock Miners: The Intermountain West, 1860-1920* (Texas A&M Press, 1979) 45; Henn, 1999: 151; Nossaman, 1998: 317, 323; Wolle, 1995: 422-4.

National Exhibition in Denver in 1882. Several local voices and experts maintained contact with reporters for the *Rocky Mountain News*, various mining industry journals, and the United States Mint. The most reputable individuals such as Theodore Comstock even produced their own articles on the region for publication.[156]

Paralleling the rise of positive attributes, crime and vice increased in the Animas River drainage, although it never approached the levels misrepresented by popular history. Through 1878, Howardsville, Silverton, and greater San Juan County were able to claim only one shooting each. By 1881, there was certainly more violent crime such as shootings, but it was proportional to the overall increase in population and occurred mostly among the rough element in Silverton. Robbery and theft, reliant on the anonymity of a large population, also increased. To prevent crime from reaching the epidemic proportions experienced in other boom towns, Silverton fathers hired legendary Bat Masterson to keep order while other concerned citizens formed midnight vigilance committees, which made use of the noose on more than one occasion. In contrast to another myth of the mining frontier, the Animas River drainage was nearly bereft of prostitutes. "Aunt Jane" Bowen brought the first of these service workers to Silverton around 1878 as the town grew and found the market quite limited. The entire Animas River drainage was unable to support more than around twelve prostitutes into the early 1880s. To be near the potential customers, the prostitutes set up shop on Blair Street, which was the region's only red light district. Amusingly, to distinguish themselves apart from the strip of sin, those respectable citizens who already lived on Blair Street renamed the ends of the avenue Empire Street.[157]

While the Red Mountain rush was certainly an important local event, the county's established mining industry was even more significant. The three public samplers, the Martha Rose Smelter's brief life, and four successful concentration mills directly reflected a highly productive and growing industry. The number of mines either in development or production between 1882 and 1886 doubled. In particular, the county hosted around ninety-one small mines, eight medium-sized operations, two large producers, and two placers. A small mine is defined as a shallow operation with basic surface facilities, a handful of miners, and limited output. A medium-sized mine had between five and thirty workers, fairly extensive workings, and a surface plant with at least several buildings. A large mine had extensive workings, a surface plant with substantial buildings and some machinery, a workforce greater than fifty, and a significant output. While the number of operations doubled, their tonnages of ore mushroomed by a factor of ten. The ore value soared from $53,000 in silver, $10,000 worth of gold, and $16,000 for lead in 1882, when the railroad arrived, to $749,000 in silver, $40,000 worth of gold, and $207,000 in lead by 1885. Mineral exploration continued largely as before, and prospectors developed around 375 claims, only a slight increase from the late 1870s.[158]

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[156] *Rocky Mountain News* (6/20/82): 2; *Rocky Mountain News* (7/18/82): 8; *Rocky Mountain News* (7/22/82): 2; *Rocky Mountain News* (9/15/82): 2.

[157] Robert L. Brown, *An Empire of Silver* (Denver: Sundance Publications, 1984) 53; Nossaman, 1993: 166; Smith, 2002: 80; Wolle, 1995: 422.

[158] Henderson, 1926: 216 for production figures. The number of mines derives from a survey of 1879 and 1883 *Colorado Mining Directories* and weekly county summaries in *EMJ*.

Las Animas Mining District

In contrast to the rest of the county, the roster of active mines in the Las Animas district barely increased after 1882, although almost every significant operation began sending ore down to Silverton. At the Aspen, the New York & San Juan company appointed Thomas Hackett as foreman because of his experience driving the Ingersoll Tunnel. Under Hackett, a large crew of miners drilled and blasted six to seven tons of ore per day, which Sweet's Sampling Works prepared for shipment to the Durango Smelter. By 1883, the Aspen featured at least 7,000 feet of underground workings.[159]

To the southwest, new properties high on the flank of Kendall Mountain began to make good on their promise of ore. In 1882, the Lackawanna Tunnel & Mining Company drove two tunnels to undercut the J.B. Smith and A.J. Craine veins. A short distance up Swansea Gulch, miners pushed Thomas Higgins' Scranton City Tunnel toward another vein. Almost one mile to the west, above Silverton, prospectors discovered a vein with potential in Idaho Gulch and staked the Idaho Group of claims. During 1883, a small party of miners leased the property and shipped ore to a Denver smelter for testing and treatment. The ore was visually impressive but difficult to treat and therefore less profitable than the lessees hoped for.[160]

In Little Giant Basin, the operators of the Big Giant Mine encountered similar problems when their tunnel reached the target vein. The ore assayed well but was too complex to treat at a profit, and the operation stalled. The nearby Solomon and Potomac mines more than made up for the Big Giant's lack of production. At the Potomac, miners enjoyed the relatively easy work of drilling and blasting ore from the vein's surface and shipped the particularly rich payrock to Durango.[161]

Still aspiring to become a mining engineer and operator, Victor Vincent deepened his involvement with the Solomon Mine, which proved his undoing. In 1882, Vincent interested fellow Frenchmen Jules Rifflard and Richard Salembier in the Solomon and discussed leasing the property from the Solomon Silver Mining Company. The trio agreed, Vincent appealed to the wealthy Arthur C. King in New York City for capital, and they organized the French Silver Mining Company. The outfit retained the Solomon company's crew of twenty miners and kept them busy all winter producing ore. After encountering a 10"-wide vein of solid copper and galena ore, the French petitioned the Ressouches brothers and Solomon Silver Mining Company to sell the claims. The owners agreed, but only on condition of regular payments and specified underground development should the French default and abandon operations.[162]

After signing the sale contract, Vincent was suddenly caught in a difficult position. In an unrealistically short time, King began demanding returns on his investment while the Ressouches reminded Vincent about their payment schedule. To appease King, Vincent procrastinated on the required development and directed the miners to extract ore as fast as they could. After several

[159] Nossaman, 1998: 100, 203, 307; Ransome, 1901: 162.

[160] *Report of the Director of the Mint*, 1882: 547; *Report of the Director of the Mint*, 1883: 409; *Rocky Mountain News* 10/17/82): 6; *Rocky Mountain News* (7/21/82): 2; *Rocky Mountain News* (8/30/83): 2.

[161] *Report of the Director of the Mint*, 1882: 547; Nossaman, 1998: 206; *Rocky Mountain News* (6/24/82): 3; *Rocky Mountain News* (8/18/82): 2.

[162] *"Mining News" EMJ* (11/11/82): 259; Nossaman, 1998: 308.

months, the Ressouches found out about the neglected development and immediately ordered a stop to ore production, which left Vincent in an impossible situation. He was not allowed to produce ore until he paid the Ressouches, and he could not pay the Ressouches without mining ore. The French defaulted on the contract and the Ressouches attempted to reclaim the Solomon Mine, but the French resisted. At a deadlock, both parties filed suit at the end of 1883 and shut down the operation. Deflated, Vincent quit the French and returned to France.[163]

To the southwest Silver Lake Basin began to resound with activity. In 1881, several prospectors imitated John Reed and made the dangerous ascent into the basin, where they examined the west wall a short distance south of Reed's claim. After climbing rock cornices, they found a rich vein, staked it with the Iowa and Stag claims, and began development of a tunnel and shaft. At the end of the season, the party had ore samples assayed in Silverton. The report surprisingly found that the ore was not only rich with silver and industrial metals, but also gold. In 1882, the party returned and began production. The members enticed a crew of miners to make the sheer cliff at the Iowa their home for the working season with all the supplies and lumber necessary to build a basic surface plant.[164]

While the Iowa miners acclimated, John Reed labored on Silver Lake a short distance to the north. During 1880 and 1881, he traced the Silver Lake vein for a considerable distance with shallow excavations hewed into solid bedrock. In 1882, he produced several tons of ore from a tunnel he drove while lamenting the slothful progress due to the short working seasons. To be caught by a heavy snow in the basin would be a life-threatening event, which forced him down relatively early each year.

During a stay in Silverton in 1883, Reed convinced John W. Collins that the Silver Lake and Round Mountain claims would pay well if worked, but required an initial investment. For a share of the Silver Lake, Collins and Reed formed a partnership, ascended into the basin, and began production. Reed and Collins also packed in enough lumber and equipment to build a small blacksmith shop and cabin. They hired a small crew of miners to begin a second tunnel. Once the miners reached the vein, the party produced around five tons per day and packed it down to Sweet's Sampler.[165]

On the east side of Silver Lake Basin, Julius Johnson drove a tunnel underneath the Royal Tiger claim. An old-time prospector, he leased the property from McPherson Lemoyne. The lease ended around 1883 when Lemoyne sold the Royal Tiger to Innis, who hoped to approach his fabled lake of gold from the opposite side of the mountain should the Highland Mary fail, which it was.[166]

After ten years of confusing instructions, conflicting orders, and decisions that railed against common sense, Edward Innis finally ran out of money. In 1885, he closed the Highland Mary. Innis' reliance on a psychic confirmed the suspicions of workers and caused a minor sensation in the Colorado press. *Rocky Mountain News* announced: "The Silverton *Miner*

[163] *Report of the Director of the Mint*, 1882: 548; Nossaman, 1998: 308.

[164] Ransome, 1901: 157; *Rocky Mountain News* (8/1/82): 3; *Rocky Mountain News* (9/19/82): 3.

[165] *Report of the Director of the Mint*, 1883: 409; Henderson, 1926: 49; Nossaman, 1998: 307; Ransome, 1901: 149; *Rocky Mountain News* (8/30/83): 2.

[166] Nossaman, 1998: 325; Prosser, 1914.

pronounces the Highland Mary Mine a howling failure. This mine has been worked, says the *Miner*, under the direction of spirits."[167] Innis left the county broke and embarrassed, with little recognition that, despite the complete lack of ore production, he had made the Highland Mary one of the most advanced operations in the San Juans to date. In the process, he squandered around $1 million (or $19,000,000 today) and paid his seeress $50,000.[168]

Eureka Mining District

Unlike the Las Animas district, Eureka enjoyed a major boom between 1882 and 1885. Capital flowed, the number of substantial operations increased, and ore production rose as a result. California and Placer gulches, in the district's northern portion, saw the most activity. After limited success with the Alaska Mine, Alfred Hard settled in Animas Forks or Eureka. Hard served as manager of the Mastodon Mining & Reduction Company in Placer Gulch, which was so productive that he planned for a mill. When not at the Mastodon, Hard worked as a superintendent at several other mines and participated in new ventures. In particular, Hard and his Cleveland friends organized the Silver Lead Mining Company in 1882 and speculated on claims near Eureka.[169]

Rasmus Hanson was easily as busy as Hard, if not as successful. Born in Denmark in 1847, Hanson immigrated to Quebec at age twenty-one, and moved on to Chicago. The opportunity for adventure drew Hanson west, as far as Cheyenne where financial circumstances forced him to work for the Union Pacific Railroad. He became interested in mining, saved pay, and tried his luck prospecting in Nevada. Unsuccessful, Hanson migrated to Central City in 1870, Clear Creek County, and ultimately Park County, where he prospected and worked as a miner. In 1873 or 1874, Hanson realized that the San Juans presented possibilities, being recently opened.

He built a cabin and realized his dream in 1880 by discovering the Sunnyside Extension at the head of Placer Gulch. As noted above, he worked the claim with L.C. Osborne, but Osborne apparently tired of the labor and leased the property to Hanson in 1882. Hanson struck rich ore during the year and realized enough income to buy the property in 1883. From that point, Hanson engaged in a cautious development strategy anathema to most profit-hungry mine owners. Specifically, he did not overcapitalize the operation and instead reinvested his profits in development and improvements. Progress was slow, but steady, and once the mine was ready for major production, Hanson stood to profit significantly. This pattern characterized the first years of the Sunnyside Extension, and in 1885, Hanson was ready to treat ore in his own mill and save the fees levied by custom plants. He leased the Greenleaf Mill at Animas Forks. The Greenleaf, however, performed no better on Hanson's ore than on material from the rest of the Eureka district, so he relinquished the lease, planned his own mill, and patiently saved his money. Hanson attempted to increase his income by working the Atlantic for the Red Gulch Mining &

[167] *Rocky Mountain News* (8/10/85): 6.
[168] *Denver Times* (7/10/01): 5; Eberhart, 1987: 345; *Rocky Mountain News* (9/14/58): 65.
[169] *Colorado Mining Directory*, 1883: 650, 672.

Milling Company at the same time as the Sunnyside Extension. A fire in the Atlantic tunnel house, however, destroyed his equipment.[170]

To the west in California Gulch, new owners of the Mountain Queen prepared to bring the mine into production. When James Cherry left the county following the Eclipse failure, investors sold company assets to two camps. One bought the smelter and refitted it as a concentration facility. The other group purchased the Mountain Queen, originally supposed to provide the smelter with excellent silver ore. While sources conflict regarding the exact date, S.W. Thorne likely bought the mine in 1882 for the high price of $125,000, which inspired confidence among other investors. Thorne pursued a development campaign and brought the mine into meaningful production. Shortly afterward, Thorne formalized the operation as the Mountain Queen Mining Company.[171]

Despite the positive economic climate of the early 1880s boom, some of the established operations ran into considerable difficulty. After significant investment in advanced equipment, Matt France drove the lower tunnel on the Silver Wing and finally reached the target vein. Unfortunately, the vein did not feature ore in the same amount or character as it did near the surface, and instead offered complex, low-grade material that was difficult to treat. Although France may have been confident that he could find profitable ore, investors were unwilling to risk more money and suspended work. France probably produced small amounts of ore from the upper workings in an attempt to pay the costs of further exploration. Conversely, mining engineer J.F. Taylor at Mineral Point Tunnel in California Gulch, previously the Silver Peak Mining Company, grossly underestimated the cost of driving the mile-long tunnel. By 1884, the tunnel was still far from its destination and had not encountered any of the hidden veins that were expected. Taylor had little to show, his British investors granted no more capital, and the operation went bankrupt due to unpaid debts. The town of Animas Forks lost a major employer, and the tunnel remained closed for decades.[172]

Numerous other operations and a large population at Animas Forks mitigated the loss. During the early 1880s, Animas Forks had a distinct business district, numerous cabins, a population of at least 160 residents with an additional 300 scattered amid the surrounding mines. The business district catered to the needs of workers primarily and visiting company officials secondarily. This can be expected because of the town's role as the Eureka district's northern commercial hub and the eastern gateway into the county. Eureka was the second most important town in the mining district and the commercial hub for its central portion. The population was similar to that of Animas Forks, but the surrounding mountains featured fewer mines and the area population was therefore less. Thus, Eureka did not grow as quickly as Animas Forks and had a smaller business district.[173]

The southern portion of the Eureka district finally saw activity during the early 1880s as prospectors began to develop claims in Minnie and Maggie gulches. Oliver and Frank Gorsage

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[170] Brown, 1984: 92; *"Mining News"* *EMJ* (7/19/90): 81; Nossaman, 1989: 178; Nossaman, 1993: 193, 202; Nossaman, 1998: 261.

[171] Marshall and Zanoni, 1998: 143; Nossaman, 1998: 265.

[172] Nossaman, 1993: 121.

[173] *Colorado Business Directory*, 1884: 200; *Colorado Business Directory*, 1885: 228; George A. Crofutt, *Crofutt's Grip-Sack Guide to Colorado: A Complete Encyclopedia of the State* (Omaha: Overland Publishing Company, 1885) 90.

built cabins at the mouth of Maggie Gulch and worked the Auburn, Charity Ann, Minnie, Silver Lead, and other nascent mines. Their camp evolved into the settlement of Middleton, which attracted a mercantile and the Middleton Smelter. The Hover Brothers found the pasture offered by the wide Animas River valley was excellent for cattle and established a dairy. Middleton was never formally platted as a town, but it remained an important local settlement for decades.[174]

The mines on the east side of Cunningham Gulch were among the county's earliest producers and enjoyed additional improvements during the early 1880s boom. It remains debatable whether the east side was in the Eureka district's far southern extent or the east edge of the Las Animas district. In either case, Reese, Mulholland, Blair, and Mickey Breen sold the Green Mountain Mine to British interests in 1881, who in turn leased it to George Ingersoll and partner. The concentration mill that Ingersoll built in 1882 functioned correctly, unlike most, and provided Ingersoll sound returns for several years. Nearby, Christian Schoellkopf kept twenty miners busy extracting a substantial tonnage of ore from the Pride of the West. Around 1880, he developed the vein through three tunnels, and each had its own tunnel house and ore bin. To the north, another party began preparing the Old Hundred for production.[175]

Mineral Point Mining District

The Mineral Point district enjoyed a small wave of interest during the early 1880s. Even though the district was far from Silverton, the samplers there provided mining companies with an alternative to the smelters in Hinsdale County, and the cost of goods and materials was less due to the railroad. The Polar Star and Red Cloud continued to be the principal operations. By 1882, the Crookes developed the Polar Star to the point where the underground workings were accessed through tunnels on both the San Juan and Hinsdale county sides of Engineer Mountain. The mine was more important to the Crookes than ever because their smelter was in financial difficulty and they needed the high-grade ore. Greenleaf and his Mineral Mountain Mining Company maintained production at the Red Cloud through two shafts and expanded work to the nearby Burrows No.2. In addition to these principal producers, a few partnerships began shipping high-grade ore from shallow mines such as the Big Giant, Bill Young, San Juan Chief, and Palmyra.[176] The remote town of Mineral Point changed little during the early 1880s. The population increased slightly to 200, which supported two mercantiles. The town featured the Forest House and Mineral Point Hotel.[177]

Mineral Creek Mining District

While Silverton was popularly known as a mining town, the definition came mostly from a role as the milling, ore shipment, and business center of San Juan County. In actuality, few

[174] Nossaman, 1998: 262.
[175] Nossaman, 1998: 101
[176] Nossaman, 1998: 123.
[177] *Colorado Business Directory*, 1884: 276; *State Business Directory*, 1885: 326; Crofutt, 1885: 120.

mines of significance lay within a reasonable distance by foot, at least until 1882. At that time, the development of some of the county's largest and most important operations granted Silverton a direct association with ore production. The mines were centered on the Hercules and North Star vein system at the base of Sultan Mountain, an easy walk from town.

As noted above, the Sultan Mountain Mining Company purchased the North Star in 1881, hired Oliver Posey as manager, and began heavy production. The company gladly leased the concentration mill that Theodore Comstock built at the mine and enjoyed substantial profits. The mill generated so much concentrate that the Denver & Rio Grande graded a siding just for the mine. However, the available ore underground began to dwindle and the company responded by selling the entire operation to Lucius B. Kendall for $75,000 in 1884. Kendall obtained the money from investors and profits earned from the Bonanza Mine in the Poughkeepsie district. He astutely observed that the Sultan Mountain company merely extracted the shallow ore and failed to fully develop the vein at depth, leaving vast ore reserves. Kendall sold a one-third interest to W.M. McKelvey for $72,500, and they organized the Silverton Mining Company. Through the sale, Kendall recovered his own costs and had plenty of capital for formal development. Posey was out of a job, although the Congress and Yankee Girl mines, two of the best in the Red Mountain district, now consumed his attention. He purchased them in 1882 with George Crawford of Pittsburgh, in addition to the National Belle in 1884, and soon realized a fortune. Kendall and McKelvey did well also, because the North Star became one of the county's longest-lived producers.[178]

A short distance to the south, several other companies were at work on the Hercules and Little Dora veins. One outfit had been driving the Empire Tunnel toward the Little Dora in 1881 in anticipation of the railroad and struck the formation. When trains began service, the company sent its ore to the Durango Smelter. After John Williams sold his interest in the Sultan Tunnel, he turned his attention to the Victoria section of the vein system. Knight, Slocum & Company did a little work on the system and likely started the Montezuma Tunnel. In 1881 or 1882, Williams became involved with the Victoria Consolidated Mines Company, which purchased the incomplete Montezuma and Ajax tunnels and began pushing them toward the Victoria and Hercules veins. By 1884, Williams had both tunnels in production.[179]

During the mid-1880s, subtle change began to creep through the county. The first sign was that many small pocket mines and shallow operations either curtailed or suspended production altogether. Another indicator was that investors grew tight with the capital necessary to develop small mines into sound producers. In 1886, a combination of internal and external problems brought to an end the boom stimulated by the railroad and Porter's smelter. Miners exhausted the shallow veins, overestimated their ore reserves, and found that the substantial veins decreased in value and increased in complexity with depth. In short, miners had finished off the easily treated, shallow ore and were left with deeper unprofitable material. Outside the

[178] *"Mining News"* EMJ (8/4/83): 71; *"Mining News"* EMJ (6/14/84): 448; Nossaman, 1998:265; Smith, 1994: 37.

[179] *Colorado Mining Directory*, 1883: 680; *"Mining News"* EMJ (12/22/83): 387; *"Mining News"* EMJ (11/8/84): 320; *Silverton Standard* (3/12/10): 1.

district, a synergy of forces eroded confidence in the silver market and not only caused the value of the white metal to slip, but also made investors wary. In particular, opponents of the silver standard shifted Treasury policy in favor of paper currency and opposed the free coinage of silver. In 1885, the value of silver decreased from $1.12 per ounce to $1.06 and continued a downward trend until it bottomed out at $.94 in 1888. The watershed year, however, was 1886, when silver reached $1.00 per ounce, which seemed to be the threshold for mining investors. The prices for industrial metals fell in parallel, and they constituted a significant portion of the county's ore. Copper dropped from $.21 to $.16 per pound, and lead decreased by a penny to $.04 per pound.[180]

The net result was that the mine owners and operators in San Juan County saw their profits evaporate and closed many of the remaining operations. In the Las Animas district, almost all the mines went idle except for the Aspen, North Star, and Titusville (recently developed on Kendall Peak). In the Eureka district, the roster of productive mines fell until the Sunnyside, Hanson's Sunnyside Extension, and the Mountain Queen remained the only reliable principals. Mineral Point's miners exhausted the shallow ore, and investors were unwilling to risk more capital on deeper work. Cement Creek was quiet and grew even more so when the Sampson Mine, the most promising operation, went bankrupt in 1885. To the west, activity in the Mineral Creek district contracted around Sultan Mountain and Chattanooga, which shrank in size and depended on Red Mountain district traffic more than ever.

A third symptom of the countywide problems was that well-funded companies scaled back their operations and tried cutting costs, much of which was labor. In 1885, S.W. Thorne reduced the wages of his miners at the Mountain Queen from the already low rate of $3.00 per shift to $2.50 without reducing the price of room and board in tandem. Miners protested and threatened to strike. At the Aspen Mine, John Porter decreased wages from $3.50 to $3.25. For additional savings, however, he stopped providing miners with the luxury foods they had grown accustomed to. Pay and food being sacred to miners, they still threatened to strike and Porter, unwilling to negotiate, tested the miners' will.[181]

Unfortunately for Thorne and Porter, they underestimated the miners' resolve and set in motion the county's first serious labor dispute. The miners walked away from both operations, and the Aspen crew appealed to the Silverton chapter of the Knights of Labor, the most powerful miners' union in Colorado during the 1880s. The union met with Porter, who proved intractable, and word quickly spread and other groups of miners threatened to strike in sympathy. Porter and Thorne's actions appeared to initiate a wage-cut trend that other mine owners throughout the county would imitate. To nip this in the bud, miners in support of their Aspen and Mountain Queen brethren gathered in huge numbers in Silverton and pressured Porter to accede. Tensions ran high and the fate of the region's entire mining industry teetered on Porter's decision.[182] Backing up their threat in writing, a reporter for the *Engineering & Mining Journal* noted: "At a

[180] Brown, 1984: 191; *"Mining News"* *EMJ* (8/14/86): 119; *Report of the Director of the Mint*, 1894: 20; Saxon, 1959: 7-9, 14-7; Smith, 1994: 184.
[181] *Rocky Mountain News* (1/31/85): 1.
[182] *Rocky Mountain News* (1/31/85): 1.

meeting of miners held at Silverton, a resolution was passed and signed by all who were present, pledging themselves not to work for less than $3.50 a day."[183] Unwilling to precipitate a catastrophe, Porter conceded and his miners went back to work. Thorne instead closed the Mountain Queen. When the investors found out about this and Thorne's other mismanagements, they ousted him. The Aspen Mine, a bellwether of the Las Animas district, went silent for the first time in over ten years. It was now obvious that a depression was at hand.

The Late 1880s Slump, 1886 - 1889

San Juan County entered a dark period in 1886, and the principal mining interests of the county had reason to believe that silver's value would continue to slide. And yet, they instituted a handful of significant projects using mostly their own capital. The projects did not involve fabulous discoveries, new veins, or rich ore. Instead, they were an attempt to improve efficiency through mechanization and other infrastructure improvements, increase production, and reduce the extraction cost per ton of ore mined. Some of the projects were costly, and they collectively maintained some momentum to mining industry in the county.

The Las Animas district hosted a significant share of the activity. Howardsville assayer Thomas Trippe spearheaded one of the county's most important projects in 1888 when he convinced investors to build a $50,000 concentration mill for the Titusville Mine. Trippe asserted that separating the waste from the metalliferous content and then shipping the concentrates to the Durango Smelter would provide significant cost savings. Instead of building the mill at the mine, Trippe sited it on Deer Creek near the Animas River where he could harness water power. Moving the ore to the mill, however, was a problem and in response, Trippe contracted for a Huson aerial tramway to carry the ore for a distance of around 8,000 feet. This may have been the county's third major tramway system. Because the construction season was short, the mill was not ready when winter set in. Trippe, however, had been courting St. Louis investors who accepted his word as an experienced mining expert that the operation was one of the best in the region. There was certainly some truth in this because the tramway was the second ever built in the Las Animas district, and the mill was one of a few constructed within the last five years. Trippe then negotiated a deal for an astounding $250,000, which he divided among his investors.[184]

The North Star Mine on North Star Peak was among the few operations to weather the 1886 recession, but not without difficulty. The Crookes finally wearied of the high operating costs engendered by the challenging location and floundered for ways to trim the budget. With their Lake City smelter closed, the Crookes accepted the reality that they had to send the ore to the Durango Smelter. The teamsters took the shortest route to the railroad at Silverton, leading mule trains on a well-built trail that wound around the exposed east summit of North Star Peak, down Little Giant Basin, and to a transfer station in Arrastra Gulch. There, workers hefted the sacked payrock into wagons and completed the final leg to Silverton. This cumbersome process

[183] *"Mining News"* EMJ (2/14/85): 112.
[184] *"Mining News"* MSP (3/31/88): 205; *"Mining News"* EMJ (10/5/89): 299; *"Mining News"* EMJ (11/22/90): 605; Ransome, 1901: 161.

consumed a huge proportion of the profits, and so the Crookes finally decided to invest in a concentration mill to separate out some of the waste. Why they waited until 1889 is a mystery since the benefits of concentrating ore for a mine such as the North Star were well known by then. Regardless, the Crookes invested $40,000 to $50,000 in a facility similar in scale to Thomas Trippe's Titusville Mill. The North Star facility, however, was not nearly as well planned. The Crookes could have followed Trippe's template with the Titusville and sited the facility on the floor of Cunningham Gulch. The distance from mine to mill had the ideal fall line for an aerial tramway. Instead, the Crookes chose a location at the head of Little Giant Basin along the Silverton route, which required that the crude ore be packed around North Star Peak first. In addition, the physical environment presented the same impediments that convinced Trippe to build his mill lower down on the Animas River. When finished during 1889, the *Engineering & Mining Journal* praised the mill as the highest in the nation at 12,700 feet. This, however, was an exaggeration because the mill actually lay at around 12,160 feet. The Crookes ran the mill until 1892, when they moved it down to the mouth of Boulder Gulch.[185]

At the time that Trippe and the Crookes were building their mills, the New York & San Juan Mining & Smelting Company was reorganized as the San Juan Smelting & Mining Company and consolidated its assets to achieve the business practice known as vertical integration. The massive company controlled coal mines, coke ovens, the Durango Smelter, transportation, and several silver mines including the Aspen complex. Given the low price of silver, San Juan Smelting & Mining decided to remedy the awkwardness of managing the Aspen's five separate tunnels and improve efficiency by driving a central haulageway to undercut the vein system at great depth. In 1888, the company commissioned the Amy Tunnel, named for Henry Amy, manager of the Durango Smelter, on the north base of Hazelton Mountain, 1,000 feet lower than the mine's early workings. In so doing, miners could work the ore veins from the bottom up and haul the ore through the tunnel to a proposed concentration mill. By 1889, miners drove the tunnel more than 1,000 feet where they struck the ore system and brought the property back into profitability. In later years, the tunnel was renamed the Aspen to reflect its association with the Aspen ore system.[186]

The Eureka district had grown relatively quiet except for two of its principal mines, which were the Sunnyside and Sunnyside Extension. The high gold content of their ores was the reason that these two mines did well during the recession. Although the value of silver ebbed, that of gold did not, but the recession created difficult economic conditions. As a result, the owners of the mines attempted to reduce their operating costs in the same manner as Trippe and the Crookes. Both, however, needed no outside investors and instead had their saved earnings for exactly such purposes.

Rasmus Hanson, owner of the Sunnyside Extension, continuously if not cautiously reinvested his profits in formal development for long-term operations. Progress was slow for several years because Hanson's funds were limited, but by 1886, he finally shifted from development to substantial production. He generated so much gold and silver that his income

[185] *"Mining News"* EMJ (6/29/89): 595; *"Mining News"* EMJ (9/21/89): 252; Ransome, 1901: 23.
[186] *"Mining News"* MSP (5/5/88): 285; *"Mining News"* EMJ (5/12/88): 347; Ransome, 1901: 162; Smith, 1982: 56; Smith, 1992: 27.

partially offset the decline of the other mines in terms of the county's overall production figures. Hanson also saved enough capital to build his own mill. Thus, he organized the Sunnyside Extension Mining Company and began construction at the mine in Placer Gulch. Originally, Hanson entertained grand plans of electrifying the facility with power generated at a hydro plant on the Animas River, but quickly shelved the idea. In 1889, Hanson finished the mill and found it to be a metallurgical success.[187]

John Terry combined elements of Trippe's Titusville model and Hanson's electrification plan when he erected a mill in Eureka Gulch for the Sunnyside Mine. He was unsatisfied with the small capacity, inefficiency, and remote location of the stamp mill at Lake Emma and petitioned Milton Engleman to fund a new facility. Like Hanson, Terry wanted to electrify the mill, and similar to Trippe, he thought a lower location and an aerial tramway were best. Also like Hanson, Terry was unwilling to incur too much debt and so planned to build the system in financially sustainable phases. Thus, he began construction in 1889 at a confluence deep in Eureka Gulch, around one mile west of the town. The mill featured two processes that relied on mercury to amalgamate with free gold and concentration equipment to recover the material that resisted amalgamation. A small hydro-power plant was installed at the mill, which provided lighting and probably ran the machinery. When finished in 1890, the facility performed well and allowed Terry to increase production at the mine, but he waited until capital reserves were replenished before adding the tramway.[188]

The other major project in the county was a fifth mill erected during the late 1880s. This one went up within sight of Silverton on the base of Sultan Mountain at what was now known as the Victoria Mine. During the mid-1880s, John Williams brought either the Ajax or Montezuma tunnel into production under the Victoria company and demonstrated that the Hercules and Little Dora vein system were productive. On this premise, even though the value of silver was at a low point in 1888, Williams managed to sell the Victoria company to a group of Boston capitalists. They reorganized Williams' outfit as the Victoria Mining & Milling Company and continued production. It remains uncertain who proposed the idea of a mill, but Williams was convinced that shipping concentrates to the Durango Smelter was far less costly than waste-laden ore. In 1889, the investors fronted the money for the mill and secured Alonzo Smith to build it. Smith claimed he had superior experience from his participation in erecting Colorado's first stamp mill, which is unproven. The new Victoria Mill and the nearby North Star complex, which may have been the most productive mine in the county during the late 1880s, contributed greatly to Silverton's popular image as a gritty mining town.[189]

Otto Mears backed the last major project completed in the Animas River drainage during the late 1880s, and it had a regional impact. After assembling a network of lucrative toll roads in the eastern San Juans, Mears saw a railroad as the next logical step in his transportation empire and proposed a line from Silverton northwest up Mineral Creek, over Red Mountain Pass, and down into the Red Mountain district. No one but Mears, John Porter, and the most powerful

[187] *"Mining News"* EMJ (12/29/88): 551; *"Mining News"* EMJ (9/21/89): 252; *"Mining News"* EMJ (12/7/89): 505.
[188] Marshall and Zanoni, 1998: 119; Ransome, 1901: 176.
[189] *"Mining News"* EMJ (12/1/88): 465; *"Mining News"* EMJ (9/21/89): 252; *Silverton Standard* (11/9/89): 2.

mine owners thought that it could be done, and they brought their capital to bear and completed the Silverton Railroad in 1888. The railroad astonished the mining industry and the Denver & Rio Grande directors, who claimed that such a venture was impossible. The mine owners in the Red Mountain district had a direct interest in the new line because the railroad reduced their high operating costs and restored profitability despite the low value of silver. Porter in particular wanted the railroad because he needed the ore for the Durango Smelter, which had trouble securing enough payrock due to the recession. Even though the Silverton Railroad better served the Red Mountain district than Silverton, the railroad benefited San Juan County. In essence, the railroad ensured that the county, and especially Silverton, remained the all-season portal into the Red Mountain district. This was crucial during the late 1880s because, despite the new mills, the rest of the county's mining industry was in poor condition.[190]

[190] Whitman Cross, Earnest Howe, and F.L. Ransome, *Geologic Atlas of the United States: Silverton Folio, Colorado* (Washington, .D.C: U.S. Geological Survey, Government Printing Office, 1905) 26; Henn, 1999: 134; Sloan & Skowronski, 1975: 35; Smith, 1982: 50; Smith, 1994: 166; E.F. Tucker, *Otto Mears and the San Juans* (Montrose, CO: Western Reflections, 2003) 91.

The Value of Silver Restored, 1890 – 1893

The residents of San Juan County were rewarded for their perseverance through uncertain times when the politics surrounding the value of silver turned in their favor. During the late 1880s, western legislators clamored for a return to a pro-silver policy to bolster sagging mining industries in their states, as well as their own personal silver stock portfolios. Well organized, they succeeded in 1890 in passing the Sherman Silver Purchase Act, which required the federal government to buy 54 million ounces of silver per year at $1.05 per ounce. The figures fostered a demand and price capable of resuscitating the west's silver mining industry, creating jobs, revitalizing regional economies and improving the popularity of the legislators among constituents.[201]

San Juan County was caught up in the return to mining, and more than just its economy was revitalized. The mountains boomed with sound, and an atmosphere of industry and purpose returned. During 1890, investors loosened their purse strings and purchased some of the proven mines, invested in mills and machinery to lower operating costs, and enlarged existing operations. The net result was an increase in the number of operations, amount of ore produced, and population. During the late 1880s recession, the county featured between ten and twenty small mines, around seven medium-sized operations, and one substantial producer. During the early 1890s, this increased to at least twenty small mines, ten medium-sized operations, and two substantial producers. The production of metals almost doubled from the 1890 figure of $337,000 in silver, $187,000 worth of gold, and $156,000 in lead.[202]

During the revival, mining companies in the county and Red Mountain district sent more ore through Silverton than the Durango Smelter could process. Otto Mears saw this as an opportunity, organized the Standard Smelting & Refining Company, and built a second smelter in Durango in 1892. Mears' strategy was threefold. First, he attempted to compete directly with the Durango Smelter and subsume a share of the smelting business. Second, Mears operated the smelter in coordination with his Silverton Railroad, which strengthened both companies. Last, Mears wanted to provide a low-cost treatment facility for the mines that he and friends operated and pocket the savings. Although the facility was equipped to treat the copper-rich ores of the Red Mountain district, it also processed similar payrock from San Juan County. The San Juan Smelting & Mining Company responded by adding several furnaces to its Durango Smelter, lowering its fees, and improving the returns. The Crookes also attempted to profit from the high volume of ore and built a silver leaching mill at the mouth of Boulder Gulch, near Howardsville.[203]

Las Animas Mining District

[201] Brown, 1984: 193; Smith, 1982: 92; Ken Reyher, *Silver & Sawdust: Life in the San Juans* (Montrose, CO: Western Reflections, 2000) 179; Stephen M. Voynick, *Colorado Gold: From the Pike's Peak Rush to the Present* (Missoula: Mountain Press Publishing Co., 1992) 62.
[202] Henderson, 1926: 216 for production figures. Active mines were derived from a survey of *EMJ* and *Silverton Standard*.
[203] *"Mining News"* *EMJ* (2/6/92): 187; Nossaman, 1998: 252; Ransome, 1901: 23; Smith, 1982: 101; Smith, 1992: 28; Tucker, 2003: 114.

In the Las Animas district, the key mining outfits that managed to survive the recession were among the first to boom in response to positive climate of 1890, and several of these were in Silver Lake Basin. What followed laid the groundwork for that basin to become one of the most advanced centers of mining technology in Colorado. Benjamin W. Thayer and James H. Robin thought they had outsmarted the recession when they examined the Iowa Mine in 1888 and found a vein that offered an unusual combination of gold and silver. The Sunnyside Vein system was the only other similar known ore formation. The partners leased the property in 1889, began production, and were elated when the Sherman act restored silver's value and rendered the new ore even more valuable than before. Thayer and Robin increased the workforce to expedite development and discovered a second vein of galena, which ensured even greater profits.[204]

Thayer and Robin were well on their way to realizing a dream shared by other local businessmen who dabbled in mining. Thayer arrived in Silverton in 1881 with the railroad and found a job in a mercantile. Dissatisfied, he migrated to Durango in search of opportunity and married Nellie, daughter of John L. Pennington. Probably with Pennington's capital, Thayer returned to Silverton in 1883, opened his own mercantile, and invested in real estate. A solid businessman, Thayer ascended into Silverton society, where he met Robin.[205]

Born on the Isle of Jersey in New York, Robin was one of the first entrepreneurs to establish a business other than a mine in the Animas River drainage. In 1875, Robin and several brothers leased a brick yard near Silverton, which generated handsome profits that they reinvested in real estate. The brick yard also demonstrated that construction materials, always in demand, provided surer income than uncertain mining ventures. With this in mind, Robin and John Pennington pooled their resources, established a sawmill on Cement Creek in 1880, and sold the lumber in a yard in Silverton. At the same time, Robin maintained a real estate office and speculated with his own money. He cemented his role in Silverton society by entering local politics and working as a community activist alongside his wife Amelia. Once Robin had enough capital, he ventured into more uncertain mining projects, including the Iowa.[206]

During the summer of 1891, the Iowa consumed of Robin and Thayer's attention. They hastily repaired the buildings up on Kendall Peak's cliff, brought in additional supplies, and made arrangements for a small crew of miners to stay the winter. When the mine became snowbound, all the crew could do was develop the several veins and stockpile ore for the coming thaw. And when it arrived in June, Robin and Thayer eagerly received the precious payrock and reports that the veins looked better than ever. Thayer and Robin realized that their meager investments would constrain production and more money was necessary for the mine to blossom. Robin approached Gustavus Stoiber, a trained mining expert with funds, and together, the men organized the Iowa Gold Mining & Milling Company in 1893. Stoiber served as president, Robin secretary, and R.W. Watson and H.W. King as vice-presidents.[207]

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[204] *"Mining News"* *MSP* (11/2/89): 339; *"Mining News"* *MSP* (3/1/90): 140.

[205] Nossaman, 1998: 62.

[206] Nossaman, 1989: 62, 238; Nossaman, 1993: 32, 60, 310.

[207] Colorado Mine Engineers' Reports: Iowa Mine; Iowa Gold Mining & Milling Company *Stock Prospectus* Denver, CO, 1896; *"Mining News"* *MSP* (11/21/91):331; *Silverton Standard* (8/20/92.

While the Iowa was a confirmed bonanza, developments on the Silver Lake claims a short distance north dwarfed Robin and Thayer's relatively simple operation. After running the Stoiber Brothers Sampling Works for four years, brothers Edward and Gustavus had a significant disagreement in 1887 and divided their mutual assets. Gustavus assumed the sampling works and Edward the Silver Lake claims. Gustavus' choice was the safer because the sampling works provided a reliable source of income, while Edward based his decision on the educated guess that Silver Lake would provide great rewards for its high risk.[208]

The Stoibers were proper, conservative Germans reared in a privileged socioeconomic climate. Edward was born in 1854, began studies in engineering at a young age, and attended the famed School of Mines at Freiberg. In 1879, he and Gustavus sought their fortune in Leadville where Edward experienced immediate success as a mining engineer and metallurgist. Competition among professionals increased in Leadville while the Animas River drainage begged for metallurgists, and so the Stoibers came to Silverton in 1883 and built their sampling works. While on business in Denver, Edward met Lena Allen Webster, described as a very liberated divorcée. Lena embodied the image of frontier woman and was well-suited for the remote and industrial environment to which Edward brought her.[209]

When Edward assumed the Silver Lake, he spent two years sampling, examining the property's geological features, conducting assays, staking claims with Lena, and calculating the most effective manner of development. Unlike most mine owners, Edward took a primary interest in the low-grade ore and considered high-grade material to be merely a bonus. The main problem, however, was that the costs of shipping the low-grade payrock from the basin and processing it in the sampling works exceeded the returns. Stoiber realized, however, that if he could mine and concentrate the ore in large volumes with a highly efficient system, the economies of scale would render the low-grade material profitable through a nominal cost per ton. Devising an efficient system and working out the economic calculations was easy for the German engineer, and by 1890 he had a plan devised.

During the late spring when Silver Lake Basin's snow blockade stabilized, a small army of workers with mule trains packed in thousands of board feet of lumber, tons of hardware and machinery, and the basic necessities of life. This they assembled into the largest surface plant and mill yet in the county. When finished, the mill was able to generate 50 tons of concentrates per day, which provided Stoiber his economy of scale. Because Silverton lacked a facility or storage area capable of accommodating the hundreds of tons of concentrates and high-grade ore that Stoiber expected to store at a time, he built his own. Stoiber chose the abandoned Little Dutch Smelter site on the west side of Arrastra Gulch's mouth. While the exact structures remain unknown, they certainly included large bins, freight platforms, and a corral and stable for the constant procession of draft animals.

The crown jewel to Stoiber's instant empire was an electric power plant that he commissioned on the Animas River. In 1890, electricity was a revolutionary technology under

[208] Bureau of Mines, *Manuscripts MSS Box 640, v27* (Denver: Colorado Historical Society) 20; Sloan and Skowronski, 1975: 29.
[209] Henderson, 1926:4 9; Allen Nossaman, *Personal Interview*, Durango, 2002; *"Obituary"* *EMJ* (5/5/06): 865; Prosser, 1914; Sloan and Skowronski, 1975: 29.

experimentation, and the San Juans served as a cradle for its application to mining. In 1888, the Virginius and Tomboy mines above Telluride installed the first electric plants in the San Juans, followed by John Terry's small facility at the Sunnyside Mill in Eureka Gulch. These early power plants were small and generated direct current (DC), which was able to run variable speed motors but only could be transmitted short distances before suffering a debilitating power loss. As a result, DC current had to be consumed near the point of generation, giving mining engineers pause for thought. What, they reasoned, was the advantage of electricity if it had to be generated on-site? Even if a DC power plant could be run by hydropower, a costly steam engine and boiler usually had to be kept on standby in case the water system failed. Why not do away with the electrical equipment and merely use the steam engine alone to operate mine machinery for a fraction of the capital? Alternating current (AC) provided a partial answer to this problem. AC current could be transmitted for miles without power loss, but as of 1890, AC motors were unable to run variable speed equipment. AC current could, however, energize lighting and run constant speed motors that operated with little drag, such as those used in machine shops and some mill applications. With this in mind, progressive electrical engineers near Telluride finished the first AC power plant in the San Juans and Colorado at Ames in 1891, which set the precedent.[210]

Stoiber was not far behind. Around the same time, he completed what appears to have been the second AC power plant in the San Juans and Colorado. According to archival references, a power plant built on the Animas River, most likely at the concentrates storage terminal, and power lines carried the electricity two miles up to Silver Lake Basin, which was too far for DC current. Given this, Stoiber's power plant had to generate AC current, which lit the interiors of the buildings and ran several small motors in the mill.[211]

At the beginning of November 1890, Stoiber started the mill and it ran to perfection, although the electrical equipment may not have been working initially. Over the course of the summer, mule skinners hauled up supplies and coal so the mine and mill could run through the winter. After around a year, Stoiber and Lena pored over the balance sheets of their Silver Lake Mines Company. The conclusion was $255,000 net, or around $5,148,286 today, which constituted around twenty-five percent of San Juan County's total production. This was far from pure profit, however, because an operation as large as the Silver Lake Mines Company at an elevation of 12,000 feet was very costly.[212]

After two years of constant production and milling, Stoiber declared the Silver Lake a success. While his strong work ethic may have prevented him from the retirement sought by other successful mine owners, Stoiber instead spurred him to expand operations in 1893. Lena, personnel manager for the company, requested a second boardinghouse at the mine and increased the workforce to 130. Like the first boardinghouse, it featured uniquely luxurious amenities in such as running water and steam radiators.[213]

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[210] W.S. Burbank, E.B. Eckel, and D.J. Varnes, "The San Juan Region," *Mineral Resources of Colorado* (Denver: Colorado Mineral Resources Board, 1947) 396; *"Mining News" EMJ* (12/29/1888): 551; Smith, 1982: 98.
[211] *"Mining News," EMJ* (4/26/90): 479; *"Mining News," EMJ* (11/15/90): 581.
[212] Ransome, 1901: 149.
[213] *"Mining News" EMJ* (9/9/93): 273.

While the Silver Lake was clearly the most significant operation in the Las Animas district, if not the county, other mines participated in the wave of renewed activity. At the Titusville, new director Thomas Kane started up the mill and tramway in 1890 on stockpiled ore, and the facility apparently recovered a satisfactory amount of the metalliferous content. Kane ordered his miners to increase production, and when the tonnage they generated exceeded the mill's capacity, he ordered the mill to operate around the clock.

In Dives Basin, Martin Van Buren Wason and Theophile Benjovsky finally reopened their Dives Mine in 1890 after patiently waiting for the value of silver to rise. Their operation was small but sound. At the North Star, the Crookes found that the run-of-mine ore now provided excellent returns, and in 1891 saw profits increase when miners happened into a vein rich with high-grade material. To increase production, the Crookes increased the workforce to thirty. In 1892, they moved the North Star Mill from Little Giant Basin down to the mouth of Boulder Gulch to process ore from their other holdings in the county. Meanwhile, several lessees at the Highland Mary wisely remembered the silver veins that Innis left in place in the upper workings during his misguided search for gold. They had an easy time bringing the workings into minor production.[214]

Mineral Creek Mining District

The Mineral Creek district finally assumed a position of prominence in the county during the early 1890s, after receiving little attention for decades. While it saw no developments quite as grand as the Silver Lake, Mineral Creek surpassed the Eureka district in terms of investment, large operations, and production. Ore poured from the Hercules and North Star ore systems on Sultan Mountain and comprised a significant proportion of the county's total production, but not without challenge.

Ever since Lucius Kendall bought the North Star Mine in 1884, his Silverton Mining Company concentrated the ore in the mill that Theodore Comstock built. Over time, however, the mill recovered less and less of the metals content. Comstock based his concentration process, highly successful at first, on the character of the ore that was available during the early 1880s. Most of this material came from upper, oxidized areas of the ore system. As the Silverton company developed the deep reaches of the system, its miners entered a zone where the ore became increasingly complex and resistant to Comstock's concentration process, however. By 1890, company directors conceded that too much of the metals content was leaving as tailings and admitted that the facility had to be refitted at great cost. They consulted an expert who reiterated that the mill would actually have to be almost totally rebuilt. Under contractor John Thexton, the Denver & Rio Grande built a siding to deliver the construction materials and equipment, and a large crew installed a system to power the mill by water. By October, Thexton opened the mill cautiously. The company was relieved to find higher recovery of metals content, and during the year, the North Star produced well over $100,000. In 1892, the Silverton

[214] Bureau of Mines *Manuscripts MSS Box 640, v. 27*: 6;*"Mining News,"* EMJ (3/28/91); *"Mining News"* EMJ (9/9/93): 273; Silverton Standard (5/24/90).

company optimistically and increased the workforce to thirty-five miners, but mill returns fell off dramatically the following year. Company directors scaled back operations and let some miners go. The company faced the decision of permanently reducing operations, and hence income, or parting with yet more capital to troubleshoot problems. They chose the latter course, which began a protracted and costly trial-and-error process of making the mill effective.[215]

The Victoria Mining & Milling Company followed a similar trajectory, sited as it was adjacent to the North Star on the same ore system. The company produced heavily through 1890 and its mill ran with some success at first, but when mill trouble materialized, the directors lost confidence and engaged in avoidance. The company put the entire operation up for lease, hoping that someone else would solve the milling problem while paying the lease royalties. In 1891, the partnership of Morrison & Fitzgerald took a three-year lease and found enough ore to keep the mine in production. Within the first year of their term, the Victoria company went bankrupt due to unpaid debts, however. The sheriff seized the mill and Little Dora Mine, appointed a receiver, and put them up for sale in 1891. It is unclear whether the partnership was allowed to continue work in the interim. Threatened by the loss of their entire investment, company principals repaid outstanding debts during 1892 and repossessed the mine. In an attempt to restore the operation to profitability, they found additional capital in 1893 to refit the mill and improve the flow of ore by building an aerial tramway up to the Little Dora.[216]

A third company floundered, despite huge capital investment. In 1889 or 1890, the San Bernardino Syndicate of London spent a considerable sum on a mill and tramway for the San Juan Tunnel and adjoining San Bernardino claim, both on Sultan Mountain. The investors immediately overextended themselves, went bankrupt, and sold to other British capitalists who organized San Bernardino Silver Mines, Ltd. The mine appeared to be a ready-made producer, except that ore was not much different from that at the North Star and Victoria. The complex material confounded the mill, and after several years of struggling, the company failed.

The area around Chattanooga, at the head of Mineral Creek, was a center of activity. The town of Chattanooga was a key stop on the Silverton Railroad, which, coupled with road traffic to the Red Mountain district, incubated it from too much contraction during the late 1880s recession. Chattanooga featured a tiny business district that included a mercantile and a combination saloon, restaurant, and boardinghouse run by James Sheridan.[217]

When the value of silver increased in 1890, Sheridan and other Chattanooga residents grew optimistic that several important mining ventures would revive the town. To the south lay the Bonner, in which Gustavus Stoiber recently invested. The mine was small but began to yield payrock in 1890. The other was the Silver Ledge between the town and Red Mountain Pass. The Silver Ledge vein was discovered in 1883 but lay fallow until J.C. Kingsley sank a shaft in 1890. A catastrophic fire in the shaft house the following year cooled his interest. Several miners were at work at the bottom of the shaft during the event, but pursued their work unaware. When the

[215] *"Mining News,"* EMJ (9/9/93): 273; Ransome, 1901: 251; Silverton Standard (5/17/90): 1; Silverton Standard (7/14/90): 2.
[216] *"Mining News,"* EMJ (3/1/90): 256; Silverton Standard (1/25/90): 2; Silverton Standard (4/25/91): 2; Silverton Standard (10/10/91): 5; Silverton Standard (3/26/92): 2; Silverton Standard (5/13/93): 2.
[217] Colorado Business Directory, 1892: 152; Colorado Business Directory, 1893: 182.

fire unleashed the signal bell cord, it drifted down to their station and the miners realized that something was wrong. When the ore bucket followed with a crash, they knew it was time get out. The fire apparently turned them back down the shaft, which was wise because a full box of dynamite exploded and scattered burning debris. The miners managed to survive without suffocating, however.[218] Shortly after the fire, Kingsley sold the Silver Ledge to the partnership of O'Brien and Anderson, who repaired the damage. The partners then leased the mine to a British syndicate in 1891, which purchased the property but defaulted on payments. William Feigel bought the mine at bankruptcy auction and finally brought it into meaningful production.[219]

Eureka Mining District

In the Eureka district, the Sunnyside and Sunnyside Extension remained the dominant operations and followed similar development paths. The advantage that both mines had over most others in the county was both fiscally prudent management and gold ore. Like Stoiber's Silver Lake Mine, the Sunnyside and Sunnyside Extension possessed a preponderance of low-grade ore over rich material, which the managers made profitable. Any remaining rich material could then be pure profit.

John Terry was already processing the Sunnyside's low-grade ore with the Midway Mill that he built in Eureka Gulch in 1889. His economic calculations were proving correct and the Sunnyside remained profitable, although how much so was uncertain due to secrecy. Until 1890, most of the profits, with deductions for improvements such as the mill, went to the feuding Engleman family. Then, Milton Engleman, the family's principal contact with Terry, died. Terry saw in this an opportunity to take possession of the mine as no one in the Engleman family was willing to assume Milton's administrative duties. They sold to Terry, and with the Englemans out of the equation, Terry had more money to devote to the mine. By the early 1890s, the operation featured several principal tunnels driven on the vein, a large surface plant at the lowest entry, a mill on Lake Emma, the Midway Mill in Eureka Gulch, and a herd of pack animals that fed the lower mill in an endless procession. The next large project would be a tramway to replace the tired animals, but Terry put this on hold.[220]

Rasmus Hanson was sole owner of the Sunnyside Extension almost from the beginning of operations and cautiously invested in improvements. With the new Hanson Mill in regular operation by 1890, Hanson increased the workforce to around twenty-five miners and ten surface employees. They generated forty to fifty tons of ore per day, ran the mill around the clock, and produced $15,000 per month. Some of the ore came from the adjoining Mastodon Mine, which Hanson linked to the Sunnyside Extension through underground workings. By 1891, Hanson felt that he had enough capital to finance the next move toward efficiency, a tramway from one of the main tunnels down to the mill. Once complete, Hanson's operation began to approach

[218] *Silverton Standard* (6/28/90): 2; *Silverton Standard* (4/11/91): 3.
[219] *Silverton Standard* (6/6/91): 2; *Silverton Standard* (10/24/91): 2.
[220] Marshall and Zanoni, 1998: 119.

Stoiber's Silver Lake Mine, although Hanson's workforce was a fraction of that employed by Stoiber.[221]

Just as the Sunnyside Extension appeared to reach a peak of production and complexity, Hanson curiously sold the operation in 1892. Perhaps Hanson knew something about the ore reserves that the British buyers did not. They paid Hanson $200,000, retained him as manager, but ran into trouble, possibly as early as 1893. Based on Hanson's ten-year record of extracting ore that assayed well, the new owners supposed that plenty such material remained. They miscalculated, however, and exhausted the rich ore within a year or two, leaving low-grade material that resisted treatment in the mill. Despite Hanson's efforts, and possibly to his embarrassment, production declined, and he ran the mill only intermittently, while deciding how to remedy the problem.[222]

Ordinarily, Animas Forks could be expected to celebrate the sale of the Sunnyside Extension and the financial success of one its residents. Few people were present to do so, however. In 1891, a fire that started in the Kalamazoo House burned most of the business district, and most of the residents left. The population that stayed was tiny, no one replaced the lost buildings, and the town had almost no businesses. The Postal Service revoked the post office later that year.[223]

Even though the Sunnyside was going well and smaller operations were active in the area, the town of Eureka remained small and relatively quiet. The town contracted during the late 1880s recession and did not recover as well as could have been expected. Around 120 residents lived in and around the hamlet, and the business district featured only the Helmboldt meat market, a mercantile run by W.G. White, and a hotel operated by Esther Ekkard.[224]

Elsewhere in the Eureka district, a few other mines showed promise, if not regular production. On the northeast flank of appropriately named Galena Mountain, the Swartz brothers reopened the Hamlet, initially developed during the early 1880s. They drove several tunnels on the vein and shipped ore regularly for several years. The Tom Moore, between Eureka and Animas Forks, began production in 1893. The Green Mountain and Pride of the West were the principal operations in the district's southern portion and contributed to a growing energy in Cunningham Gulch. Joseph Williams, Morgan Jones, and partners took a lease on the Green Mountain in 1889 and struck an outstanding vein just in time for passage of the Sherman act the following year. They enjoyed the results for three years when Gustavus Stoiber and James Robin assumed the lease and increased the workforce. Christian Schoellkopf still owned the Pride of the West, which featured three tunnels that penetrated the vein at different elevations. He reopened the mine in 1890 and planned to undercut the vein with a tunnel driven from the floor

[221] *"Mining News,"* *EMJ* (7/19/90): 81.
[222] Jonathan Horn, *Gold Prince Mine, Mill, and Aerial Tramway National Register of Historic Places Registration Form* (Montrose: Alpine Archaeological Consultants, Inc., 2010) 3.
[223] Bauer, et al, 1990: 12; Jonathan Horn, *Animas Forks National Register of Historic Places Registration Form* (Montrose, Alpine Archaeological Consultants, Inc., 2010) 11.
[224] *Colorado Business Directory*, 1891: 394; Schulze, 1977: 1890-7.

of Cunningham Gulch. To expedite the project, Schoellkopf installed a compressor and rock drills, a considerable investment.[225]

Cement Creek Subdistrict

The increase in the value of silver revived an interest in Cement Creek, quiet since the mid-1880s. Nearly all the properties there were dormant and had seen little work except for prospecting, and so appeared to offer more potential than those in the county's other districts. Most of the activity materialized around Gladstone, abandoned since 1887. Paul McCann was the first investor of note to arrive, examining the idle Sampson Mine for its gold potential as early as 1889. McCann had extensive experience with mining and milling ventures in Clear Creek County and qualified to render objective judgment on the property. He felt that it could be made to pay if the mill was equipped appropriately, so he purchased the mine in 1890 and put a crew to work installing new machinery.[226]

Willis Z. Kinney represented Henry Soule and Cyrus Davis, wealthy eastern investors. They reopened the Harrison Mine, a short distance south of Gladstone, and appointed Kinney as manager by 1890. The mine appeared to offer enough ore to justify a mill, which Perry Fisher erected in 1890. While the operation was not a huge success, it kept the Fisher Mill busy at least on a seasonal basis. The company workers lived in Gladstone and were the first inhabitants to occupy the town since around 1887. A small crew of miners employed by John M. May joined Kinney's workers in town, from whence they commuted up the South Fork of Cement Creek to the Big Colorado. May felt that conditions were right to begin developing the upper portions of a vein on that property, and when his miners proved ore, he commissioned a deep haulage tunnel from the valley floor in 1893.[227]

Kinney and the Fisher Mill figured prominently in development of the Gold King. Olaf A. Nelson worked as a miner in the Sampson and became familiar with the local geology and the trend of the main gold-bearing vein. Nelson felt that the Sampson company was working the wrong portion of the vein and that he could locate a richer segment. Nelson spent time searching the area downslope from the Sampson property for traces of the vein, found promising ground, and staked the Gold King claim around 1887. During the next several years Nelson devoted time to exploring the claim at depth and struck the Gold King Vein. Nelson subsequently followed the course taken by many prospectors. He sought financial assistance and approached Kinney around 1892. The following year, Kinney sent several of the Harrison miners to conduct further exploration; they brought around forty-five tons of ore to the Fisher Mill for testing. Like the rest of the Sampson Vein, the ore proved complex but rich, and Kinney's enthusiasm convinced Davis and Soule that they probably had a bonanza worth pursuing. They leased the claim from Nelson and began developing the Gold King Mine, which became one of the county's best

[225] *Silverton Standard* (11/23/89): 2; *Silverton Standard* (5/10/90): 1; *Silverton Standard* (5/23/91): 2; *Silverton Standard* (5/20/93): 2; *Silverton Standard* (12/9/93): 3.
[226] *"Mining News," EMJ* (5/25/89): 485; *Silverton Standard* (8/8/91): 2.
[227] Brown, 1984: 71; *Silverton Standard* (10/4/90): 2; *Silverton Standard* (8/8/91): 2; *Silverton Standard* (12/26/91): 2; *Silverton Standard* (6/9/93): 3.

producers. But before Kinney could make much headway with the Gold King, San Juan County faced one of the worst economic disasters in the history of the mining industry.[228]

The Silver Crash, 1894 – 1897

Almost immediately after the Sherman Silver Purchase Act was signed into law, reformers rebelled against what they perceived to be a massive government subsidy for mining and profiteering among powerful capitalists, and they clamored for repeal. At the same time, a national economic crisis loomed, creating political instability and factions in both the federal government and Great Britain, one of the main consumers of American silver. Repeating the cycle of the mid-1880s, the increasingly dour climate contaminated investment in silver and the industries that depended on it, causing the metal's value to slip. The price of silver eroded from a high of $1.09 in 1891 to $.99 and kept going down to $.78 by mid-1893, an all-time low that forced mining companies in San Juan County to assess the viability of their operations. As with the 1886 cycle, some of the small mines closed, but many companies were able to get by because they were more efficient than before and the smelters in Durango improved their operations.[229]

Then, in 1893, the political factors noted above came together to bring the ruin of the western mining industry, followed by a nationwide depression. President Grover Cleveland called a special session of congress to repeal the Sherman Silver Purchase Act, effective November 1893, hoping to prevent an economic crash. At the same time, Britain adopted a gold standard and abolished silver, as well as ceasing minting of Indian rupees. The market for silver promptly evaporated and the metal's value plummeted to $.64 by March 1894. The result was cataclysmic. Mines across the west suspended operations and thousands of workers suddenly found themselves jobless. A financial panic swept the west and rippled out to the rest of the nation, ushering in a depression that lasted through much of the 1890s.[230]

Like the rest of Colorado, the San Juan region, which relied to a great degree on silver, was devastated. All the mining companies in San Juan County that depended on the high price of silver closed, and the rest faired little better. Some estimates suggest that as many as 1,000 workers in the county lost their jobs, from a total population in the county of 1,600 in 1890. Residents with enough security to stay witnessed a mass exodus. With little ore coming down from the mountains, the San Juan Smelting & Mining Company and Otto Mears shuttered their smelters in Durango, and Mears and the Denver & Rio Grande reduced service on their railroads.[231]

A review of the county finds that while nearly all the medium-size and small mines suspended work, each district featured a handful of companies that appeared to be surviving and even thriving in some cases. As the depression dragged on through 1896, the impossible happened. A number of mines reopened, and the county's production figures increased to record

[228] W.Z. Kinney, *Correspondence: Exhibit A, 1932*; Nossaman, 1998: 313; Wolle, 1995: 418.

[229] Henderson, 1926: 216; *Report of the Director of the Mint*, 1894: 20; Saxon, 1959: 7, 8, 14, 16.

[230] Brown, 1984: 194; *Report of the Director of the Mint*, 1894: 26, 30; Saxon, 1959: 7, 8, 14, 16; Smith, 1982: 92; Smith, 1994: 184, 187; Stone, 1918, V.1: 437.

[231] Schulze, 1977: 1890-7; Smith, 1992: 68.

levels. Between 1894 and 1897, the county featured twenty small mines, eleven medium-sized operations, and two large mines. In terms of production, 1894 was a poor year and the county's mines generated $221,000 worth of silver, $340,000 in gold, and $132,000 in lead. By 1896, these figures climbed to $1,515,000 worth of silver, $909,000 in gold, and $169,000 in lead. This railed against the downward trend in the rest of the state. Four principal reasons explain why the mining industry survived and kept the county from collapsing.[232]

Even though the Standard and San Juan Smelting & Mining Company smelters in Durango suspended during 1894, mining companies still had several outlets for their ore. The Sweet Sampler was purchased in 1892 and renamed the Keith Sampler, and Gustavus Stoiber sold his sampler in 1894 to partners that reorganized it as the Silverton Public Sampler. These two facilities received enough business to prevent them from closing and were able to ship their concentrates and matte by rail to smelters on the plains In 1894, Thomas F. Walsh initiated one of the most important ore buying firms and built the first new smelter at Silverton in nearly a decade. Walsh's motives were twofold. On one hand, he felt that if he provided relatively low cost ore treatment, companies in the county and Red Mountain district would generate enough payrock to keep the facility afloat until better times returned. On the other hand, Walsh needed a smelter to process the ore from his own mines, the Mountain Queen and others leased in the Eureka district. Walsh, Charles J. Hughes, and Albert Smith incorporated the Silverton Smelting & Mining Company and purchased the abandoned Martha Rose Smelter because it featured the building and original infrastructure, which saved them capital. During the winter, workers repaired the facility and installed new equipment, and by spring, Walsh had the facility operating. After several weeks of operation, the smelter appeared to be a success. Walsh became a local hero for delivering a functional smelter to the county in its darkest hour of need.[233]

The Omaha & Grant Smelting & Refining Company, one of the most powerful smelting firms in the Rocky Mountain West, saw the void left by the closure of the Durango Smelter. With aspirations of a monopoly, Omaha & Grant leased the Durango Smelter from the San Juan Smelting & Mining Company in 1895. During 1896, the directors realized that production in San Juan County started to recover while the rest of the state suffered and interpreted this trend as a harbinger of an enormous revival. The firm strategically used the poor economic climate to convince San Juan Smelting & Mining to sell the Durango Smelter.[234]

Another reason why the county's mining industry seemed to weather the depression lay in the ore that the solvent companies produced. Their payrock contained a higher proportion of gold than most of the ore bodies in the region, and the value of this precious metal held a constant value of around $20.70 per ounce. Because the ore featured a combination of gold and silver, as the mining companies produced more gold, they generated more silver in parallel. Nearly all the mines that continued operations from the early 1890s into the depression were proven gold producers, including the Green Mountain, Iowa, Mastodon, Silver Lake, and

[232] Henderson, 1926: 216 for production figures. The estimate for active mines was derived from a survey of *EMJ* and *Silverton Standard*.
[233] Thomas A. Rickard, *"Across the San Juan Mountains,"* *EMJ* (July, 1903); Sloan and Skowonski, 1975: 51, 121; Wolle, 1995: 431.
[234] Ransome, 1901: 23; Smith, 1982: 101; Smith, 1992: 77.

Sunnyside. In a few cases, mine owners reassessed their idle properties for gold ore and reopened them if warranted.[235]

Perhaps the most important factor of why the county overcame the depression and dismal value of silver was a dramatic change in attitude toward ore production and the required investment. A handful of mine owners responded to the Silver Crash not by curtailing operations but by taking the opposite approach. They expanded operations and poured capital into underground development, mechanization, and mill improvements on a proportion that the county had not yet seen. The purpose was to produce and concentrate ore in economies of scale that were great enough to dramatically reduce the cost per ton. The owners calculated that this offered the double benefit of not only offsetting silver's low value, but also rendering low-grade ore profitable to produce, a key factor since the principal mining districts were awash with the material.

The strategy of economies of scale was an excellent model for companies with large ore reserves, but it required one resource difficult to secure during the mid-1890s depression, capital. Only four or five mining companies in the county were able to implement the strategy, and they were so successful, their enormous yield skewed the county's production figures and made the overall mining industry appear to be in a better state than it actually was. Most of the small and medium-sized operations were either closed or not doing well. Some mining experts credited Edward Stoiber and John Terry with pioneering the economies-of-scale practice, and Frederick Leslie Ransome observed:

> The success of Messrs. Stoiber and Terry in handling low-grade ores has demonstrated that when wasteful and inadequate methods are replaced by modern appliances and shrewd management, mines carrying abundant low-grade ore may be made profitable, even with the present low price of silver.[236]

The *Silverton Standard* offered a more detailed explanation:

> In 1893, when the price of silver was cut in two, or reduced nearly one-half, many of the low-grade producers were closed, but about all of these have resumed operation, and many more new producers of like character have been added to the list. At the time the operators of the silver mines were confronted with a situation which seemed to preclude further effort. Edward G. Stoiber, then proprietor of the Silver Lake plunged into problem with more than a million to lose if he failed, but emerged successfully, after employing every close value-saving appliance which the character of his low-grade lead-silver ores suggested. He saved the values so well that his concentrates of $7 ores enabled him to continue mining profitably. When this had been done the other owners of low-grade mines proceeded to the building or alteration of mills which enable them to operate, and all along the line, throughout the entire San Juan region, there has been a marked advancement in the economy and better value saving of mill enterprises.[237]

[235] Saxon, 1959: 78, 14, 16.
[236] Ransome, 1901: 23.
[237] *Silverton Standard* (1/11/02).

Out of self-interest as well as a desire to support the central San Juans, Otto Mears also made major contributions that helped the region weather the depression. He understood that the mining industry relied on his roads, railroads, ore production, and financing. To prevent a complete shutdown of the Red Mountain district, he maintained service on the Silverton Railroad even though it meant no profits. On his roads, Mears softened his tolls and even suspended them at times, and he continued production at his mines to keep ore going through Silverton. Mears' greatest contribution, however, was the construction of another railroad, even though the project over-extended his finances. In 1895, he and other Colorado capitalists incorporated the Silverton Northern Railroad to build a line up the Animas River from Silverton to Animas Forks. Because Edward Stoiber would see direct service to his terminal and the railroad would carry John Porter's coal, both men were heavy investors. Further, Stoiber promised Mears all the ore traffic that he could generate, and in return Mears assured him a half rate. The railroad company purchased Mears' Animas Forks Toll Road as the rail bed and began construction in fall 1895. With the region in depression, the project created quite a stir, and the county was elated at the prospect of direct rail access for its principal centers of mining. Track gangs labored between snowstorms throughout the winter until they finished the line to Howardsville by May 1896. The following month saw the crew move camp to Eureka, where Mears stopped work due to the financial burden. Despite its short length, the Silverton Northern would prove to be Mears' most profitable railroad because it served one of the richest portions of the San Juans.[238]

Bear Creek Mining District

The constant value of gold was the force that drew prospectors into the southeastern reaches of San Juan County while silver values declined. In the spring of 1893, E.L. Roberts of Silverton and D. Preston Bell of Durango prospected Bear Creek, the first principal drainage south of the Las Animas district, and they found ore at the drainage head. With interest in silver already waning and mines closing, prospectors were eager for a gold discovery. When word of the Bear Creek strike began circulating, around 500 wealth-seekers eagerly hastened to the site, began staking claims, and organized the Bear Creek Mining District. Among the new properties were the Bonita and Sylvanite, named after a type of telluride gold ore, and both seemed to offer excellent potential. By June, community organizers attempted to formalize the collection of prospectors' tents on the valley floor as a camp. Within a short time, someone secured a post office under the name of Sylvanite, although the settlement was popularly known as Bear Creek. R.W. Bastin & Company began carrying in supplies via pack train, and a few local investors perused the claims in hopes of securing the best ones while the prices were low. Among these were Ira Scott, his wife, and Judge E.T. Wells, and they bought the Sylvanite and immediately put five men to work on development. When winter arrived, everyone left the remote region, and

[238] Henn, 1999: 134; Michael D. Kaplan, *"The Toll Road Building Career of Otto Mears, 1881-1887,"* The Colorado Magazine, Vol. L2, No.2 (1975): 168; Sloan and Skowonski, 1975: 34, 127, 150; Tucker, 2003: 91, 104.

as they waited to return the next year, the economy collapsed and set the stage for a full rush during 1894.[239]

When the spring arrived, many of the original prospectors returned, followed by a large number of others. Sylvanite grew in size and may have attracted a few of the businesses expected in a prospecting camp, such as a mercantile and saloon. Lute Johnson, publisher of the Creede *Candle*, thought enough of the settlement to haul in a press and began printing a newspaper. Johnson had an easier time packing the press from Creede than prospectors experienced with their goods from Silverton. While Silverton was only eighteen miles away and Creede fifty, the glaciated peaks of the Las Animas district presented a major obstacle. Bear Creek, on the other hand, drained east into the Rio Grande River valley, a direct and gentle route to Creede. Thus, Creede became the district's principal point of entry.[240]

The Bear Creek excitement followed the course typical of short-lived rushes. During 1894, fortunate prospectors identified and claimed the few obvious veins, while others left. Because of the decrease in population and the seasonality of Sylvanite, the Postal Service revoked the post office at the end of the year. Regardless, some prospecting continued, and the most promising claims demonstrated ore below the surface. The Sylvanite and Bonita yielded several tons of payrock for testing, and gold was proven on the Elk Horn, Gold Bug, Good Hope, and Kankakee. With the above claims proven, investors had enough confidence by 1895 to purchase them and begin development. Scott and Wells used some of the profits from their Sylvanite Mine to buy the Good Hope. A.L. Emigh, Freeman Thomen, and others organized the Golden Shear Mining Company and bought the Bonita. Thomen came from Creede and discovered the Sunnyside, the first vein developed in that area. F. Nathan & Company of Kansas City bought the Gold Bug for $25,000, established the Gold Syndicate Mining Company, and planned an 800-foot tunnel to undercut the vein.[241]

Isolation was an impediment and kept the new operations small and seasonal. By 1896, two years after the initial rush, Sylvanite had seen much speculation but relatively little work at depth. All the productive mines were shallow, poorly equipped, and the extent of their ore reserves unknown. Unlike the rest of San Juan County, nearly all the work was by hand, and not until 1896 did Bear Creek begin receiving even small pieces of machinery. Scott and Wells installed a hoist and compressor at the Good Hope, likely the first apparatuses of their kind in the area. Most of the mining outfits did not follow this example. They had little need, because by the end of the season, they reached the end of their profitable ore and abandoned further efforts.[242]

When the spring thaw of 1897 granted a return to the Bear Creek district, only the Bonita, Gold Bug, Good Hope, and Sylvanite mines reopened. The Golden Shear company produced small batches of ore in the Bonita, the Calaverite Mining Company employed nine miners at the Sylvanite, and the Wonder Leasing Company did well with the Good Hope. The Gold Syndicate company was the largest operation and kept several miners driving the main tunnel toward the

[239] Bauer, 1990: 138; *"Mining News," EMJ* (9/30/93): 351; *"Mining News," EMJ* (2/9/95): 133; *Silverton Standard* (5/13/93): 3; *Silverton Standard* (6/17/93): 2.
[240] *Silverton Standard* (5/25/95): 3; *Silverton Standard* (8/26/99): 1.
[241] Bauer, et al., 1990: 138; *"Mining News," EMJ* (2/9/95): 133; *"Mining News," EMJ* (10/24/96): 397.
[242] *Silverton Standard* (6/6/96): 5.

Gold Bug and around fourteen others producing ore. Finally, miners struck the vein at depth, but the company kept the findings a secret, which raised suspicions that the vein was bereft of ore. This proved false, and the vein offered enough payrock to allow the company to outlast most of the others that remained in the district.[243]

Las Animas Mining District

When Edward Stoiber began implementing the economies-of-scale concept during the early 1890s, he did so with a huge mill, an army of workers, and electricity. Stoiber understood that more improvements were necessary for the strategy to fully reach its potential. He revisited the mill, his power sources, and transportation system for ways to increase production and reduce costs. Because the mill already had a high treatment capacity and was relatively efficient, it needed no major changes. Instead, Stoiber and the expert metallurgist Robert J. McCartney tinkered with improvements to some of the concentration equipment. They invented one of the best vibrating tables for concentrating San Juan ores, the so-called Stoiber-McCartney table.[244]

A small power plant wired electricity up to the mine, where it was used primarily for lighting and secondarily to run simple appliances. Because motor technology was nascent, steam powered the energy-intensive machinery, which kept a herd of mules busy packing the fuel coal required. To reduce the expense of both the coal and packing, Stoiber installed more motors at mine and mill in 1894 and built a second power plant on the Animas River, which also provided some current to his brother's Iowa Mine. He chose a site on the south side between Arrastra Gulch and Silverton for the plant, which had a generator house, boiler house, a set of massive coal bins, and direct rail service. Several years after construction, newspapers claimed that the power plant was the most complete privately owned AC facility in the nation and saved Edward $15,000 in coal per year, or $330,096 today. Along with the power plant buildings, in 1895 masons also erected what was the largest and best appointed residences in the San Juans with hot and cold water, sinks, bathtubs, toilets, and steam heat. Edward and Lena named the power plant and mansion complex Waldheim, German for forest home.[245]

Stoiber realized that his transportation system was an outstanding resource to look for savings. Nearly everything hauled up to the mine and all the concentrates sent down from the mill moved by mule train, at a cost of around $4.00 per ton. While mules were well-suited for the trip to Silver Lake Basin, they were slow and cumbersome. Of greater importance, mules were costly to purchase and maintain and requiring the constant supervision of mule skinners. His master plan called for replacing the mules with a tramway, and Stoiber's desire for savings forced the issue in 1895. Like Terry, Stoiber wanted to minimize his debt. Given this, he designed the system in two segments that linked the mill with the shipping terminal on the Animas River. Stoiber contracted with William M. Frey, tramway expert from Leadville, to build

[243] *Colorado Mining Directory*, 1898: 295; *"Mining News" EMJ* (8/28/97): 255; *"Mining News," EMJ* (11/13/97): 586; *Silverton Standard* (9/11/97): 2; *Silverton Standard* (10/23/97): 8.
[244] *"Mining News," EMJ* (8/20/98): 226; *"Obituary," Mining Reporter* (2/18/04): 173; *Silverton Standard* (12/3/98).
[245] *"Colorado's Wealth in Water Power," Denver Times* (12/31/98): 10; Rickard, 1903: 60, 68; *Silverton Standard* (6/30/94); Wyman, 1993: 3-4.

the first, 8,700 feet in length. By November, Frey completed construction and watched with the press as the system started without incident.[246]

Gustavus Stoiber and James Robin were also busy improving the Iowa Mine. Through the Iowa Mining & Milling Company, they made the Iowa second only to the Silver Lake in terms of implementing economies of scale. Following Edward's example, they focused on large-scale production and savings, including improvements at the mine, widespread adoption of mechanization, a mill, and a tramway. Like Edward, they insisted on enacting the plan in manageable steps. The first was the construction of a large concentration mill to separate out the waste and retain a portion of the treatment fees paid to smelters. Unlike Edward, Gustavus and Robin sited their mill not at the mine but instead on the floor of Arrastra Gulch, almost directly over the obsolete Little Giant arrastra. This location was inefficient in the beginning because it required mule trains to carry down the crude ore, but the location made shipping out the concentrates easier. Workers broke ground for the mill early in 1895 and built a highly functional facility capable of concentrating 150 tons of ore per day.[247]

A tramway was the next logical step. Stoiber and Robin contracted with the Trenton Iron Works of New Jersey for a Bleichert system in 1896 and then directed their attention to mining operations and claim development. They hired more miners to drive two tunnels into the vein system to work it simultaneously at different elevations. In keeping with proper mining engineering, Gustavus planned a third tunnel from the lowest elevation possible to serve as a haulageway for the ore produced in the upper levels. Vertical raises linked the lower and upper tunnels and served as conduits for ore. Miners in the upper workings dumped ore into the raises, which rolled down and collected in bins over the haulage tunnel, where other miners sent it out directly to the tramway. While this extensive vertical development was costly and ambitious, it ultimately lowered production costs and created a lasting underground infrastructure. At the same time, external infrastructure in the form of a surface plant was necessary to support the work underground. The new tunnels and facilities initially taxed the company's coffers but paid off in the long run.[248]

In 1896, Gustavus, Robin, and the other Iowa investors were well on their way to building an empire as large as Edward's Silver Lake. The party gained advantage when they purchased the Tiger Mining & Milling Company, which just began work on the Royal Tiger Mine directly across Silver Lake from the Iowa. The outfit had done little with the property and was eager to sell because it could not bear the costs of development. Once Gustavus and Robin erected a surface plant, they invested in underground development and brought the mine into production.[249]

In the climate of the mid-1890s depression, the success of the Stoiber brothers was impressive and railed against the statewide trend. When Edward built the Waldheim power plant,

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[246] *Silverton Standard* (11/9/95); *Silverton Standard* (1/28/98).

[247] Iowa Gold Mining & Milling Company, 1896; *"The Silvery San Juan Has Enjoyed a Year of Unparalleled Prosperity in all Lines of Industry"*; *Silverton Standard* (11/9/95).

[248] *"Mining News,"* *EMJ* (12/19/96): 589; Iowa Gold Mining & Milling Company, 1896; *Silverton Standard* (4/25/96).

[249] *"Mining News,"* *MSP* (12/12/96): 487; Walter H. Weed, *The Mines Handbook: A Manual of the Mining Industry of North America* (New York: Stevens Copper Handbook, 1925) 730.

he intended to provide electricity to both his and the Iowa Mine. At the same time, Gustavus installed one of the largest compressed air systems in the county at the Iowa and provided air for drilling in Iowa and also the Silver Lake. Gustavus convinced the Postal Service to locate the misspelled post office of Arastra at the Iowa in 1895, while Edward housed most of the combined workforce at the Silver Lake. In addition, Gustavus, Robin, Joseph Bordeleau, Frank B. Brown, and R.S. Courtney organized the Silverton Deep Mining & Tunnel Company to drive an ambitious haulage tunnel from Arrastra Gulch to undercut the Silver Lake, Iowa, and Titusville mines. They fully expected to encounter Edward's Silver Lake first and the Iowa second. In the spring, miners began the tunnel high up on the west side of Arrastra Gulch and worked into the fall.[250]

Eureka Mining District

While sources claim that John Terry was instrumental in developing the strategy of economy of scale at the Sunnyside, his participation was, at first, somewhat accidental. Like the Stoibers, Terry had a master plan for the Sunnyside that included extensive underground workings, an advanced surface plant at the mine, and a tramway that delivered ore to a large mill. He completed several of the most expensive pieces, and then the Silver Crash forced him to put the plan on hold. Even though Terry reinvested his profits to minimize his debt, he still financed some of the improvements with credit, problematic when his funds ran short in 1894. To make matters worse, the vein pinched out and required Terry to pay for a costly exploration campaign. When the economy soured, creditors demanded payment on Terry's debt, which he was unable to pay. They threatened foreclosure, and Terry held them at bay with a clever argument. He explained to the creditors that if they seized the property now, it would sell for a fraction of its worth given the poor economic climate and they would recover only a portion of the outstanding debt. Instead, if they waited, it was only a matter of time before Terry found a continuation of the vein. The creditors agreed, and in 1895, Terry vindicated himself by contacting the rich elusive vein. He paid off all his debts, began buying out other investors for sole ownership, and saved for further improvements.[251]

By 1896, Terry felt financially secure enough to construct the next phase of his plan. Like the Stoibers, he replaced costly mule trains with a tramway from the mine to the Midway Mill. Next, Terry installed vibrating tables in the mill. The improvements had the desired effect of lowering some costs, increasing the tonnage of ore sent to the mill, and recovering a higher proportion of the metals content.[252] Terry also entertained the long-term goal of building a third, larger mill at Eureka and extending the tramway. The fact that the vein proved to be inconsistent, however, eroded his confidence in the financing. A group of New York investors took an interest in the Sunnyside and made Terry an offer of $450,000 over time with a $100,000 advance as earnest money. Terry accepted. The investors hired mining engineer Thomas A. Rickard as

[250] *"Mining News,"* EMJ (7/27/95): 86; *"Mining News,"* EMJ (8/31/95): 206; Prosser, 1914; *Silverton Standard* (5/4/95).
[251] Marshall and Zanoni, 1998: 120.
[252] Burbank and Luedke, 1969: 56; Ransome, 1901: 176.

manager. The Sunnyside was not Rickard's only charge, however, as he oversaw other large mines through his Denver consulting practice. From the comfort of Denver, Rickard reviewed Terry's plans and supported the idea of a third mill in Eureka. Rickard dispatched a subordinate to the Sunnyside as acting manager to begin preparations for the new mill and tramway.[253]

After spending a considerable amount of capital on the new mill, overhauling the Midway Mill, and other improvements, investors were horrified when miners lost the vein again. Rickard recommended an exploration campaign, but the investors did not want to risk further loss. After a half-hearted attempt to find the vein, they allowed the property to revert to Terry, who now had $100,000 to invest. Between 1896 and 1897, his miners struck the vein and produced so much ore that Terry ran both the Midway Mill and the old facility on Lake Emma. He resumed construction on what became known as the Eureka or Terry mill, its tramway, and a power plant.[254]

Mineral Creek Mining District

The other two mines that explored economy of scale were the Victoria and North Star on Sultan Mountain in the Mineral Creek district. Physically, both operations conformed to the same template as the Silver Lake and Iowa and were ready to produce. They featured several tunnels on a shared vein system, extensive workings, fully equipped surface plants, and mills at their lower tunnels. The Victoria also had an aerial tramway linking its upper tunnels with the mill. The character of the ore and the efficiency of the mills, however, differed from the Silver Lake and Iowa. The ore was a complex compound of silver and industrial metals, which had plagued the expert mill men for four years. The Silverton Mining Company refitted the North Star Mill in 1890 and again in 1894. The Victoria company changed its mill in 1893 and 1894. However, the Silverton company principals gave up on the mill and compensated by focusing on the highest grades of ore and leasing sections of the vein to independent partnerships for added income. More than forty miners shipped high volumes of ore to the Durango Smelter until 1897, when they exhausted the profitable material. Plenty of low-grade ore remained, but because the investors were unwilling to refit the mill again, the company closed the mine.[255]

The Victoria company, on the other hand, triumphed and its mill proved effective, rendering the low-grade ore in the mine profitable to produce. It seems curious that the Victoria Mill was effective while the North Star Mill was not because both companies were adjacent and worked the same vein system. In 1895, the Victoria hired Thomas Kane as manager, formerly superintendent of Colorado Mining & Land Company at Mineral Point. Kane ran a workforce at least as large as that of North Star and produced and milled around forty tons per day through 1896. However, during 1897, the ore changed in character again and the Victoria company

[253] Henn, 1999: 34; *"Mining News,"* *EMJ* (4/25/96): 406; *Silverton Standard* (4/18/96): 1.
[254] Henn, 1999: 34; *"Mining News,"* *EMJ* (10/9/97): 435; *"Mining News,"* *EMJ* (4/30/98): 531; *Silverton Standard* (10/2/97): 1.
[255] *"Mining News,"* *EMJ* (3/30/95): 301; Ransome, 1901: 23; *Silverton Standard* (6/9/94): 3; *Silverton Standard* (6/23/94): 3.

scaled back operations, reverted to the small amount of high-grade ore that was left, and then suspended.[256]

One last factor contributed to sound production in the county during the post-Silver Crash depression. Some mine owners attempted to realize at least some income from their properties rather than let them remain idle. At the same time, investors saw the dismal conditions as an opportunity to snatch up otherwise productive mines at reduced prices. Both groups then tried to mechanize operations to the extent their capital allowed to reduce operating costs. Nearly all the county's districts saw at least several such ventures.

The Mastodon Mine in the Eureka district was well-positioned to be reopened. The mine was quiet during the early 1890s because its richest ore was exhausted. Rasmus Hanson was familiar with the property because it was connected with the Sunnyside Extension, which he sold in 1892. Hanson managed the Sunnyside Extension for the new owners, and the operation was failing because, like the Mastodon, the rich and easily milled ore had been exhausted. He leased the Mastodon in 1894 or 1895, developed the vein, and began treating the ore with limited success in the Hanson Mill. Between this and shipping the ore to Silverton, Hanson demonstrated to the Sunnyside Extension owners that the Mastodon was worth their attention, and since it was adjacent, could be worked in tandem. They agreed and either leased or purchased the property, which provided enough ore to postpone the inevitable failure of the entire operation.[257]

A.L. Jones, an investor in Denver, was convinced that the Silver Wing Mine offered great potential because it possessed plenty of low-grade ore although closed since the early 1880s. Jones envisioned a large operation similar to the North Star or Victoria, with multiple tunnels, a mechanized surface plant, and a large mill at the lower tunnel. He enlisted Chicago capitalist E.W. Morrison, and together they bought machinery, water rights, timber rights, and numerous claims on the Tom Moore Vein. Not only was the operation similar to the North Star, it suffered a similar fate. In 1895, Jones hired a large workforce of forty-five to install the machinery, develop the upper workings, drive the lower tunnel, and prepare a site for a new mill. The following year, while the mill was still under construction, Jones shipped high tonnages of ore to the Durango Smelter.[258] After the mill was finished, the company found that the payrock was too complex for the new facility and reverted to shipping the ore to the Durango Smelter. Of the failure, the *Silverton Standard* stated: "A magnificent mill is connected with the property which has thus far been unused. We are informed that the ores of the Wing are better adapted to smelting than milling."[259] In response, Jones hired more miners and improved efficiency, without running the mill.

Cement Creek Subdistrict

[256] *"Mining News,"* EMJ (9/14/95): 258; *Silverton Standard* (7/27/95): 4.
[257] *Silverton Standard* (8/10/95): 2; *Silverton Standard* (2/29/96): 8.
[258] *"Mining News"* EMJ (9/14/95): 258; *Silverton Standard* (5/1/8/95): 3; *Silverton Standard* (8/10/95): 1.
[259] *Silverton Standard* (12/25/97): 1.

In the Cement Creek drainage, Willis Kinney continued work on the Gold King, which he and backers Cyrus Davis and Henry Soule purchased. In 1895, they formed the Gold King Mining & Milling Company to allocate capital and pursue the rich gold vein that awaited underground. The following year, Kinney had enough funds to commission Tunnel No.1 high up on the mountainside in the vicinity of the original discovery. Before reaching the target ground, the miners struck an unexpected vein that they termed the Davis. Around 200 feet of exploratory drifting proved that the vein was nothing less than a bonanza. After striking the Davis Vein, miners then encountered the Gold King Vein, as expected. With miners extracting payrock from not one but now two fabulous veins, Kinney immediately planned the facilities to produce in economies of scale. To minimize debt, he built the facilities incrementally. He started with a ten-stamp mill on the east edge of Gladstone in 1896 and enlarged it fourfold the following year. He also erected an aerial tramway to deliver the ore from the mine. In a few years, the Gold King produced enough ore to contribute materially to the county's production figures, and this trend would only intensify.[260]

Mineral Point Mining District

The Mineral Point district had no massive mines to sustain activity during the Silver Crash, and its small operations wilted in the poor economic climate. The town of Mineral Point was nearly abandoned. The nearby San Juan Chief Mine was the only center of noteworthy activity. Ed M. Brown tinkered with the property during the early 1890s and even built a mill in preparation for production, but the Silver Crash brought this to an end. In 1895, owner George S. Orth & Company of Pennsylvania tried to get things moving again by conducting underground development and enticing Brown to return. He did, but because the ore was complex and the mill ineffective, he continued only limited development for several more years and waited for the value of silver to rise.[261]

Ice Lake Mining District

Ice Lake Basin, locked in the high peaks at the head of the South Fork of Mineral Creek, saw limited activity. In 1890, William Sullivan began work on the Bandora Mine, proved rich silver ore, and sold it to Colorado Springs investors the following year. They organized the Bandora Mining & Milling Company but did little with the property until 1893, and nothing after the Silver Crash. Unwilling to wait for the price of silver to be restored, they reopened the mine in 1896 under superintendent James B. Snow and began production. Because the mine was far from Silverton, the cost of importing supplies and packing out the ore was too high to sustain the operation. Thus, the owners built a mill to separate out waste from the ore, and either they or the county commission contracted with Ben Harwood to improve the existing trail into a road. This

[260] Kinney, 1932; *"Mining News,"* *EMJ* (6/19/97): 639.
[261] *Silverton Standard* (7/27/95): 1.

had the added benefit of making the basin more accessible for other ventures. By 1897, the owners leased the Bandora to Patterson & Johnson, who enjoyed a sound yield.[262]

The Great Mining Revival, 1898 – 1910

As the decade of the 1890s waned, a variety of factors contributed to a revival of silver mining across the west and especially in Colorado. Even though the value of silver did not recover from the Silver Crash of 1893 and hovered at around $.60 per ounce, the residents of San Juan County saw their mining industry blossom. With the exception of isolated years, miners produced more gold, silver, and lead than any time in the past. Given the low value of silver, several factors help explain the trend.

First, the nation's economy recovered from the depression, and while the rebound started in the east, it reached the west by the late 1890s. As the economic climate stabilized, investors felt secure enough to risk capital, and mining companies were able to find financing such as loans and credit for their projects. Second, transportation improved, railroad traffic increased, and goods and services were readily available again. Third, mine and mill owners, tired of bearing the costs of idle, profitless properties, were more than willing to extend themselves to bring their operations back into production or sell or lease them to investors who would. Fourth, the demand for industrial metals such as copper, lead, and zinc greatly increased due to the revival of industry. Fifth, advances in mining technology and engineering decreased the costs of ore production, and improved milling methods recovered even more of the metalliferous content than ever. Some of these were developed in response to the Silver Crash.

The last and sixth factor was the production and concentration of low-grade ores in economies of scale through massive investment and mechanization. As noted above, John Terry and the Stoiber brothers pioneered this practice. When capital and credit became available again by the late 1890s, other large mining companies in the county and throughout Colorado imitated them and profited from the abundance of low-grade ore. While the movement gave rise to gigantic operations, smaller outfits were also able to profit when they supplanted labor with machinery and ensured the production of high volumes of ore per shift.

The revival was dramatic in San Juan County at all levels. By 1900, the county population rose 2,300, 700 more than the last peak of 1890. The number of mines nearly tripled from those that were active the depression. In 1898 and 1899, the county featured approximately seventy-five small outfits, twenty-five medium-sized operations, and five large producers. These figures shifted as companies expanded their operations, and the numbers of medium-sized and large mines increased. Between 1900 and 1905, there were fewer small outfits, but the medium-sized mines rose to thirty-three and the large producers jumped to fourteen. The buoyant conditions stimulated a wave of prospecting in turn. In 1898 and 1899, prospectors developed around 25 new properties, and by the early 1900s, they worked at least 100. The production of metals fluctuated during the revival but changed little on average. Yields of approximately $1

[262] *"Mining News,"* *EMJ* (10/3/91): 393; *Silverton Standard* (6/6/96): 5; *Silverton Standard* (8/1/96): 3.

million in gold, $400,000 to $500,000 in silver, $300,000 to $400,000 in copper, and as much in lead per year were the norm.[263]

If the number of mines increased, then production should have risen in concert, and yet it remained static through the revival. What accounted for this trend? First, many of the new mines were failures and produced little ore. Second, the quality of ore decreased and offered a smaller metals content, which was troublesome because the material was already low in grade. Third, some large companies exhausted their ore reserves, and even though the mines were physically substantial, their production was not as high as might be expected.

While the revival brought San Juan County out of the post-Silver Crash depression, it changed the corporate landscape of the mining industry. The massive amounts of capital required to mine and mill economies of scale, and the proportional profits to be made, attracted companies that were larger, and capitalists who had more power than in years past. Most of the substantial companies consisted of groups of wealthy investors with interests in other mining regions and even separate industries. These companies had plenty of capital, developed individual mines into major operations, and were satisfied with regular ore production. Some of the companies owned proven mines and mills throughout the San Juans and considered their overall profitability most important, even if a few of the individual operations failed. Companies sought domination within the industry, speculated with prominent mines as if they were no more than prospects, and worked through subsidiaries. These entities contributed to an atmosphere of corporate mining in the county, although a high number of modestly sized operations maintained a strong local presence.

The American Smelting & Refining Company (ASARCo) was among the first of the massive corporate entities to affect San Juan County. The company was organized in 1899 by some of Colorado's and the nation's most powerful smelter men. They were bent on nothing less than national domination of the smelting industry, which they hoped to achieve through the business trust of ASARCo. James B. Grant of the Omaha & Grant Smelting & Refining Company was among the organizers, and he included the Durango Smelter in the new trust. In the same year, ASARCo acquired Otto Mears' Standard Smelter, and in so doing, controlled a significant share of the smelting capacity that served the San Juans.[264]

The company was adamantly antilabor and had the support of Frank Guiterman, manager of the Durango Smelter. Guiterman detested organized labor from personal experience quashing strikes at Telluride, and he carried his policies over to the Durango Smelter. In 1899, the State of Colorado mandated the eight-hour law for mill workers, and clever Guiterman told his workers that he would uphold the law but pay them for only eight hours instead of the usual ten-hour shift. Guiterman underestimated the power and unity of the workers, who belonged to the Mill and Smelterworkers' Union, and they struck and literally shut down both plants. Chapters in

[263] Henderson, 1926: 216; Schulze, 1977: 1890-7; Schulze, 1977: 1900-10. The number of active mines was derived from a survey of *Colorado Mining Directory*, *EMJ*, and *Silverton Standard*.

[264] James E. Fell, Jr., *Ores to Metals: The Rocky Mountain Smelting Industry* (Lincoln, NE: University of Nebraska Press, 1979) 223, Ransome, 1901: 23; Smith, 1982: 101; Smith, 1992: 78.

Pueblo, Denver, and other smelting centers in Colorado followed in sympathy, and the Western Federation of Miners threatened similar action at many mines in Colorado.[265]

The result of the massive strike was profound. At first it paralyzed Colorado's mining industry, and as mines began to close, the demand for coal slackened and railroads curtailed traffic. Some of the mining districts in the San Juans were definitely in trouble, although Silverton offered enough ore treatment to soften the blow in the Animas River drainage. The mining industry became polarized as prolabor individuals sided with the strikers and antilabor forces, mostly mine owners, argued that the action was to everyone's ruin. In heavily unionized San Juan County, mine owners felt threatened by the potential for sympathy strikes. Newspapers fed the fires of tension and harped on the fact that if the strike in Durango forced the closure of mines, 500 workers in Silver Lake Basin and Arrastra Gulch alone would be jobless. After several weeks, the Colorado Supreme Court declared the eight-hour day unconstitutional, the wages and shift issue was back to where it started, and the strike collapsed. Everyone breathed a sign of relief as mining returned to normal in the Las Animas district.[266]

Despite the near monopoly that ASARCo held over the smelting industry, mining companies in the Animas River drainage generated enough ore to support at least one niche smelter. Unable to compete with the Durango plant, Thomas Walsh closed his Silverton Smelter in 1898 or 1899. The San Juan Smelting & Refining Company filled the void with the Kendrick-Gelder Smelter, built at mouth of Cement Creek in 1900. Like Walsh's facility, the Kendrick-Gelder Smelter specialized in treating ores rich in pyrite and copper, which attracted mining companies in the Red Mountain district. Because some of the operations in the Las Animas district had similar payrock, they found the smelter to be of benefit.[267]

In 1907, the vagaries of economic cycles again impacted San Juan County. This time, a national recession struck, and it nudged San Juan County into decline. The year began like many others during the revival. Mining companies generated almost $1 million in gold and $105,000 in zinc, then being recovered as an important industrial metal. Miners also produced $776,000 in silver and $662,000 in lead, both in greater quantities than previous years. The county was so productive that it ranked second only to Leadville in terms of lead and copper in Colorado. As the recession set in, prices ebbed until silver averaged a lowly $.56 per ounce and copper dropped from $.17 to $.13 per pound. At the same time, many mining companies were experiencing only low-grade deposits. The large companies with concentration mills were able to subsist on ore valued at $6 to $12 per ton, but the value had to be double for those companies without. Many small outfits simply lacked such payrock and were forced to close. Production in the county declined after 1907, peaked briefly in 1910, and then abruptly dropped off. The number of active mines fell from the heights of the early 1900s to around ten small outfits, fifteen medium-sized operations, and five large producers. Mining in the county contracted

[265] Fell, 1979: 227; Smith, 1992: 78-9.

[266] *Denver Times* (6/7/99): 2; Fell, 1979: 230; Smith, 1982: 128.

[267] *"Mining News," EMJ* (7/14/00): 48; *"Mining News," EMJ* (5/15/09): 1019; *"Mining News," EMJ* (1/26/01): 28; *"Mining News," MSP* (5/22/09): 708; *Silverton Standard* (1/8/10); Sloan and Skowonski, 1975: 121, 142.

around those large companies that were savvy and wealthy enough to profit from their low-grade ore reserves.[268]

In the face of low metals prices and poor economic conditions, some of the large mining companies again made a concerted effort to cut their operating costs. Management closely examined budgets, and, in what was becoming a wearisome pattern, identified labor as a place to seek savings. The companies tried to get more out of their workers for less money by either increasing hours or reducing pay, which set the stage for inevitable conflict. Both labor and the companies were well prepared. Willis Kinney and Franklin L. Ross represented the San Juan Mine Owners' Association, and the Silverton Chapter of the Western Federation of Miners was a shield for the miners. Ross was related to J.B. Ross and a partner in the Ross Mining & Milling Company. Kinney himself rose from humble working-class roots, as the son of a leather merchant. In search of opportunity, he journeyed to Pueblo in 1880 and worked in a smelter then as a miner in Silver Cliff, before moving to the San Juans in 1883. Prior to his success with the Gold King, Kinney managed the Harrison Mine.[269]

In response to the mining companies' desire to either extend the miner's work day or reduce pay, the miners' union demanded a wage of $3 per eight-hour shift, which the mine owners' association vehemently protested. As tensions rose in 1907 and a strike seemed imminent, the Deputy State Labor Commissioner made a trip to Silverton to mediate. The miners' union and more than one thousand members proved to be a resolute opponent. To avoid a shutdown of the mining industry, risky in the poor climate of the recession, Kinney and Ross acceded to the miners' demands.[270]

The economic climate was especially unkind to the county's milling industry. Collectively, the small mining companies constituted the principal customer base for the independent mills. The small outfits were unable to afford their own concentration mills and had to send their ore to these facilities, which either purchased the material or treated it for a fee. Most of the large mining companies, in contrast, did little business with the independent mills because they concentrated their own ores in-house. Some companies, such as at the North Star, even accepted custom business to offset the waning production from their own mines. When the small outfits began to run out of ore valued above the $12 to $24 per ton threshold, they sent less to the independent mills. As a result, the demand for custom treatment slumped, which caused the independent milling business to collapse. Only the Silverton Public Sampler, Silver Lake Mill, and Kendrick-Gelder Smelter accepted custom business after 1907.[271]

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[268] George E. Collins, *"Mining in the United States During 1908: Colorado,"* *EMJ* (1/9/09): 104-5; George E. Collins, *"Mining in the United States During 1909: Colorado,"* *Engineering & Mining Journal* (1/8/10): 97-8; Howe Cross, 1905: 26; *Mineral Resources*, 1908: 395; Saxon, 1959: 7, 8, 14, 16; Henderson, 1926: 216 for production figures. *EMJ* and *Silverton Standard* for number of active mines.

[269] Brown, 1984: 71; Kinney, 1932; *"Mines of Cement Creek: Wonderful Progress made during the past Seven Years and a Great Future planned by People of Enterprise,"* *Silverton Standard* (10/19/01); Sloan and Skowronski, 1975: 49.

[270] *"Special Correspondence from Mining Centers,"* *EMJ* (7/20/07): 133; *"Special Correspondence from Mining Centers,"* *EMJ* (7/27/07): 180.

[271] *"Mining News,"* *EMJ* 4/18/08): 832.

The reason why the Kendrick-Gelder Smelter survived was because it was a niche facility that processed ores primarily with a high copper and pyrite content. The Durango Smelter, and the independent mills that did business with Durango, shunned such ores because they were incompatible to process alongside the region's lead-zinc material. In 1905, J.B. Ross purchased the smelter from the San Juan Smelting & Refining Company, which was in trouble, to treat pyretic ore from his mines in the Red Mountain district. His Ross Mining & Milling Company owned the Congress on Red Mountain Pass, the Galty Boy in Cement Creek and the Champion, all of which yielded pyretic ore. Ross also operated the Silver Wing, Bandora, and other lead-rich mines at times to fuel the smelter with fluxing-grade ore. The firm also hoped to attract custom ores from independent mines in the Red Mountain district. The Ross brothers did well with the mining business but not with the smelter. Their mines provided enough ore to pay most of the operating costs, but little custom ore came down from Red Mountain. Thus, the Ross brothers shut down the smelter in 1908 and sold the facility to wealthy New York investor W.B. Lowe a year later. Lowe attempted to modify the furnaces to treat lead-zinc ores typical of San Juan County in hopes of securing local business. The facility proved unable to economize production sufficiently, and in 1910, Lowe closed Silverton's last independent smelter.[272]

Las Animas Mining District

The Las Animas district featured several of the county's most significant companies during the late 1890s revival, and although they were among the largest in the county, the companies were local entities because their directors began in Silverton. These included Edward Stoiber's Silver Lake Mines Company and Gustavus Stoiber and James Robin's Iowa Mining & Milling Company. At Silver Lake, Edward continued to reinvest capital. As aforementioned, Edward planned a tramway from the mine down to an ore storage terminal, with the first 8,700-foot long segment, built to a short distance above the Iowa Mill. In 1898, he finished the system. He contracted again with William Frey who began construction on the tramway's second segment and on a massive terminal that replaced the original. In addition to receiving ore, the terminal served as a base station for the mine and included assay, machine, and carpentry shops. In total, the ore bins had the capacity for 16,000 tons of material, and the two tramway segments totaled almost 15,000 feet, making it one of the longest systems in the state.[273]

The underground workings in Silver Lake Basin took the form of an ore factory with more than a dozen miles of passages and levels linked by a central internal shaft. An electric hoist raised a cage in the shaft, and miners pushed loaded cars off the cage and across a long set of ore bins directly over the Stoiber Tunnel. Mules pulled trains of cars under the bins, workers filled them, and they continued out to the mill. To expedite the blasting process required to break the ore loose, Edward employed compressed air rock drills. When he wanted to increase the number of machines, he realized that a new compressor would have to be hauled up to the mine

[272] *"Mining News,"* EMJ (5/15/09): 1019; *"Mining News,"* MSP (5/22/09): 708.

[273] *"Mining News,"* EMJ (8/20/98): 225; *"Mining News,"* EMJ (8/27/98): 256; Prosser, 1914; Ransome, 1901: 156; *"The Silvery San Juan Has Enjoyed a Year of Unparalleled Prosperity in all Lines of Industry"*.

and sought an alternative. In keeping with his progressive attitude, Edward decided to experiment with revolutionary electric models, since the mine already had an electrical infrastructure. By January 1899, miners were using the drills with success, drawing the attention of mining experts.[274]

In 1900, ten years after Edward began at the Silver Lake, he finally accomplished his vision. When the *Silverton Standard* received the news of the tram terminal under construction in 1898, the editors postulated that Edward would eventually build a mill on the site. Fulfilling the predictions, Edward did just that in 1900. With McCartney's assistance, Edward personally designed the new mill and selected the equipment, and then pushed its construction around the clock throughout the year. The mill and associated facilities were among the largest and most advanced ore treatment complexes in the San Juans, if not Colorado. The main building alone covered two acres, and the ore delivery structure and terminal built in 1898 occupied additional ground. With an array of advanced equipment, the mill was able to treat an astounding 1,000 tons of ore every 24 hours, more ore than many mines generated in a month. In general arrangement, the Silver Lake was now like Terry's Sunnyside, only the facilities were at least twice the size.[275]

While the Iowa Mine was not quite as extravagant as the Silver Lake, Gustavus Stoiber and James Robin were almost matching Edward's improvements one-for-one. They already owned the Royal Tiger Mine, across Silver Lake from the Iowa, and incorporated this sound producer into the Iowa operation. In 1898, Stoiber and Robin organized the Tiger Mining & Milling Company to finance an aerial tramway to the Iowa, a compressed air line from the Iowa, and additional surface facilities. The double-rope tramway allowed miners at the Royal Tiger to send ore over the lake and into the Iowa terminal, where workers coupled the buckets onto the main line. The buckets then coasted down to the Iowa Mill, emptied by workers, and sent back up to the Royal Tiger for filling. To power a number of new drills at the Royal Tiger, Stoiber and Robin increased the capacity of the compressed air system at the Iowa.[276]

Imitating Edward, Gustavus and Robin decided to build a storage terminal on the Animas River for concentrates from their Iowa Mill and smelting-grade ore from the mine. Gustavus chose a site on the north side of the river slightly east of Arrastra Gulch. Crews then erected the facility in 1899, completed a tramway to the mill, and secured direct freight service from the Silverton Northern Railroad.[277]

In addition to aggressively pursuing improvements at the Silver Lake and Iowa, Edward and Gustavus continued to fiddle around with their joint tunnel project, originally known as the Silverton Deep. The idea behind the tunnel was to undercut the ore systems of both mines at great depth, provide a platform for miners to stope the veins 700 feet upward to the existing workings, and serve as a central artery through which the deep ore could be hauled out. Such a project would be an engineering feat on par with similar tunnels in Creede, Idaho Springs, and

[274] Arthur Lakes, *"The Silver Lake Mine,"* Mines and Minerals (Apr 1903): 389; Ransome, 1901: 156.

[275] Bureau of Mines, *Manuscripts MSS 640 V.27*: 19; *"Mining News,"* EMJ (12/1/1900): 648; *"Mining News,"* EMJ (5/11/01): 600; *"Mining News,"* Mining Reporter (12/4/00): 361; Ransome, 1901: 156.

[276] Colorado Mining Directory, 1898; *"Mining News,"* EMJ (8/27/98): 256; *"Mining News,"* MSP (5/14/98): 519.

[277] *"Mining News,"* EMJ (7/14/00): 48; *"Mining News,"* Mining Reporter (1/25/00): 52; Silverton Standard (1/26/00).

other important Colorado mining districts. The Stoibers started the tunnel in 1895 but put the project on hold. With both mines highly productive by 1897, they renewed their interest in the tunnel and renamed it the Unity, probably to reflect their fraternal cooperation. Teams of expert miners resumed work on the tunnel, and around 1898, Edward installed a mechanized surface plant that included an aerial tramway tied into the Silver Lake system. Edward provided the Unity crew with plumbing, steam heat, and electric lighting. In 1901, miners made the connection with the deepest workings in the Silver Lake Mine, around 3,000 feet to the south.[278]

During the early 1900s, large corporate entities from outside the county targeted well-developed properties in the Las Animas district for acquisition. The North Star Mine was one of the first to draw interest. After operating the property for more than twenty-five years, the Crookes decided to sell after realizing around $2.5 million in ore. In 1900, they were approached by wealthy and experienced investors with the Smuggler-Union Mining Company. This outfit was one of the largest in Telluride and held the Contention Mining Company as a subsidiary. Some of the investors were from Boston, others associated with the powerful Calumet & Hecla Mining Company in Michigan, and the rest were local to the San Juans. The Contention directors offered the Crookes a fair price, and they accepted.[279]

Like the Stoibers, the Contention company intended to build a mill on the Animas River, secure a siding from the Silverton Northern Railroad, and send the ore down through Little Giant Basin via tramway. The Contention company wasted no time in pursuing its production scheme, but there was one important impediment to the plan. The summit of North Star Peak lay between the mine's surface plant and Little Giant Basin, the tramway route to the mill. Further, the route itself was not straight and featured a crook like Stoiber's Silver Lake system. After considering these factors, the engineer bored a tunnel from the North Star workings through the peak and blasted a room out of the north cliff. In the room, workers erected a terminal for a double-rope reversible tramway, which descended to the abandoned North Star Mill in Little Giant Basin. They converted the mill building into a midway station, and a Bleichert system continued down to the Contention Mill on the Animas River. The tramway was unique because of the refitted mill and two different legs.[280]

Once the mill and tramway were finished, the company increased the workforce to 100. Miners engaged in development and ore production, and others started up the Contention Mill on the river. After only a year, however, the entire operation collapsed. Bulkley Wells, the colorful manager of Smuggler-Union, had neglected to adequately develop the ore veins in the North Star and did not ensure that the concentration process in the mill was truly effective. During the winter of 1902, Wells closed the mine and mill as a monumental failure, and the company looked to its other mines to recover the loss.[281]

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[278] Lakes, 1903; *"Mining News,"* EMJ (12/8/00): 677.

[279] Bureau of Mines, *Manuscripts MSS 640 V.27*: 16, 18, 27, 59; *"Mining News,"* EMJ (7/20/01): 77; *"Mining News,"* Mining Reporter (1/9/02): 30; *"Mining News"* Mining Reporter (1/30/02): 146.

[280] Bureau of Mines, *Manuscripts MSS 640 V.27*:59; *"Mining News,"* Mining Reporter (11/7/01): 369; *"North Star Group,"* Mining Reporter (10/2/02): 270; Prosser, 1914.

[281] Colorado Mine Engineers' Reports: Shenandoah-Dives; Prosser, 1914; *Silverton Standard* (1/2/04).

In 1901, Edward Stoiber's Silver Lake empire was the subject of the second acquisition in the Las Animas district by a major corporate entity. The Guggenheims, empire builders on a national scale, offered Edward a stunning $2.5 million for the Silver Lake collection, or $54 million today. Some sources claim that Edward accepted around $1.3 million in cash and the rest in stock. The only stipulation that Edward had was that he be retained as a consultant until the mill was finished and treating ore successfully, which was proven in May. Satisfied that his legacy was fully functional, Edward and Lena retired to Denver and traveled Europe.[282]

The Guggenheims continued Edward's operation. They purchased the Titusville for $500,000 and the Scranton City because these mines lay long the same geological features as the Silver Lake workings. Immediately after the transactions, Samuel I. Hallett, a talented mining engineer and metallurgist, arrived from Aspen to replace Robert McCartney as manager. Hallett maintained the Silver Lake Mines Company structure, kept the employees, and hired McCartney as a consultant. McCartney attended to other operations as well, including the North Star Mill on Sultan Mountain. Amusingly, one of the first changes that Hallett instituted was the replacement of some of the concentration machinery in the mill with Hallett tables, apparatuses of his own design.[283] The Guggenheims did not have the personal interest that possessed Stoiber, and problems soon developed. The first drew Stoiber's honesty into question. Within three months of the sale, the principal ore vein pinched out, leaving the costly operation with much less payrock than had been supposed. Possibly at Stoiber's recommendation, Hallett directed nearly all the miners to extract the existing ore and drive exploratory workings in search of the lost vein and others. The miners triumphed, Hallett was relieved, and Stoiber exonerated.

Although Hallett was not as intimate with the mine as Stoiber, he was an effective manager. The workforce produced 260 tons of ore per day, and although this was only one-quarter of the new mill's capacity, it still was more than any other mine in the county. Around 30 percent of the ore flowed out of the Unity Tunnel, which was now a haulageway for the Silver Lake's lower workings, and the remainder came from Silver Lake Basin. The figure was honorable, especially given that the mill reduced the ore to 60 tons of concentrates, which required daily rail service to remove. With all the ore descending to the Silver Lake Mill, Hallett mothballed the old facility in Silver Lake Basin. Shortly after, the Guggenheims dispatched Hallett to Mexico to examine several promising mines there.[284]

In 1903, the Guggenheims merged with smelting giant ASARCo, which controlled the Silver Lake empire both for the mine's profitability and as a source of ore for the Durango Smelter. Under ASARCo, problems with the Silver Lake continued and consumed profits almost as quickly as they were generated. In October 1904, workers in the tramway's turning station above the Iowa Mill stoked their stove a little too high, and the wind blew sparks out of the

[282] Colorado Historical Society *Manuscripts MSS 640, V.27*: 20; Denver Times (5/2/01): 4; Denver Times (12/29/01): 6; *"Mining News,"* EMJ (5/11/01): 600; *"Mining News,"* EMJ (8/27 01): 539; *"Mining News,"* Mining Reporter (1/9/02): 30; Prosser, 1914; Silverton Standard (6/7/02); Wolle, 1991: 428.

[283] *"Mining News,"* EMJ (10/11/02): 494; *"Mining News,"* Mining Reporter (9/25/02): 258; *"Mining News,"* Mining Reporter (10/30/02): 363.

[284] Denver Times (11/23/01): 9; *"Mining News,"* EMJ (3/14/03): 423; *"Mining News,"* EMJ (6/20/03): 945; *"Mining News,"* Mining Reporter (5/1/02): 437; *"Mining News,"* Mining Reporter (6/11/03): 549; Prosser, 1914.

stovepipe onto the building, which caught fire and burned to the ground. The cables on both tram segments released, which dropped the tram buckets and pulled over a number of towers. The system was a total wreck and the conflagration suspended the entire mining operation. The Silver Lake Mill was shut down until the tram system could be repaired, and instead of bringing the original mill in Silver Lake Basin back into operation, the manager laid off half the workforce and curtailed activity at the mine.[285]

After the tramway had been repaired, another catastrophe struck. In 1906, workers at the Silver Lake Mill noticed that a fire had been deliberately started in the office and sounded the alarm. They frantically rushed to the hydrants only to find that someone had cut the hoses. With no way to control the fire, the blaze enveloped the entire building, ancillary structures, and the lower terminal for tramway, which suffered another massive release. The devastation was not total because the ore elevators, powerhouse, shops, and boardinghouse remained intact. Without a mill, ASARCo suspended operations yet again and considered whether the Silver Lake was worth the trouble. The disaster caused a distinct dip in the county production figures for 1906.[286]

ASARCo decided to invest in the Silver Lake one more time and likely consulted with the manager. Guess to revise the original operating strategy. ASARCo floated the idea of reopening the long-quiet Aspen Tunnel, which still offered low-grade ore with a high zinc content. A single mill, however, would not be very efficient for the ore from both mines since it differed greatly, and in response, Guess planned a mill with two separate flow paths. One path would be tailored to ore from the Silver Lake and the other could treat not only high zinc payrock from the Aspen, but also custom orders. By April 1907, the reincarnated Silver Lake Mill was finished and featured split flow paths as planned. The path for Silver Lake ore could treat 200 tons per day and the other path half that, a large downgrade from Stoiber's original design of 1,000 tons per day.

The Iowa Gold Mining & Milling Company, second largest outfit in the Las Animas district and one of the county's most profitable, experienced problems during the early 1900s even worse than the Silver Lake. Gustavus Stoiber and James Robin discovered that the main problem with producing ore in economies of scale was that a mine's life was relatively short when the ore reserves were limited. By 1901, the Iowa showed signs of exhaustion after only six years of intensive mining, and, in response, Gustavus and Robin pursued an aggressive exploration and development campaign to prolong operations. When this failed, they curtailed operations, let go more than half of the workforce, and suspended the mill and tramway. Gustavus and Robin then took the option that companies reserved for times of trouble and leased both the Iowa and Royal Tiger properties while seeking a buyer. In 1902, around forty workers sought ore in both mines, and Al Kunkle struck a fabulous vein in his Royal Tiger lease, but it lasted for only one year. Because of the meager production from both properties, no one

[285] *"Mining News,"* *MSP* (2/4/05): 77; *Silverton Standard* (10/24/04); *Silverton Standard* (12/17/04).

[286] *Mineral Resources of the United States* (Washington, D.C.: U.S. Geological Survey, Government Printing Office, 1906) 232; *"Mining News,"* *MSP* (5/5/06): 301.

seriously considered purchasing the complex, including the Guggenheims, who owned the Silver Lake on one side of the Iowa and the Titusville on the other.[287]

The stress of the rapid Iowa's failure proved to be too much for Stoiber and Robin. Depressed and despondent, Robin shot himself in 1903. In 1905, an avalanche wrecked a significant portion of the Iowa Mill. Gustavus died of a massive stroke on the train from the Red Mountain district down to Silverton soon after.[288]

During the late 1890s and early 1900s, the revival in the Las Animas district was by no means limited to large companies. Investors with moderate resources, who greatly outnumbered the Stoibers, Robins, and Guggenheims of the industry, financed and even personally worked a number of small to medium-sized operations. Some of these were continuations from the mid-1890s while a substantial proportion of them were new. Significant fortunes were not won or lost on these mines, by they were an important part of the revival on a cumulative basis.

While most of the companies organized during the late 1890s boom were there to mine, a few sought riches by exploiting investors. For much of its history, San Juan County saw little obvious fraud, but free-flowing capital of the revival proved to be a sound financial resource for a few highly dubious schemes. In 1897, B.F. Kelly and W.H. Bush organized a project so preposterous that only investors as out of touch with reality as Edward Innis could possibly see its merit. Kelly and Bush established the Gold Tunnel & Railway Company to drive the Oro Tunnel no less than 20,000 feet from the Animas River east under Deer Park and Silver Lake Basin, terminating at the Highland Mary Mine. Not only was the tunnel supposed to pierce known veins, but, as with the Mineral Point Tunnel, it in theory was going to discover new formations and repay investors many times over. In 1898, Kelly and Bush collected enough money to secure the Highland Mary and a site on the Animas River, and began work.[289] Silvertonians, well versed in mining, frowned on the project, as the *Silverton Standard* stated: "B.F. Kelly, better known as 'Tunnel Kelly,' if he never was thought of before as being a rustler and 'smart' man, will be now since he and W.H. Bush, the promulgators of the famous Oro Tunnel scheme, have realized out of their enterprise $400,000."[290] The project was a clear sign to the Las Animas district that investors in fact had plenty of capital and were eager to spend it during the late 1890s. The Oro was not Kelly's only venture, and he engaged in similar projects in Clear Creek County. As preposterous as the Oro was, it led to one of the most important operations to develop in the Las Animas district during the revival.

The operation involved the Highland Mary, which Innis left as a ready-made mine when he went bankrupt in 1885. When miners originally drove the Innis tunnel, they pierced several major silver veins but did little with them because Innis was bent on finding the lake of gold. Kelly and Bush also neglected the veins probably because they were focused on their financial scheme and took little interest in what the Highland Mary had to offer. Kelly and Bush were

[287] *Silverton Standard* (1/18/02); *Silverton Standard* (2/22/02).
[288] *"Mining News," MSP* (8/12/05): 116; *"Obituary," Mining Reporter* (1/13/03): 61; Sloan and Skowonski, 1975: 163.
[289] *"Mining News," EMJ* (7/3/97): 16.
[290] *Silverton Standard* (10/8/98).

ousted from the Gold Tunnel & Railway Company in 1900, and Mary B. Murrell of Denver, Toledo investor C.W. Everett, and New York City capitalist John R. Wyatt assumed control. Murrell was probably the first of the partners to realize that at least several silver veins lay undeveloped in the Highland Mary and convinced Everett and Wyatt to organize the Highland Mary Gold Mining & Railway Company to bring them into production.[291]

Because knowledgeable about mining, Murrell assumed the position of manager, extremely rare in the mining industry. In 1902, she hired fifteen miners who repaired the surface plant and began rehabilitating the 6,500 tortuous feet of the winding Innis Tunnel. At the same time, Murrell secured J.A. Snedaker to build the mill originally planned for the Oro Tunnel, but adjacent to the Innis Tunnel where it was actually needed. Snedaker designed an excellent facility that not only effectively concentrated ore, but also included a small hydropower generator for electricity. The mine, however, was a long way from being truly profitable because the underground workings were so disorganized that they interfered with the movement of ore to mill. Under superintendent W.E. Wilson, miners split their duties between ore production and trying to link the disparate levels together through vertical workings. By 1904, he was satisfied with the development and directed the crew to send a steady stream of ore into the mill. The operation enjoyed such a high level of profitability through 1906 that the Silverton Northern Railroad considered grading a line up Cunningham Gulch to the mine.

On the other side of North Star Mountain, the Black Prince had the signs of becoming a major operation. In 1902, W.B. Severn, L.H. Chadwick, and other investors from Chicago and Michigan organized the Black Prince Gold Mining Company with the intent of developing the forgotten Black Prince vein. Severn and partners found that, with Contention's mill and tramway, the Black Prince was almost a ready-made mine. Eager to be done with the North Star debacle, the Contention company was more than willing to sell the Black Prince claims, the tramway, and the mill to Severn and partners.[292]

During the fall, the company put a large crew to work driving the main tunnel toward the vein and erecting a well-appointed surface plant. The conservative *Engineering & Mining Journal* noted: "Black Prince. This company has purchased the possessions of the Contention Mining Company on King Solomon Mtn, near Silverton, and is making many improvements. The old Contention tram is also being extended to the Black Prince lode." The tramway was not exactly "extended" and was, in reality, shortened. Workers erected a new terminal directly under the original Contention system and linked it to the Black Prince with a rail line. When the adjustments were finished, the Black Prince company operated the mine and mill with success at first. However, repeating the same pattern of the preceding twenty-five years, the ore increased in complexity with depth, the mill recovered only a fraction of the metals content, and the mine proved very expensive to operate. Had the investors looked into the histories of the operations that surrounded the Black Prince, they may have been more thorough in their planning. By 1904,

[291] *"Mining News,"* EMJ (2/23/01): 253; *"Mining News,"* Mining Reporter (7/11/01): 29; Silverton Standard (10/26/01).
[292] Colorado Mine Engineers' Reports: Shenandoah-Dives Group; *"Mining News"* Mining Reporter (11/20/02).

the company closed the mine but continued to run the mill as a custom facility on ore from other mines in the area.[293]

The Lackawanna Mine, on the north flank of Kendall Mountain above Silverton, was promising enough to draw significant investment. In 1898, George Whitelaw and John Norton, principals with the Four Metals Mining Company in Pueblo, added the property to its growing roster of mines in the San Juans. By driving exploratory passages on several veins, miners found enough ore to sustain a constant but limited production, which encouraged the company to invest in surface improvements. A system for shipping and storing ore was among the new facilities, and it consisted of a double-rope reversible tramway and set of ore bins on the Animas River. The Four Metals Mining Company enjoyed such success with the Lackawanna that one of the directors proposed a concentration mill at the base of the mountain. After several years of regular production, the rest of the directors felt confident enough to agree and financed a modest facility. Workers finished the mill in 1903, which is when trouble began. Similar to the Black Prince, the ore was too complex for the mill and the veins featured less material than expected. By 1904, Whitelaw and partners found the operation became unprofitable and stopped work.[294]

The Las Animas district weathered the 1907 recession better than most, but was not immune to the widespread failure of many of the small and medium-sized mines caused by the poor economic conditions. Some of these, however, were replaced by new ventures of similar size and productivity. In addition, the Silver Lake and the Iowa maintained their status among county's most important operations.

Despite this status, the dismal economic climate and a host of problems gave ASARCo reason to doubt whether the Silver Lake had been worth buying from Stoiber. When the replacement Silver Lake Mill was finished in 1907, ASARCo planned to treat silver-lead ore from the Silver Lake Mine in one of the two flow paths and zinc-rich material from the Aspen Tunnel in the other circuit. The Garfield Smelting Company, a subsidiary of ASARCo, reopened the Aspen, a short distance west of the mill, and was confident enough in the operation to build a new tramway. The arrangement, however, was short-lived. Neither treatment path in the new mill recovered a sufficient percentage of the metals content. ASARCo found that the facility was simply not profitable and suspended operations. ASARCo cancelled production at the Silver Lake and leased out blocks of ground instead of working the mine itself. Garfield decided to continue with its Aspen project and erected its own mill at the tunnel. Garfield's metallurgist had no better luck with the zinc-rich ore, however, and after spending a small fortune on a brand new mill, Garfield suspended work at the Aspen as well.

With an enormous amount of capital invested in both the Silver Lake mine and mill, ASARCo was unwilling to concede defeat. The managers agreed that the split treatment concept in the Silver Lake Mill held great potential, so they went back to the drawing board to refit the

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293 *"Mining News,"* EMJ (12/13/02): 795.

294 Bureau of Mines, *Manuscripts MSS 640 V.27*:98; *"Mining News,"* EMJ (2/8/02): 223; *"Mining News,"* EMJ (7/19/02): 93; *"Mining News,"* Mining Reporter (3/12/03): 249; Silverton Standard (1/25/02).

facility. The task likely fell to Louis O. Bastian, a milling expert who served as one of the superintendents for much of the decade and had experience with the facility. By late winter of 1909, ASARCo was ready to try again, brought ore down from the Silver Lake and over from the Aspen, and ran the first tests. To the relief of all, the mill ran as expected, after two years of delays. Management prepared to resume normal operations at the Silver Lake Mine, but before they made headway, the tramway's turning station burned. Yet another disaster struck when a series of avalanches let go following a powerful spring storm in 1911. One slide took out towers for both the Silver Lake and Iowa tramways and laid power lines on the ground, which shorted and started a fire at a transformer station. ASARCo fixed the tramway relatively quickly.[295]

In June, ASARCo sent a crew of eighteen miners to join the lessees at the Silver Lake and they naturally took up residence in one of the boardinghouses. While the massive residential complex was not filled to capacity, Silver Lake lessees and a considerable crew of miners employed at the Iowa made for a population of several hundred. The population, however, was too transitory for the Postal Service to justify maintaining the Arastra office, which was revoked in 1910. By July, the ASARCo miners began production, and as the demand for lead-rich ore increased at the Durango Smelter, ASARCo sent up additional teams until the workforce was around one hundred by the fall. The atmosphere of Silver Lake Basin approached the heyday years under Stoiber and the tramway carried as much as 100 tons of ore per day down to the mill.[296]

The last and final disaster for ASARCo struck in the summer of 1912. Leaving out the intense drama and excitement, the *Mining & Scientific Press* dryly reported that: "A fire occurred on June 30 at the Silver Lake Mine, near Silverton, owned by the American S.&R. Co. Practically all the mine buildings were destroyed, except the boardinghouse, which was saved by dynamiting smaller buildings between it and the blacksmith shop, where the fire started. The upper terminal of the tramway was destroyed, necessitating the closing of the mill."[297] With that, the company finally gave up on the mine, leased out blocks of ground to small parties.

Ironically, the Silver Lake and Iowa mines literally traded roles after the 1907 recession. Whereas the Silver Lake produced heavily and the Iowa was failing before the recession, the Iowa resumed its status as a major operation and the Silver Lake declined. The poor economic conditions facilitated the juxtaposed relationship, but the greatest factor was the difference of management strategy between the conservative ASARCo at the Silver Lake and a new organization that operated the Iowa.

After Gustavus Stoiber and James Robin died, their heirs and the surviving Iowa Tiger Consolidated Mining & Milling Company directors assumed that both the Royal Tiger and Iowa properties were bereft of profitable payrock. Otto Mears suspected otherwise and reasoned that if the Iowa and Silver Lake mines were neighbors on the same general ore system, there was no

[295] *"Mining News,"* EMJ (3/20/09): 625; *"Mining News,"* EMJ (4/4/11): 487; *"Mining News"* MSP (2/5/10): 239; Silverton Standard (2/13/09).
[296] Bauer, et al, 1990: 13; Mineral Resources, 1912: 694; *"Mining News,"* MSP (7/8/11): 59; *"Silverton, Colorado,"* MSP (1/20/12): 150; Silverton Standard (7/15/11).
[297] *"Mining News,"* MSP (7/27/12): 126.

logical reason why the Iowa should not match the Silver Lake's eighteen solid years of production. The ore, however, would require expertise to find and attentive management to produce. With this in mind, in 1908, Mears and Jack Slattery approached the Iowa owners with a proposal to lease the entire idle operation. The owners accepted, and Mears and Slattery organized both the Iowa-Tiger Leasing Company and the Mellville Leasing Company, the beginning of a long-lasting and highly lucrative leasing syndicate.[298]

Formally known as John H. Slattery, Jack was a staunch Silvertonian with experience in business and mining. Slattery worked as a civil and mining engineer in the Red Mountain district during the early 1890s left with the Silver Crash of 1893. The collapse of mining made engineering jobs difficult to find, so Slattery chose an industry always in demand. He moved down to Silverton and operated the Bucket of Blood Saloon, subsequently the Hub Saloon, and Grand Hotel. Slattery thus became a community figure, started a baseball club, and even served in the state legislature. Slattery's capital, popularity, business experience, and knowledge of mining made him an excellent leasing partner.[299]

Instead of viewing labor as a resource to be tolerated only by necessity, like Kinney and Ross, Mears and Slattery understood that their success hinged on their miners. Given this, the partners hired the best workforce that could be assembled and gave the miners incentive to find ore and produce it efficiently through a profit-sharing program. Up-front capital for repairs, improvements, equipment, and labor was in excess of what Mears and Slattery were comfortable providing, so they included around five other investors in their small but highly effective leasing syndicate.

Louis O. Bastian, formerly superintendent of the Silver Lake Mill, provided metallurgical expertise and some capital. When ASARCo ran into trouble with the mill, he went into semi-retirement and purchased the Corner Store mercantile in Silverton in 1909, but was easily drawn back into mining probably by Slattery. Matt Delsante was another Silverton resident and immigrant Italian miner familiar with the area's resources. King C. Gillette, of Beverly Hills, was a major contributor of capital. Frank Slattery, Jack's brother, provided management and administrative oversight. James R. Pitcher was Mears' right-hand man and son-in-law. Pitcher met Mears through the Mack Brothers Motor Car Company in New York City as a mutual investor, and they were convinced that the automobile was the wave of the future. Pitcher socialized with Mears and met Mears' daughter Cora, who he married in 1904. The following year Pitcher was appointed secretary and treasurer of the company, but sided with Mears during a stockholder disagreement in 1906 and walked out. Mears brought Pitcher west out of the comfort of New York City to gritty Silverton and offered him the position of manager over the Silverton Northern Railroad.[300]

As a syndicate, the team of seven worked together to lease some of the county's formerly most productive mines, with an emphasis on the Las Animas district. Various combinations of

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[298] *Mineral Resources*, 1908: 396; *"Mining News," MSP* (8/2/08); Sloan and Skowonski, 1975: 285; Tucker, 2003: 114; Weed, 1925: 730.

[299] Sloan and Skowronski, 1975: 285; *Silverton Standard* (4/29/99).

[300] James H. Baker, *History of Colorado* v. 5 (Denver: Linderman Co., Inc., 1927) 153; *Silverton Standard* (4/17/09); *Silverton Standard* (7/3/09); *Silverton Standard* (9/24/10); Sloan and Skowonski, 1975: 51, 242, 333; Tucker, 2003: 115.

two and three of the syndicate members claimed themselves as principals in any given lease while all seven usually contributed capital. As a result, when several names of the syndicate showed up on the paperwork for a lease, it was implied that all seven were actually involved.

During the summer, Mears and Slattery rehabilitated the surface plant and underground workings at both the Royal Tiger and Iowa, and then pursued an organized exploration program for ore. Contrary to the property owners' misconception, the miners found plenty of low-grade material available in the old stopes and began production. The workforce divided itself into six groups. The first two brought the existing ore out of the Iowa and Royal Tiger mines for shipment down to the Iowa Mill, which the third group repaired and operated. The fourth group outfitted the surface plants at both mines, while the last two groups carried out a planned and educated underground exploration campaign. One of these last groups realized that the original Iowa company paid little attention to the geology below the main tunnel level and assumed that ore surely lay deep in the ground. In 1909, miners sank a shaft and discovered an extension of the Melville Vein, which had been previously mined in the upper levels. While additional development demonstrated at least six months' worth of ore at the time, the Melville ultimately yielded for years. Elsewhere in the workings, another crew discovered an entire vein of ore valued at $1,200 per ton, around $40,000 today. In 1910, Louis Quanstrom, the metallurgist in the Iowa Mill, noticed that the proportion of gold recovered from Royal Tiger ore constantly increased and suspected that the miners must have been encountering gold stringers too fine to be obvious. Quanstrom relayed this to the Royal Tiger foreman, who tested the idea by blasting a chamber out of the vein's hanging wall. To everyone's surprise, the shot revealed a hidden, parallel gold vein.[301]

With all the new ore that the Iowa owners originally asserted did not exist, Mears and Slattery kept over one hundred employees busy through 1911 and 1912. The mill workers tried to keep up with the 100 tons of ore sent down to them every day, and the miners made several additional discoveries. Heavy production continued through 1913, and after five years of a continuous yield, Mears and Slattery finally saw operations at the Iowa and Royal Tiger slow.

The 1907 recession did little to stop Martin Houk at the Shenandoah and Trilby mines, in Dives Basin. By the spring of 1908, Houk's Trilby Tunnel was an impressive 2,000 feet long, and miners finally struck the sought-after vein. The findings were troubling, however, as Houk realized that the vein was not quite as rich as he expected. Hoping to find a better section of the Trilby vein, Houk devised a two-pronged approach, driving development workings along the vein from the Trilby Tunnel, and through the Shenandoah. Houk organized the Danville Leasing Company with investors from Danville, Illinois, and briefly brought ore out of both tunnels. When winter closed the pack trails, Houk ordered his miners into an exploration and development phase. Houk's plan paid off in 1909 when miners finally struck a rich copper vein at Shenandoah. However, the crew exhausted the payrock within several months, forcing Houk

[301] Colorado Mine Inspectors' Reports: Iowa; *"Editorial Correspondence: Denver,"* EMJ (7/30/10): 230; *"Mining News,"* EMJ (10/30/09): 893; *"Mining News,"* MSP (7/23/10): 130.

to return to his investors for more money. Although the ore in the Trilby proved unprofitable, Houk kept the Shenandoah in constant but limited production through 1912 when he moved on.

When the Shenandoah came available, Daniel McLean mobilized to lease the historic producer. McLean, who lived in Durango, leased the Dives several years earlier and felt that the basin still had much to offer if managed correctly. In 1913, McLean organized the Dives Leasing Company, sent a crew of miners up to the Shenandoah, and continued where Houk left off. McLean's miners had no trouble finding enough ore to assemble a shipment and sent 132 tons down on mules when the trails were free of snow.[302]

While some of the large operations were able to weather the 1907 recession, many of the small and medium-sized mines became scenes of great disappointment and lost capital. Such was the case with the Lackawanna Mine. A group of miners optimistically took a lease on the property early in 1907, but as the economic climate disintegrated and metals prices slipped, they were unable to find the capital necessary for exploration and suspended operations. At the same time, Henry Frecker, who purchased the Little Nation Mine above Howardsville in 1900, was finally ready for production. During the preceding seven years, he pushed the Tom Trippe Tunnel, the lowest of three entries, toward the Royal Charter Vein as capital came available. In 1907, he finally reached his destination and rounded up the capital for formal development and even a mill, which he planned at Howardsville.

Howardsville was thriving in 1907, although the town remained fairly static. Howardsville continued its role as a hub for Cunningham Gulch and supported a number of service businesses, a railroad station on the Silverton Northern, freight outfits, and slaughterhouses. The late 1890s boom had a limited impact and brought more people and Rickett's Mill, a concentration facility that failed within several years. By 1907, the population was mostly working class and numbered around 150 to 170.[303] As soon as the snow of 1908 melted, Frecker hired a construction gang to build the mill. By July, the facility was complete and featured a battery of ten stamps to crush ore and concentration machinery to separate out the metals. After a week of testing, the mill seemed to fulfill its promise and the *Mining & Scientific Press* hesitantly declared it a success, but in actuality the ore was too complex for the limited facility. The lack of further coverage suggests that Fecker had to close it sometime during the year.[304]

Cement Creek Subdistrict

The Cement Creek drainage saw a small explosion of activity due to the revival, a change from past trends. The drainage drew little interest during early 1880s boom or the late 1880s, and just as investors prepared to develop a few claims during the early 1890s, the Silver Crash wrecked the economy. By the late 1890s, the drainage was poised to boom because it seemed to be one of the last areas in the county where investors might still encounter fresh bonanzas.

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[302] *"Mining News,"* *MSP* (7/12/13): 72.

[303] Schulze, 1977: 1910-8; Sloan and Skowonski, 1975: 134.

[304] *"Mining News,"* *EMJ* (5/16/08): 1025; *"Mining News,"* *MSP* (5/2/08): 580; *"Mining News"* *MSP* (7/4/08): 6; *Silverton Standard* (4/18/08).

The Gold King Mining & Milling Company, organized by Willis Kinney, Cyrus Davis, and Henry Soule, was already in bonanza. In 1897, Kinney built a mill at Gladstone and a tramway up to Tunnel No.1, which allowed the mine to rank among the county's gold producers. Like many other managers of large mines, Kinney envisioned increasing production through more development and better surface facilities. Financing such a strategy, however, required an enormous capital investment. Funded by stock, creation of subsidiary companies, and debt, Kinney began a major improvement campaign in 1900. Kinney began two new tunnels to undercut the vein system and work it simultaneously from different levels. He organized the American Mine & Tunnel Company to drive the American Tunnel into the mountainside between Tunnel No.1 and Gladstone, and the Anglo Saxon Mining & Milling Company to drive the Gold King Tunnel from the mill at Gladstone (later renamed the American Tunnel). The American company then built a tramway down to the mill. Meanwhile, the Gold King company was entangled in a legal battle with the owners of the nearby Sampson Mine, who claimed that they owned the rights to the entire vein system. Both camps were unwilling to see their profits go to lawyers and came to terms in 1900. The Gold King directors suggested that the two parties merge and share profits, with the majority going to Kinney, Davis, and Soule. The Sampson owners accepted, and the directors reorganized the entire outfit, including the subsidiaries and several coal mines in Durango as the Gold King Consolidated Mines Company.[305]

It appears that the American Tunnel intersected the vein system during 1901, because production increased to the point where Kinney enlarged the mill a second time. The facility reduced around 200 tons of ore per day into forty of concentrates, which were enough to justify daily railroad service. Kinney continued his improvement campaign the following year and attempted to lower production costs and increase the mill's efficiency. Up to 1902, steam powered nearly the entire mining and milling operation, hence company interest in Durango coal mines. To reduce the costs of hauling coal, Kinney installed a powerhouse at the mill and electrified as much machinery as possible. To increase the mill's efficiency, he installed a number of new appliances, including a battery of vibrating tables that recovered gold from what had been discharged as tailings. It remains unknown how much the improvements cost, but they resulted in immediate short-term profits. In 1905 alone, the company realized $656,000. The mining industry recognized the Gold King as one of the county's most advanced operations.[306]

Gold King Mine lent legitimacy to the Cement Creek drainage and inspired investor confidence in other operations. As early as 1896, eastern investors organized the Red & Bonita Mining Company to develop a group of claims north up Cement Creek from the Gold King, but progressed slowly due to post Silver Crash depression. As the economy showed signs of recovery in 1897, they began driving two tunnels easterly into Bonita Mountain in hopes of striking an extension of the Sampson Vein. Confident, the directors financed a small mill at the lower tunnel and erected a surface plant. In 1898, miners reached the vein, found that it offered ore, and began production. Repeating the well-worn trend, however, the shallow ore was simple

[305] Kinney, 1932; *"Mines of Cement Creek."*

[306] *"Gold King and Gold Prince Properties of the San Juan,"* Mining Investor (7/25/04): 234; Mineral Resources, 1905: 209; *"Mining News,"* EMJ (9/21/01): 368; *"Mining News,"* EMJ (8/9/02): 195.

enough to be treated in the mill, but after two years of extraction gave way to complex material. As a result, the mill ran intermittently and ultimately suspended. The mill later played an important role in the Cement Creek drainage's second-largest mine, the Mogul.[307]

The Yukon Tunnel followed a trajectory that paralleled the Red & Bonita. The Yukon was among the first significant operations that the revival fostered in the Cement Creek drainage, and even though the tunnel was a financial failure, the associated mill became important to other mining outfits. A group of eastern investors looking for opportunities learned the Uncle Sam and Lamont mines, on the west flank of Storm Peak, featured a bold vein largely untapped. In 1897, Roswell F. Baker, Major M.W. Emery, and E.R. Perham organized Boston & Silverton Mining & Reduction Company, and purchased the Lamont and Uncle Sam. A.A. Lamont, former owner of the property, became manager. To provide immediate income, the company pulled ore from the two remote properties but planned to drive a haulage tunnel around 4,000 feet easterly from the floor of Cement Creek, undercut the main vein, and work it upward. Baker suggested that the tunnel would probably penetrate hidden veins on its way and could serve as a platform for mining interests on the east side of Storm Peak. Of the project, the *Silverton Standard* opined:

> It is destined one day to be one of the most important factors in the development of the mineral resources of San Juan County, being so situated that by a company-operative system the entire section lying between the Animas River and Cement Creek could be developed at great depth. It could be made to serve the same purposes for all of the producers and promising prospects in that great mineral belt. Already some fifteen veins have been intersected and every one of considerable value.[308]

Under Lamont, miners began driving the tunnel in 1897 but progressed slowly because they drilled largely by hand. To expedite the project, Lamont installed a compressor the following year so the miners could bore blast-holes with rock drills. The company directors understood that the tunnel would require several years to complete, but nevertheless grew impatient. They ordered a mill be built at the tunnel in 1899, which, upon completion the following year, stood idle. The mill was a typical concentration facility with a wide variety of appliances. Lamont finally had the opportunity to test the mill in 1901, when miners penetrated the first of several veins. Predictably, the ore at depth was too complex for the mill, which recovered only some of the metals during its first two years of irregular use. During the next four years, Lamont spurred his miners toward the principal vein, encountering several other ore bodies on the way. Lamont attempted production in 1906 and 1907, but found the mill to be ineffective. Without the mill, he was limited to producing only medium-grade ore, and the low-grade material, of which there was plenty, would have to wait.[309]

On the South Fork of Cement Creek, several miles south of Gladstone, Thomas J. Hurley followed a similar path with the Occidental and Natalie properties. He was convinced that the

[307] Henderson, 1926: 214; *"Mining News,"* EMJ (12/26/96): 613; *"Mining News,"* EMJ (10/23/97): 497.
[308] *"Possibilities of the Yukon Tunnel,"* Silverton Standard (11/28/03): 1.
[309] *"Mining News,"* EMJ (5/6/99): 539; *"Mining News,"* EMJ (3/16/01): 345; Ransome, 1901: 258; Silverton Standard (2/23/07): 1.

Occidental and Silver Ledge veins, high on the valley's east side, offered ore at depth and planned to develop them through several tunnels. Hurley organized the Occidental Mining Company in 1895 but was unable to secure funding because of the depression. He drew on his reputation and interested enough investors to begin work and acquire the adjoining Natalie group of claims in 1897. The amount of money was insufficient to support several tunnels, an advanced surface plant, and a mill, so Hurley organized a second company and issued more stock. In 1899, he conveyed the Natalie group to the new Natalie Mining & Milling Company and began building one of the most advanced operations on Cement Creek. He commissioned the Hurley Tunnel on the Natalie property and erected a large powerhouse that enclosed a steam-driven generator and a massive air compressor. A crew of around twenty pushed the tunnel, operated the costly machinery, and even produced a little ore in the Occidental workings. By 1903, Hurley reorganized the two companies into the Natalie-Occidental Mining Company to delay investors from demanding returns. This tactic bought Hurley only one year. In 1904 investors withdrew. In response, Hurley organized yet a third company, the Mines Securities Corporation, to complete the project. He began producing ore in the Occidental workings in 1905 but quickly went back to work on the Hurley Tunnel. By 1906, Hurley permanently suspended operations.[310]

The Henrietta was developed around the same time, but was truly a success. Elmer King worked the mine on a small scale in 1897 and 1898, revealing very rich pyrite-rich silver ore. Because the mine lay on the south flank of Red Mountain No.3, the ore was similar in character to material from the Red Mountain district. This interested the Kendrick Promotion Company because the firm was securing sources of ore in the Red Mountain area for a new pyretic smelter planned for the mouth of Cement Creek. In 1899, the company drove exploration workings, confirmed the richness of the ore body, and leased the property. The following year, the Kendrick investors reorganized their firm as the San Juan Smelting & Refining Company, built the Kendrick-Gelder Smelter, and bought the Henrietta.[311] In contrast to most mines in the drainage, the Henrietta was successful for several reasons. First, it was not overcapitalized, and second, its owners already had a process in place proven to be effective on the ore. During 1901, the company aggressively developed the property and hired fifty miners to send large volumes of ore to the smelter. A tramway down Prospect Gulch to the floor of Cement Creek in 1903 was the only capital-intensive facility. In 1905, the San Juan company found the smelter to be unprofitable and sold the plant to J.B. Ross, who bought it to treat ore from his mines in the Red Mountain district. The San Juan company, however, was unwilling to part with the Henrietta because of its richness and continued to send the ore to the Kendrick-Gelder Smelter through 1906.

The Grand Mogul, known simply as the Mogul, was part of a wave of new ventures in the Cement Creek drainage during 1901. F.M. Snowden and Theodore Dick located the vein in Ross Basin in 1881, produced a little ore, and then did little more for decades. In 1901, eastern investor Howell Hinds organized the Sioux Mining Company and purchased the property. The

[310] *"Mines of Cement Creek,"*; *"Mining New"* EMJ (3/16/01): 345; *"Natalie-Occidental,"* Mining Investor (7/25/04): 248; Silverton Standard (4/1/99): 1; Silverton Standard (12/23/99): 1; Silverton Standard (4/25/03); Silverton Standard (7/2/04): 1; Silverton Standard (4/1/05): 1.
[311] Henderson, 1926: 214; *"Mining News,"* EMJ (12/30/99): 797; *"Mining News,"* EMJ (5/15/09): 1019; *"Mining News,"* MSP (5/22/09): 708; Silverton Standard (1/8/10).

company hired C.E. Condit as manager, and he ordered miners to simultaneously extract ore from the old upper workings and drive a deep haulage tunnel from Cement Creek to undercut the vein, and Ross Basin, at depth. Condit sent the ore to the nearest mill, the Red & Bonita facility.[312]

Within the year, the Mogul Mining & Milling Company purchased the Mogul and continued the plan initiated by the Sioux company. The Mogul company, however, possessed greater financial resources because it installed machinery at the Mogul Tunnel and employed a crew of fifty. Those financial resources were judiciously meted out, as the *Silverton Standard* noted in 1902: "One entire working shift of 12 men quit at the Grand Mogul mine owing to the refusal of the company to furnish rubber goods for working in the wet drifts." In striking, the miners suspended operations for a considerable length of time.[313]

In 1902, the Mogul Tunnel reached the vein, and miners drove several raises to connect it with the upper workings. They still produced ore from those workings and sent the material to both the Red & Bonita and Fisher mills. Concurrently, Condit built his own concentration facility, heeding lessons imparted by the long history of mill failures. He extracted ore samples from depth, where it was most likely to be complex and tested them in the two mills, as well as others, to determine an effective treatment process. With this information, a metallurgist designed a massive facility specific to the Mogul Vein material. In 1905, the company allocated capital for a new mill, sited the plant on the north edge of Gladstone, and finished it the following year. After following what seemed like a sound policy, the company was disappointed when the costly mill was unable to recover enough of the ore's metal content to be profitable. The company immediately refitted the mill, met with the same result, and tried a last time in 1907. With the third failure, the directors gave the operation up as an expensive loss.[314]

The Big Colorado, just across the South Fork of Cement Creek from T.J. Hurley's Natalie, was among Cement Creek's 1901 ventures. John May began a deep tunnel during the early 1890s but stopped due to the post Silver Crash depression. Around 1900, C.W. Bloodgood and partners bought the property, organized the Big Colorado Mining & Milling Company, and resumed driving the tunnel. As at the Natalie and Yukon, Bloodgood realized that rock drills would expedite progress, but like Edward Stoiber, did not want the added expense of a compressed air system. Thus, he imitated Stoiber, introduced electric models, and contracted with the Natalie company for power. In 1903, miners struck the Paul B. Vein, which excited the investors who patiently waited for two years. The ore was not rich, but Bloodgood felt that it could be made to pay if concentrated on-site in a mill, so he built the mill and installed a generator for power. Like all the operations in Cement Creek to date except for the Gold King, however, the mill failed after several trial runs and eroded confidence among the investors. The Big Colorado went idle and was later dismantled.[315]

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[312] *Colorado Mining Directory*, 1901: 115; Henderson, 1926: 214; *"Mining News," EMJ* (9/14/01): 338; *Silverton Standard* (8/3/01): 1.
[313] *Silverton Standard* (2/8/02): 2.
[314] *Mineral Resources*, 1906: 232; *Silverton Standard* (6/17/05): 1; *Silverton Standard* (5/26/06): 1.
[315] *"Mining News," EMJ* (10/11/02): 494; *"Mining News," EMJ* (5/30/03): 833; *"Mining News," EMJ* (10/17/03): 597; *Silverton Standard* (11/23/01): 1.

In 1898, when the revival was just beginning, a few visionary entrepreneurs forecast that the Cement Creek drainage would boom because of the potential that its undeveloped mines offered. Kinney, King, and Soule were among these entrepreneurs, and they felt that the inevitable boom and steady stream of freight to and from their Gold King would almost certainly be able to support a short-line railroad. The first wave of mining ventures to spread through the drainage in 1899 confirmed the forecast for growth and spurred investors into action. During the year, they organized the Silverton, Gladstone & Northerly Railroad, immediately turning to Otto Mears because he already ran two of the county's three railroads. Still recovering from the mid-1890s depression, Mears declined, and so Kinney and partners obtained backing from eastern capitalists. With financing in place, Kinney hired construction crews, placed an order for rolling stock, and leased an engine from the Denver & Rio Grande. Workers tied one end of the line into the Silverton yards of Mears' railroads, established a terminal at the Gold King Mill, and crisscrossed Cement Creek numerous times. The railroad began service in 1900 and immediately captured most of the freight business in the drainage. Kinney and partners were pleasantly surprised as the railroad surpassed expectations. The railroad immediately began generating profits, and through reduced freight rates, offered Kinney cost savings for the Gold King and contributed to growth in the drainage.

The town of Gladstone was one of the principal beneficiaries because it was the contact point between the railroad and the upper portion of the drainage. In 1897, the Gold King Mine brought renewed life to the town in the form of the large workforce. The following year, J.C. Bowman opened a mercantile and secured a post office, and the wave of mining ventures that began in 1899 drew additional businesses. Joseph Landry opened a saloon and Fred C. Grebles established a busy lodging service. He operated an establishment that was a combination hotel and boardinghouse for the Gold King company, as well as two more boardinghouses for the Mogul and Natalie company workers. Around a dozen families moved to town, and the *Kibosh* newspaper began printing. Gladstone possessed an industrial ambiance, which increased over the years. In 1902, the Gold King company built three large bunkhouses at the east end of town, a school, and electric lighting. In 1905, the Mogul company erected its huge mill on the north edge of town. The town became bracketed with mills, in addition to the Gold King and Mogul facilities, Theodore Grabowski ran the Fisher Mill at the south end of town. Around 1905, the population was at 300. However, numerous mill failures and unforeseen economic troubles ultimately curtailed Gladstone's prosperity.[316]

In the Cement Creek drainage, the 1907 recession brought disaster and few of the well-capitalized, promising mines survived. Financial problems and ineffective mills ruined the Big Colorado, Mogul, Natalie, and Red & Bonita mines. The Gold King burned and went bankrupt because of its financial ties to the collapsed Gold Prince Mine (discussed below). In particular, the recession ruined Davis and Soule, and the collapse of their personal fortunes dragged down the Gold King and Gold Prince. The Gold King went idle and was placed in receivership. The court appointed D.M. Hayes as temporary manager over the Gold King; but he was ineffective at

[316] Bauer, et al., 1990: 62; *Colorado Business Directory*, 1905: 610; *"Mining News,"* *EMJ* (10/11/02): 494; *Silverton Standard* (10/19/01): 12.

maintaining production in the absence of the mill. Finally, the New Gold King Consolidated Mines Company bought the property, rebuilt the burned facilities, and tried running the operation. Another fire forced the company to suspend, and the directors leased it to the Mears and Slattery syndicate in 1910. They apparently employed the same progressive strategy at the Gold King as at the Iowa and their other highly successful leases, and restored the Gold King to its former status as one of the county's best producers.

When Hayes resumed activity at the Gold King in 1909, some life returned to Gladstone. The town was center to a population of Gold King workers who lived in boardinghouses and did business there. However, the Postal Service revoked the post office in 1912 because the population was too small, although the handful of businesses continued as before.[317]

The Yukon Tunnel was the only other substantial mine in the drainage to operate through the 1907 recession. The Boston & Silverton Mining & Reduction Company continued to drive the tunnel toward the Uncle Sam and Lamont veins during 1906 and penetrated several other ore formations. The company began production of medium-grade ore, shipped to Silverton. The low-grade ore was unprofitable to produce because the new mill was ineffective, but the investors were unwilling to pay the cost of refitting the facility. Manager Lamont left the low-grade material in the ground, pushed the tunnel, and sampled the veins, perhaps to impart an impression of progress. By 1909, investors ceased funding and put the property up for sale. W.B. Lowe bought it to provide ore for the Kendrick-Gelder Smelter, which he acquired from the Ross bothers around the same time. Lowe mistakenly thought that the accessible veins could feed his smelter. He shipped some ore but found that it resisted treatment. The ore was complex, and the smelter failed in 1910. Lowe closed both the smelter and the Yukon in 1910.[318]

Eureka Mining District

In the Eureka district, mining interests responded slowly to the great mining revival of the late 1890s. As elsewhere in the county, the revival started with a few substantial outfits that were already in production and grew into a major movement during the early 1900s. Well-financed companies, wealthy investors, and a few large corporations purchased the mines known for production and poured capital into development projects. The Sunnyside was among the major operations already in production when the revival began, and it helped to foster confidence in the central portion of the Eureka district. During 1898, John Terry used the $100,000 earnest money that investors left him when they forfeited the Sunnyside to finish his grand vision. He developed the Sunnyside Vein through several tunnels, provided the entries with surface plants, added surrounding claims, and was completing the last of a stairstep series of three concentration mills linked by an aerial tramway. Even though Terry was highly successful, he endured a procession of problems such as losing the vein several times and facing bankruptcy.

Unlike other mining companies, mill failures were not among his troubles. When Terry finally started the new Terry Mill at Eureka in 1899, it was a technical success, although a new

[317] Bauer, et al., 1990: 62; *Colorado Business Directory*, 1910: 742.
[318] *"Mining News," EMJ* (10/20/09): 1043; *Silverton Standard* (1/2/09): 1; *Silverton Standard* (1/1/10): 1.

set of problems prevented the facility from reaching its potential. Because the smelter strike of 1899 closed the Durango Smelter, Terry had nowhere to send the concentrates for refining, while a dry autumn reduced the water supply. Miners lost the vein again, which interrupted the flow of ore to the new mill. By 1901, Terry resolved these issues, refitted the mill at Lake Emma for custom business, and electrified the mine. From this point onward, he enjoyed continuous production and notoriety in the industry for building a model operation.

With emergencies abated, Terry directed his energy to address one of the fundamental reasons behind thirty years of mill failures in the county. Specifically, most ore throughout the county featured a high zinc content. The metal interfered with conventional concentration processes, rendered otherwise profitable ore worthless, and therefore ruined sound mining ventures. Had mining companies been able to remove the material, they would have ejected it with the mill tailings because little demand existed for the metal. During the early 1900s, industrial manufacturers finally began to consume zinc, however, and it became a commodity worth exploiting. With zinc now of some value, Terry and metallurgists sought a process to separate the metal and recover it for shipment as a special form of concentrate. In 1905, a year behind similar efforts at the Silver Ledge Mine, he devised the most efficient method in the county to date and received enough income from the concentrates to justify a large-scale application. In so doing, Terry made an important step in placing zinc among the county's portfolio of profitable metals.[319]

The Silver Queen Mine was another operation that helped to anchor the revival in the Eureka district. The Silver Queen Mining & Milling Company developed the property during the early 1890s and enjoyed sound production into 1896, when the post Silver Crash depression forced the company to suspend. In 1898, manager B.D. Smith reopened the mine, and like his colleagues, realized that the ore was too impoverished to ship to Silverton without concentration. In 1899, he convinced the company directors to lease the Mastodon Mill and refit it with a process specific to the Silver Queen ore. In contrast to the trend of mill failures, Smith initially realized success with the facility and ran it through 1901. Smith lost the lease on the mill the following year, and because investors were unwilling to finance a new facility, Smith reduced work to minor production and development. He tied to sell the property, grew tired of waiting for a buyer, and resumed production in 1905. Without a mill, the ore barely paid the operating costs, but he persevered into 1909 and joined forces with John Terry, who owned the nearby Sound Democrat. Terry offered the Sound Democrat Mill, Smith provided ore from the Silver Queen, and the partners divided the proceeds. The underground development that Smith completed in the preceding years paid off, because the Silver Queen was well-prepared to sustain the partnership through 1911, when miners exhausted the last of the profitable grades of ore.[320]

The Tom Moore Mine was another early participant in the revival, and while it seemed significant at first, the property was actually the foundation for a prolonged financial scheme. Samuel G. Martin, more promoter than experienced manager, became involved with the property in 1897, after a previous company enjoyed very brief success several years earlier. Martin

[319] *Silverton Standard* (1/13/06): 1.
[320] *Silverton Standard* (7/7/1900): 1; *Silverton Standard* (10/28/05): 1; *Silverton Standard* (4/23/10): 1.

convinced St. Louis investors to purchase the mine and appoint him as manager. He hired a crew that produced ore from the old upper workings through 1897. Martin reasoned that if upper workings offered ore, the depths of the vein would be even better, and recommended driving a haulage tunnel to undercut the vein system. The investors stalled, during which time Martin produced small batches of ore and sent them to local mills for testing. The results indicated that the ore was too complex to be profitable, but Martin loudly promoted the operation and pursued the tunnel idea anyway.

In 1901, investors provided Martin with enough capital to build a surface plant and start driving the Tom Moore Tunnel. By 1903, the tunnel was 2,000 feet long, but without profit. Martin continued heavy promotion and created press that production was imminent. Investors believed in tangible financial returns, and withdrew their support. Martin had siphoned off capital, incurred significant debt, fended off lawsuits, and scrambled to find more investors. He reorganized in 1903 as the Tom Moore Consolidated Mining Company, lost the property to bankruptcy in 1904, reclaimed it the following year under the Pittsburg San Juan Mining Company, and repeated this cycle annually through 1907.[321]

Legalities and furious investors finally caught up with Martin. While in Denver Martin was arrested and jailed, but not for fraud. In 1892, Martin's wife divorced him and was awarded spousal and child support payments. Instead of paying, Martin had her committed to an asylum. Upon her release, she filed a complaint. Martin used mining money to pay his way out of jail, but the story created a minor sensation in the press. Matters worsened for Martin in 1908. He had underestimated investors who backed the Tom Moore Gold Mining Company. Dennis Ryan, vice-president of the company, had ample experience with fraud and lawsuits. The Bassick Mine near Rosita was among his many lucrative ventures, and he kept that property locked in litigation with recalcitrant investors for two decades. Ryan had no patience for Martin and brought his power to bear. He leveled a lawsuit, revealed fraud, froze Martin's assets, and sought restitution.[322]

In 1900, the revival gained momentum in the Eureka district, and both local experts and outside investors initiated a wave of significant mining ventures around proven properties. Local experts developed the Hamlet Mine into one of the most important operations at Middleton, before passing the property on to outside investors. Samuel Dresback, an independent miner in Silverton, leased the Hamlet in 1900 and generated enough ore to prove the mine. James H. Robin examined the property and purchased it in 1901. During the year, Robin developed the vein with several tunnels and built a mechanized surface plant. He enjoyed regular income for three years and sold the mine to Colorado Springs investors in 1904 while the vein still offered ore. The new owners organized the Hamlet Mining & Milling Company and commissioned the Hamlet Mill at the mouth of Maggie Gulch. Charles Dale erected the facility in 1905, and it proved effective from the beginning. Manager William Lloyd increased the workforce to twenty-five, divided between producing ore in the existing workings, running the mill, and driving a

[321] *"Mining News,"* EMJ (4/25/03): 646; Silverton Standard (2/16/01): 1; Silverton Standard (3/21/08): 1.
[322] Silverton Standard (10/21/07): 1; Silverton Standard (3/21/08): 1.

deep haulage tunnel known as Level No.6, or the Mill Level, to undercut the vein. For the next several years, the Hamlet remained in this highly profitable but incomplete state.

The Mountain Queen, west of the Sunnyside Extension, followed a path similar to the Hamlet. A party of Ouray miners leased the mine for several years beginning in 1900 and produced ore from the upper workings. Rasmus Hanson, now in semi-retirement, purchased the property in 1904 for $25,000 and completed needed development. Now ready for production, Hanson convinced Cripple Creek interests to buy it for $100,000 in 1905. They organized the Mountain Queen Mining Company, invested heavily in a new surface plant, and commissioned a lower tunnel to undercut the shaft and develop the Mountain Queen Vein system at depth. Some local experts claimed that the vein was an extension of the Gold King's famed ore system, which the character of the ore suggested.[323]

During 1901, the companies involved in the revival grew in size, financial resources, and ambition. Edmond C. Van Diest organized one of the most important, the Eureka Exploration Company. Van Diest was a trained mining engineer and consultant, born into a mining family in 1865 in the Dutch East Indies. His father, P.H. Van Diest, brought the family to Boulder County in 1872 to manage the Caribou Mine before moving to Rosita in 1874, where he ran the Pennsylvania Reduction Works. When the smelter failed after around five years, the elder Van Diest accepted the position of chief of the land department for the surveyor general's office in Denver. The younger Van Diest studied engineering and metallurgy at the Colorado School of Mines, graduated in 1886, and entered the industry as manager of the mining business of the Trinchera and Costilla estates in Costilla County. He also accepted consulting jobs in southern Colorado and New Mexico, settling in Denver by the late 1890s. When the revival began in the Eureka district, Van Diest organized the Eureka Exploration Company as an umbrella organization to speculate with both proven and new properties.

Van Diest had the opportunity to buy three particularly promising mines for which he secured backing from railroad operators in the east. In 1900, he purchased the Ridgeway Mine in Maggie Gulch, on the eastern side of Galena Mountain opposite from the Green Mountain and Pride of the West mines. The following year, he purchased the Silver Wing and adjacent Fredericka at auction. The Ridgeway was a sound acquisition because like the Hamlet, it lay on a bold vein not yet developed. The Silver Wing had a record of production and was fully equipped with a mill that, with refitting, could treat ore from the two mines.[324]

Immediately after the purchase, Van Diest put twenty-five miners to work producing ore in the Ridgeway and Silver Wing and rehabilitating the mill. The facility provided the company with some income during the year, but because it was inefficient, Van Diest installed new concentration machinery. The ore in the Silver Wing resisted concentration, and so Van Diest focused on the easily treated payrock in the Ridgeway and Fredericka. When this was exhausted, Van Diest refitted the mill again in 1905 in an attempt to succeed with the complex ore that remained in all three properties. His third try failed, but the Ross Mining & Milling Company provided the solution. The company actively sought mines with ore compatible with the process

[323] Marshall and Zanoni, 1998: 145; *Mineral Resources*, 1907: 272; *Silverton Standard* (12/30/05): 2.
[324] *Colorado Mining Directory*, 1901: 114; *"Mining News," EMJ* (8/3/01): 147; *Silverton Standard* (6/15/01): 1; *Silverton Standard* (8/3/01): 1.

it employed at the Kendrick-Gelder Smelter. Much to the relief of Van Diest, the Ross company leased the Silver Wing in 1907, it at last generated income.

Despite completion of the Terry Mill and activity in the northern half of the district, the town of Eureka remained small in the first decade of the twentieth century, despite the energy of the revival. The town was fairly static with population of around one hundred residents and the handful of businesses that survived the mid-1890s depression. Most workers lived either at the mines or in Silverton. Alexander Anderson, manager of the Silverton Northern Railroad, in 1902 instituted regular commuter service between Eureka and Silverton. Not until 1910, however, after the mining revival tapered, did Eureka see measurable growth. The population doubled and two boardinghouses provided for workers. Guests stayed in the Eureka Hotel, liveries kept horses, entrepreneurs opened two saloons, and existing mercantiles did a sound business. Increased activity at the Sunnyside, regular rail service, and the decline of Animas Forks all increased Eureka's local importance.

Prominent mines in Cunningham Gulch drew attention to the southern portion of the Eureka district during the revival. New ventures funneled capital into the Pride of the West, Green Mountain, Old Hundred, and Buffalo Boy. The Pride of the West was the first in a sequence. After developing the property and working it for twenty years, Christian Schoellkopf was ready to sell. In 1897, Joseph Gibbons, Charles W. Denison, and A.B. Sullivan organized the Joe Gibbons Mining & Milling Company and bought the Pride for $65,000. They understood that the ore required concentration to make it profitable to ship and also bought the old King Solomon Mill at Howardsville. In 1898, the company pursued a costly improvement campaign in which workers erected a new surface plant, tramway and terminal on the floor of Cunningham Gulch, and new appliances in the mill. During 1899, a crew of around thirty-five produced a respectable fifty tons of ore per day and sent the material by wagon to the Howardsville mill. As at the Silver Wing, the mill was not as successful as expected, which limited the company to the highest grades of ore.[325]

In 1903, a squabble between the three principals turned into full-blown litigation, which caused work on the Pride to stall. Eben Smith, David Moffat, and their Denver syndicate took an interest and could purchase the mine outright, if they liked what they saw. The potential sale enticed the principals to cooperate again. Denison and Gibbons invested in additional underground development to highlight the vein, installed new surface machinery, and developed plans for a new mill at the lower tramway terminal. When Smith examined the property later in the year, he was impressed, but not enough to buy it. The principals regressed into litigation through 1907, when Gibbons bought out his partners. Gibbons then promptly reopened the mine and resumed production.

In 1904, John Slattery reopened the Buffalo Boy after years of inactivity. Slattery would later draw on his experience there when joining Otto Mears and associates in a lucrative lease at the Iowa Mine. Meanwhile, Howard Hines and investors from Ohio bought the Old Hundred. Hines and partners organized the Old Hundred Mining Company with the intent of developing

[325] *"Mining News,"* EMJ (2/19/98): 231; Silverton Standard (5/14/98): 1; Silverton Standard (2/18/99): 1.

the property into a complete mining and milling operation. Manager Robert Davis hired a crew of fifty to develop the workings, install machinery, erect a tramway to link tunnels, and build a power plant and tram terminal on the valley floor. In 1905, the company financed a mill at the terminal and had it running the following year. Miners began driving a haulage tunnel to undercut the vein system in 1907. The company assumed that the tunnel would open vast ore reserves, but in the interim the directors were content with the substantial amount of ore from the upper workings. As with the majority of the mines in Cunningham Gulch, the ore proved difficult to treat, the usual harbinger of difficulty.[326]

One of the most infamous ventures in the Eureka district was the Gold Prince Mine. Originally known as the Sunnyside Extension, the Sunnyside Extension Mining & Milling Company bought the Gold Prince from Rasmus Hanson in 1892. Hanson reaped the best ore during his tenure, and the Sunnyside Extension company struggled with the complex, low-grade material that remained. In 1897, the outfit went bankrupt, company official F.W. Popple was appointed receiver, and he attempted to repay the debts through income realized from ore production. In 1900, Popple sold the property to the Smuggler-Union Mining Company, whose principals also purchased the North Star. Smuggler-Union tinkered with the mine for several years, decided it was not worth further effort, and planned to sell.[327] Willis Kinney examined the operation, and thought that if it could be worked in a manner similar to his Gold King, the Sunnyside Extension would be at least as profitable. Flush with profits from the Gold King and Silverton, Gladstone & Northerly Railroad, Kinney, Davis, and Soule purchased the property in 1903 under the Gold Prince Mines Company. Kinney began planning facilities larger than those at the Gold King and made initial preparations for a substantial mill at Animas Forks, a two-segment tramway to the mill, and other new facilities. In anticipation of hauling construction materials and carrying out a stream of concentrates, the Silverton Northern Railroad finished a line from Eureka to Animas Forks in 1904, as had been proposed years before. The only viable route was up the Animas River, and the grade proved to be one of the most difficult in Mears' railroad system. It was so steep that an engine could haul only two full or three empty cars up at a time, and they were pushed to prevent breakaways.

In 1905, Kinney contracted for the mill and tramway. Meanwhile, the miners blocked six million tons of low-grade material, enough to supply the mill for fifty years. As the mill took form, and a number of innovations drew accolades from the greater mining industry. At a cost of $500,000, the mill was steel frame with reinforced concrete floors and foundations, forced-air heat, and electric power wired from the Animas Power & Water Company. The use of steel and concrete with individual motors to run specific appliances were departures from conventional mill design. The mill was capable of treating 500 tons of ore per day, and some experts claimed that the facility was the largest comparable in the state. Stoiber's Silver Lake Mill may have had a higher capacity but was smaller in size.[328]

[326] Henderson, 1926: 215; *Mineral Resources*, 1905: 209; *Silverton Standard* (9/17/04): 1; *Silverton Standard* (12/31/04): 1.
[327] Horn, 2010b; *"Mining News," EMJ* (7/24/97): 105.
[328] Horn, 2010b.

The tramway was an equally complex engineered Bleichert system. The route was not direct due to the obstacle of Treasure Mountain, so the tramway featured an angle station similar to the Silver Lake system. However, the Gold Prince tramway was further divided into three sections, which isolated potential damage from avalanche or fire. The tramway descended down Placer Gulch to a tension station; continued to an angle station on the northwest flank of Treasure Mountain and from there reached the mill at Animas Forks. The angle station and upper terminal featured concrete bases, steel frames, steam heat, and electric power.[329] At the end of 1906, the modern operation was complete. Miners began sending ore down the tramway to the mill, which processed the material and operated at around one-third capacity through most of 1907. The operation was a success, so Kinney and the local press claimed.

The Mineral Point Tunnel, a short distance west of Animas Forks, came to life in 1903 after remaining idle for nearly twenty years. N.R. Bagley, with support from the Rockefellers, revived the idea of driving the tunnel to undercut the Vermillion and Red Cloud veins. He organized the Frisco Mines & Tunnel Company, renamed the tunnel the Frisco-Bagley, and began work. Meanwhile, the company planned a mill and tested ore samples from the Red Cloud Vein to determine an effective treatment process. The investors patiently waited as Bagley slowly made progress through 1907. The following year, the tunnel struck the vein, where the ore proved to be uneconomical at depth. The operation stalled.[330]

The poor economic climate of the 1907 recession largely ceased development and production in the Eureka district. While some properties remained intermittently profitable, none were free of problems, and many failed within the next decade. For instance, the Gold Prince was nothing less than a monumental disaster, which deeply affected the mood in the entire county. At the end of 1907, low metals prices forced the company to stop the titanic mill. Without the mill, the company was unable to generate the income necessary to meet its debt obligations. At the same time, Davis and Soule, who provided most of the financing for the Gold King and Gold Prince, faced their own crises when the recession ruined other investments they held. These conditions precipitated a domino effect that brought down first the Gold Prince and then the Gold King. Davis, Soule, and the Gold Prince company all were overextended, and creditors clamored for payments on their loans. To help fund the Gold Prince, the partners diverted most of the Gold King's available resources, leaving that mine unable to meet its own debt obligations, as well. Angry creditors threatened to foreclose on both mines, and Davis and Soule negotiated a year to reconfigure their finances. A fire subsequently consumed the Gold King plant in 1908. By the end of the year, it was obvious that Davis and Soule could not extricate themselves and were bankrupted. The Gold King and Gold Prince were placed in receivership.

J.O. Campbell assumed Gold Prince receiver in 1909 and prepared to resume where the company left off. Campbell was qualified by his extensive experience with ASARCo, but even he was unable to mitigate the ensuing series of problems. Campbell hired Paul Hanson to restart

[329] Horn, 2010b.
[330] *"Mining News,"* *EMJ* (9/26/08): 638; *Silverton Standard* (12/26/03): 1; *Silverton Standard* (8/27/04): 1.

the mill, based on his experience with the Gold King. When Campbell and Hanson brought the mill into action, they discovered that the process lost a considerable percentage of the ore's metal content, despite its careful engineering. The Sunnyside Extension Mill was a testing plant to hone treatment methods known to be effective on Sunnyside Extension ore. Hanson refitted the Gold Prince Mill at great cost, tried again, produced a considerable amount of concentrates, but was still unsatisfied with the efficiency. Meanwhile, the Silverton Northern Railroad tracks washed out, stranding Animas Forks and preventing Campbell from shipping his concentrates. In 1910, Hanson ran the mill one last time with discouraging results, and shut it down. The court tried to find a buyer for the operation, but was unsuccessful.[331]

The Hamlet Mine was among the Eureka district's successes and remained highly productive through the 1907 recession. Unlike most other mining and milling combined operations, the Hamlet Mill generated concentrates as intended. In 1910, miners also drove the Level No. 6 Tunnel into the depths of the vein and found the high-grade ore. Just as the company prepared to develop the lower portion of the vein, William Lloyd, manager and driving force behind the entire operation, suddenly died. Activity stalled, while investors sought a capable replacement.[332] The Mountain Queen was another operation that remained profitable through the 1907 recession. The Cripple Creek owners completed significant improvements and sold to the Guggenheims in 1907. The Guggenheims installed new machinery and enjoyed ample production. Later that year, an avalanche wrecked the surface plant. The company rebuilt at great cost and kept the mine in production through 1910.

The Eureka district side of Cunningham Gulch was still a center of activity following the 1907 recession, but the mines were far from seamlessly productive. Once Joseph Gibbons assumed control over Pride of the West in 1907, he enjoyed sound production for several years and then leased the entire operation out. In 1910, I.C. Rosenfelt of Chicago, John Benson, and M. Pearson leased both the Pride and Green Mountain with the idea of working them together. Miners would produce ore from both and treat the material in the Green Mountain Mill. However, the new operators did not adequately consider that the high zinc content confounded milling. During the year, they had the properties in production and even went so far as to install a new compressor at the mill. As in the past, the mill did not recover enough of the metals, though, and the operation collapsed in 1912.

The Old Hundred Mining Company was already teetering when the recession pushed it over the edge. Howell Hines overextended the company in 1905 by gambling on the assumption that a tramway, mill, and power plant would facilitate production in economies of scale. Complex ore, faulted veins easily lost, and mill troubles prevented Hines from realizing the necessary income, and he defaulted on debts. An Ohio bank assumed control in 1908, and Hines personally visited Silverton to assess the situation, found additional financing, and tried a last

[331] Horn, 2010b.
[332] *"Mining News,"* *EMJ* (9/3/10): 476; *Silverton Standard* (8/20/10): 1; *Silverton Standard* (9/10/10): 5.

time in 1909 to salvage the operation. For two years, it generated significant amounts of ore, milled at an unknown location. At the end of 1910, Hines closed the mine as unprofitable.[333]

Mineral Point and Poughkeepsie Mining Districts

The mining revival of the late 1890s had only minor impacts on the Mineral Point and Poughkeepsie districts, due to the ventures of prospectors, rather than capitalists or large mining companies. The Ben Butler and San Juan Chief were the two principal operations in the Mineral Point district when the revival began. James L. Hill, New York investor, backed the Ben Butler Mining Company, which reopened the mine in 1898 and began production. Hill installed a new hoisting system the following year to work the vein at depth but then lost interest. In 1900, he sold to L.B. Jackson, who had purchased the San Juan Chief several years prior. Edward Brown maintained his lease on the San Juan Chief through the ownership change and produced small amounts of ore from the mine's shallow workings.[334] After purchasing the Ben Butler, Jackson planned to link the two properties with a haulage tunnel driven from the San Juan Chief. The project was risky as the tunnel would have to be around one mile long and hence extremely costly. Meanwhile, Jackson developed the Ben Butler and treated the ore in the San Juan Chief Mill. Neither of the properties was well-developed due to the inexperience of the past owners. The Ben Butler ore proved impractical to treat, and Jackson's operation collapsed in 1901.

The Mineral Point district otherwise had few mines of significance. The Bonanza King, Early Bird, Lion Tunnel, London, and Polar Star produced small tonnages between 1900 and 1903, but none were consistent. As a result, the mercantile in Mineral Point closed and M.M. Trickey moved his assay shop. The Poughkeepsie district was equally quiet. In 1899, Standard Oil reopened the Maid of the Mist and conducted development for a short time. In 1900, an unidentified interest tried working the Alaska, but it was sold the following year for back taxes owed by Horace Tabor. These two operations and a number of prospects provided just enough business to support the Poughkeepsie camp at the mouth of Poughkeepsie Gulch. During the late 1890s, it featured a mercantile, combination restaurant-saloon, several cabins, and mail. By the early 1900s, the camp disappeared.[335]

Mineral Creek Mining District

The Mineral Creek district was among the earliest areas in the county to boom with massive capital investment, mine development, and heavy production. All, however, met with the problems typical of operating in the San Juans. The Silver Ledge Mine, above the mostly vacant town of Chattanooga in the district's northern portion, was the first to draw investors of note. In 1897, a group of Denver elite including John L. Routt, Robert W. Speer, and Charles

[333] Marshall and Zanoni, 1998: 86; *Mineral Resources*, 1910: 432; *Silverton Standard* (11/14/08): 1; *Silverton Standard* (7/31/09): 3; *Silverton Standard* (11/27/09): 1.
[334] *Silverton Standard* (9/9/99): 1; *Silverton Standard* (6/9/1900): 1; *Silverton Standard* (9/22/1900): 1; *Silverton Standard* (10/13/1900): 1.
[335] Henn, 1999: 58; Ransome, 1901: 195; *Silverton Standard* (7/22/99): 1.

Hartzell bought the mine. Despite this, they organized the Silver Ledge Mining Company and contracted for a mill. A mill for an unproven property was predictably unwise. During the year, miners found plenty of ore, struck a gold vein, and began production. Workers completed the mill at the mine. By year's end, the Silver Ledge was in full production, and through 1898, miners ran the ore through the mill. But, at year's end, the company announced suspension for the winter, despite Silverton Railroad's all-season service. The company had overspent, while the mill was unable to recover adequate metal content. Debt forced the company into bankruptcy, and the creditors sued.

In 1899, the directors reorganized to reconfigure the debt and lease the property out. The strategy would provide regular income to repay creditors. The company appointed J.B. Warner as manager, who installed new surface facilities to make the mine attractive. Under the Elmira Mining & Milling Company's first lease, Warner oversaw a crew of ten who generated as many tons of ore per day. The operation proved successful enough to justify expansion, and the following year Warner hired more workers to run the mill. Although inefficient, the facility allowed Elmira to increase its production income. Warner convinced investors in the east to provide capital for more improvements and new mill appliances. A 1901 fire burned the entire surface plant, including the shaft house and mill, freeing Warner to erect a new mill. He replaced the mine plant, sited the new mill at Chattanooga, and had it running by the end of 1902. The Elmira company nevertheless suffered the same fate as its predecessor. Warner incurred more debt than he could repay, and the Bank of Silverton seized the property. Warner, however, came to an agreement to produce as much as possible and use the proceeds to repay the creditors. The effort lasted only through 1903, as the new mill proved only slightly better than the old, and Warner lost his position.[336]

The San Juan Mining & Leasing Company was the next outfit to lease the Silver Ledge, where it pioneered a significant trend in the regional industry. The company metallurgist recognized new demand for zinc and how to recover it with new concentration apparatuses. He innovated an electric separator that relied on a magnetic field to force zinc and iron particles from pulverized ore. The company refitted the mill in 1904 to both recover the zinc and condition the ore so that the rest of the metals could be captured. Although the separators were not perfect, they yielded the county's first meaningful production of zinc and reconsideration of the ore. At the Silver Ledge Mill, this translated into around thirty tons of concentrates per day.[337] For unknown reasons, the San Juan company did not continue its operation into 1905. Instead, D.E. Carmichael and Jesse Kramer assumed the lease and maintained heavy production with zinc separators. In the fall, litigation over unpaid debts restricted Carmichael and Kramer from extracting ore out of the workings. The partners retained only enough workers to recover low-grade material from the waste rock dump and treat it in the mill. After a year, the outfit exhausted the profitable material and moved on.

[336] *"Mining News,"* EMJ (6/20/03): 945; *"Mining News,"* EMJ (6/27/03): 982; Silverton Standard (1/24/03): 2; Silverton Standard (6/6/03): 1.
[337] Henderson, 1926: 50; *"Mining News,"* EMJ (4/28/04): 699; *"Mining News,"* EMJ (9/8/04): 406; Silverton Standard (5/14/04): 1; Silverton Standard (8/6/04): 1.

The qualified success of the zinc process followed by closure of the mine to litigation had the effect of creating and then destroying a community almost overnight. Although Chattanooga had never fully recovered from the late 1880s recession, it was not completely abandoned, either. The small collection of buildings continued to serve as both a stop on the Silverton Railroad and southern gateway into the Red Mountain district, and a few prospectors and miners occupied cabins at times. Construction of the Silver Ledge Mill restored activity and population to the defunct settlement, and by 1904 a post office opened under the name of Silver Ledge. Excitement over the experimental zinc process drew attention to the hamlet. The Silver Ledge Mine closure, however, reversed two years of growth, and when the workers left, the post office closed.[338]

Sultan Mountain, with its row of well-developed mines, was another natural magnet for capital and large engineering projects during the mining revival. The trend began with the Victoria Mine, idle like the North Star property. In 1898, Victoria company manager Thomas Kane organized the Little Dora Gold & Silver Mining Company to lease the Little Dora workings. In 1899, Kane organized the Empire Consolidated Mining & Milling Company, secured financing, and purchased the Empire Tunnel and Victoria Mill. The Empire Tunnel, drove into the base of Sultan Mountain, tapped the Little Dora Vein, and with more work, could reach the parallel Hercules Vein as well. At the same time, Kane established the Hercules Consolidated Mining Company and purchased the Ajax and Boston tunnels and a second mill. He refitted the Victoria Mill, instituted production in the Empire Tunnel, and did very well. The Hercules company moved slower because it required more development than the Empire. In 1900, Kane refitted the mill, renamed one of the main tunnels the Hercules, and pushed it beyond the Little Dora to other parallel veins. Later in the year, Kane had the Hercules mining and milling combination in full production.[339]

To improve the economies of scale, Kane brought everything together under the Hercules Consolidating Mining Company in 1901. He maintained production from the Empire and Hercules tunnels, closed the Hercules Mill, designated the Victoria Mill as the Little Dora, and improved the plant in 1902. The company may have been the single largest employer in Silverton and retained a workforce of around fifty-five, producing 75 tons of ore per day. The figure was among the highest in the county at the time. The operation was not trouble-free, however, and complex ore forced Kane to install new milling machinery in 1905, junk the plant, and erect a completely new mill. Heavy production continued for several more years.[340]

A short distance to the south of the Hercules, wealthy investors included the King group of claims in an unusual mining and power scheme. In 1900, G.A. Brouillet of Boston organized the Sultan Mining, Smelting & Power Company, bought the King group, and announced plans to build a power plant on Animas River at Rockwood to provide the Sultan Mountain area with electricity. The relationship between the King group and the proposed power plant is uncertain,

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[338] Bauer, 1990: 132.

[339] *"Mining News,"* EMJ (3/11/99): 301; *"Mining News,"* EMJ (6/10/99): 688; *"Mining News,"* EMJ (8/18/1900): 198; Silverton Standard (12/31/99): 1; Silverton Standard (11/4/99): 1.

[340] Colorado Mining Directory, 1901: 112; *"Mining News,"* MSP (8/19/05): 130; *"Mining News,"* EMJ (8/16/02): 227; *"Mining News,"* EMJ (3/30/01): 411; Silverton Standard (12/6/02): 1; Silverton Standard (6/14/02): 1.

but Brouillet probably entertained the idea of a generator-consumer relationship similar to Stoiber's Silver Lake. The King group was supposed to be the principal electric consumer with the surplus power sold to other mines. The company made little progress, however, beyond starting a haulage tunnel and building a flume to the operation. In 1901, Edward M. Brown leased the group but did little better with it than he did at the San Juan Chief. The following year, the Royal Mining Company signed a lease, installed machinery, completed the tunnel to the King Vein, and began production.

The North Star Mine was the last major property on Sultan Mountain to benefit from the revival. The operation stalled in 1896 because the Silverton Mining Company directors were unwilling to reinvest into a mill that kept failing. In 1901, they sold the operation, with its 10,000 feet of workings on several veins, ineffective mill, and multiple tunnels, including the Sultan. John C. O'Neill, Chicago capitalist who already possessed interests elsewhere in the west, researched mines in the San Juans for potential investment. He reviewed the North Star and bought the company. During the summer, he hired a crew of fifty to rehabilitate the property and secured Robert McCartney, who helped Stoiber design the Silver Lake Mill, as manager. O'Neill's experts claimed that the North Star Vein probably held value at depth and advised sinking a shaft on the formation from within the mine. O'Neill commissioned the shaft that year.[341]

Preparing the operation for production consumed more than a year. McCartney rebuilt the mill, installed a power plant, continued rehabilitation, and oversaw the exploratory shaft. By the end of 1903, McCartney reported that the mine and mill were ready to produce, but died early in 1904 while at the Silver Lake Mill. McCartney's replacement had mixed reports. The mine and mill were in full production, but the shaft confirmed that the North Star Vein was too impoverished at depth to justify further attention. The manager assured O'Neill that the upper workings still offered plenty of ore, and began driving the Sultan and North Star tunnels farther to intersect the Belcher Vein. The company then repeated the pattern that stymied profitability in the past. The mill began losing some of the metals because the ore changed character, the company focused on the highest grades and delayed refitting the mill, and when the rich ore was exhausted in 1908, the company suspended.[342]

The 1907 recession impacted the Mineral Creek district in a manner similar to the county's other centers of mining. Most small operations ceased, while large mines survived for a few years before succumbing to the poor economic climate and exhaustion of ore. The Silver Ledge Mine was idle during the recession, because still locked in litigation. The owners came to terms in 1909 and offered a lease to the Ross brothers, who no longer operated the Kendrick-Gelder Smelter but retained their collection of zinc mines. They organized the Ledge Consolidated Mining Company, unwatered the shaft, and struck rich zinc ore. Through 1912, the mine enjoyed peak production. The *Silverton Standard* regularly reported accounts such as: "At

[341] *"Mining News,"* EMJ (12/28/01): 863; *"Mining News,"* EMJ (7/19/02): 93; *"Mining News,"* EMJ (8/16/02): 227; Silverton Standard (11/30/01): 1; Silverton Standard (8/2/02): 1.
[342] Silverton Standard (4/23/04): 1; Silverton Standard (6/25/04): 1; Silverton Standard (2/18/05): 1; Silverton Standard (1/2/09): 2.

the Silver Ledge overflowing bins are reported and more ore in the mine everywhere."[343] Willis Kinney, no longer at the Gold King, assumed the position of manager in 1911.

After production declined abruptly in 1913, Joseph Warner and William Feigel leased the mill alone in an attempt to run it as a custom plant equipped for zinc. The press stated: "The Warner Mill, formerly known as the Silver Ledge, appears in the list as the first recipient of custom ores in the camp for many years and will henceforth be an active factor in the industrial activity of the county."[344] The venture was sound in theory, but the complexity of ore in the western portion of the county caused it to fail after a year.

The Hercules Consolidated Mining & Milling Company easily weathered the 1907 recession and remained Silverton's flagship operation. Under Thomas Kane, the mining and milling combination produced heavily through 1910, despite complex ore and several adjustments to the mill. The Empire Tunnel developed the lower workings, and the Hercules (Boston) Tunnel was the principal point of access for the upper workings. The operation attained the status of largest county producer during 1910 before beginning a gradual decline. Around 1912, after nearly fifteen years of a constant yield, miners exhausted the profitable grades of ore. In 1913, Kane suspended operations, and the following year the property was auctioned to repay creditors.[345]

The Silverton Mining Company tried one last time to remodel the North Star Mill when the economy began to recover after the recession. In 1909, the company hired Paul Hanson from the Gold Prince Mill, to install a zinc recovery process. Toward the end of the year, he had the mill in operation, and the company optimistically prepared several ore bodies in the upper workings. The mill functioned well enough to sustain production through 1910 and then stopped. Supposedly, the company planned to install new motors, but when the mine failed to reopen, it became obvious that the same old troubles reappeared. The North Star remained quiet through foreclosure hearings in 1913.

Ice Lake Mining District

The Ice Lake district and its principal mine, the Bandora, followed inverse trends during the mining revival. The Bandora Mining & Milling Company played a key role in preparing the district for the revival by investing in development, building a mill, and grading a road. Even though development focused on the Bandora, it inspired confidence. The road also opened the area to other companies as early as 1897. The Golden Horn Consolidated Mining Company, backed by London investors, bought the Golden Horn property in 1897 and refitted a mill there. A group of Ouray miners leased the Lady Ellen and brought it into production. While these and other small mines opened during the late 1890s, activity at the Bandora wound down. The partnership of Patterson & Johnson signed a lease in 1897, produced well, but ran out of profitable ore the next year. The partnership did not renew the lease, and the Bandora company

[343] *Silverton Standard* (5/13/11): 1.
[344] *Silverton Standard* (8/9/13): 1.
[345] *Mineral Resources*, 1910: 432; "*Mining News*," *EMJ* (13/21/14): 637; *Silverton Standard* (3/12/10): 1.

conducted some development to restore the mine to a ready state. An unknown entity leased the mine again for a short time before the property went quiet for the rest of the revival.

The 1907 recession snuffed out most district activity except for the Bandora. The Ross Mining & Milling Company leased the mine in 1907 because its ore was suitable material for the Kendrick-Gelder Smelter, which the firm had purchased in 1905. The Ross company assembled a collection of mines, including the Bandora, either through acquisition or lease to provide a continuous flow of ore to the smelter. When the company sold the plant in 1908, it no longer needed the ore and relinquished the lease. Around this time, William Sullivan bought the mine back, developed another section of the vein, and resumed production. He was rewarded in 1911 with a rich strike, which sustained limited production for several years. When the ore was gone, Sullivan suspended the last major operation in the Ice Lake district.[346]

The World War I Revival, 1915 – 1921

The revival of the late 1890s and first half of the 1900s created an energy and atmosphere that San Juan County would never see again. Capital and mechanization lowered operating costs, allowing companies to extract higher tonnages of ore from greater depths and thoroughly explore the principal vein systems for more payrock. The improved milling technology also rendered previously uneconomical grades of ore profitable to process. The 1907 recession culled those mining operations based on speculation, poor science, faulty economic equations, and inadequate ore reserves. And yet, enough companies were able to weather the recession to maintain substantial production through 1910. That year the mining industry entered another watershed period. Most mines ran out of medium-grade ore and faced an end to the profitable low-grade material, which resulted in an overall decline of the industry. During the early 1910s, a handful of large mines carried the county, and the future of the industry did not appear bright. Despite this, the county improvements in concentration processes rendered zinc a metal worth recovering. Zinc was now in demand and smelters such as Pueblo and Salida competed for ore and concentrates. To encourage zinc production, in 1910, the Denver & Rio Grande Railroad offered rate reductions for ore shipped to smelters at Pueblo and Salida, and on concentrates to Canyon City. These conditions fostered a strong interest in the county's zinc resources, and some mines like the Silver Ledge came to rely on its production. In 1911, the American Zinc Ore Separating Company installed a trial recovery process in the Sunnyside Mill at Eureka. At the Sunnyside, American Zinc installed the first Huff Electrostatic machines in Colorado, which immediately proved successful. The Sunnyside company enlarged the plant for commercial use in response. It remains uncertain whether other companies in the county adopted the technology or if the Sunnyside Mill started accepting custom ores from other mines. In either case, the county's zinc production ascended in the early 1910s.[347]

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[346] "*Mining News*," *EMJ* (7/8/11): 85; *Silverton Standard* (2/23/07): 1; *Silverton Standard* (7/1/11): 1.

[347] Henderson, 1926: 50; *Mineral Resources*, 1911: 558; "*Mining News*," *EMJ* (7/23/10): 185; "*Mining News*," *EMJ* (1/27/12): 236; *Silverton Standard* (6/1/12): 1.

A few other major mines were scattered throughout the county, and they produced whatever type of ore they possessed. The Gold King, leased in 1910 by the Mears and Slattery syndicate, ranked second in terms of output. The Iowa, also syndicate-owned, was the county's third largest producer. The Eureka district saw a number of transitory ventures in the early 1910s. W.J. Rattle organized the Vermillion Mining Company in 1905 to work the Red Cloud Vein between Animas Forks and Mineral Point. He developed the vein through the Bonanza and Rattle tunnels, and built a mill in 1909. The company enjoyed production through 1911, when the directors sued each other over debt. When the Frisco Mines & Tunnel Company intersected the Red Cloud Vein in the Frisco-Bagley Tunnel, manager Charles Gagner reported the ore was unprofitable at depth. In 1910, Gagner dispatched a party of prospectors to examine the vein through the old Red Cloud workings near Mineral Point and confirm that the vein's upper reaches held value. They affirmed this, and in response, Gagner had miners drive a raise upward on the vein from within the Frisco-Bagley Tunnel. When miners found plenty of ore, Gagner commissioned the Frisco Mill in 1912 to treat the material. The mill did fine with ore from the upper zone but was unable to process the material from depth. When the upper zone was exhausted, the company struggled and suspended in 1914. When active, the Vermillion, Frisco-Bagley, and other small mines were the economic foundation for Animas Forks in the wake of the Gold Prince failure. The handful of mines, however, was insufficient to sustain the community, which hung on in a marginal state until 1913, when the business district burned. Instead of rebuilding, most people left, and, without a population of note, the post office closed in 1915. Animas Forks embodied the county's mining decline.

The southern portion of the Eureka district was a hotspot of activity during the early 1910s. The Hamlet Mining & Milling Company sought a new manager after William Lloyd died in 1910 and hired the highly experienced Etienne A. Ritter. Ritter decided to develop the mine for long-term production and convinced the investors to fund extensive work underground. The campaign took two years and was highly successful. The Intersection Mine, at the head of Minnie Gulch, proved to be a bonanza. In 1910, the Intersection Development Company discovered an untapped gold vein. The company installed a simple hoisting system and small mill, and enjoyed regular production for the next seven years. By limiting debt and the scale of the operation, the investors maximized their profits. Samuel Martin resurfaced after his stint in jail and moved on from the troubled Tom Moore operation to manipulating the Kittimac Mines Company to support his lavish lifestyle. The company developed what was originally known as the Minnie Gulch group. As he did with the Tom Moore, Martin promoted the Kittimac and its high potential for ore but made little progress in actual production. The Hamlet, Intersection, and Kittimac all contributed to the prosperity of Middleton and Eureka.[348]

The Buffalo Boy, west of the Intersection, showed great promise because it had not yet been systematically developed. In 1909, Joseph Bordeleau organized the Continental Mining Company to lease the property. Over the next three years, miners would encounter rich gold ore in the vein, lose the trace, develop the ore formation further, reestablish contact, and repeat the

[348] Colorado Mine Inspectors' Reports: Intersection; *Silverton Standard* (5/13/05): 6; *Silverton Standard* (1/1/10): 1; *Silverton Standard* (5/3/13): 1; *Silverton Standard* (9/27/13): 1.

cycle. Overall, the operation was moderately successful until a lawsuit among the owners froze the operation.[349]

Political unrest in Europe set the stage for another mining revival. When World War I began in 1914, manufacturing industries first in Europe and then in the United States mobilized to meet heavy wartime demand, and as the war progressed and devastated Europe's economy, governments sought monetary stability in silver. To the delight of the greater mining industry, the value of industrial metals and silver slowly rose again and then shot upward as the war dragged on. Silver ascended from an abysmal $.54 per ounce to $.73 and continued upward to $.84 in 1916, a price not seen since the Silver Crash of 1893. Lead and zinc almost doubled. Around 1910, zinc was valued at $.05 per pound and leaped to $.08 by 1917, while lead doubled from $.04 to $.08 per pound. Ores that were moderately remunerative by 1910 standards became almost the stuff of bonanza, and abundant low-grade ores were at last profitable.[350]

World War I ushered in a surge of activity across Colorado and restored a sense of optimism, purpose, and prosperity to San Juan County. Conditions were now different, however, when virgin ground still offered untapped resources. By World War I, the era of high-grade discoveries, overnight millionaires, and investment schemes was replaced by new generations of speculators, investors, and laborers reexamining areas that already witnessed decades of mining. Hard work, experience, training, capital, and some intuition were all necessary to find untapped deposits of profitable ore. The successful operators applied science, economics, and careful scrutiny to identify mines that still offered potential, and most of these were the properties with proven records of production.

One man who possessed the above qualities was Mears and Slattery syndicate member Louis O. Bastian, who introduced a technological development that revolutionized the definition of profitable ore. In 1914, Bastian installed the county's first flotation machines in the syndicate's Gold King Mill. Specific to complex ore, flotation was a new treatment process that exploited the behaviors of weight and gravity in separating metalliferous material from waste. Flotation relied on oil or detergent to float metalliferous material away from finely pulverized ore in rectangular cells or tanks. Mechanical sweeps or paddles shoved the metal-rich froth out of the cells and into troughs that carried the material onward to other processes. The Atlas Mill in the Sneffels district saw one of the first trials of flotation in the San Juans in 1914, and progressive Bastian brought it to San Juan County shortly after.[351]

Bastian concluded that flotation resolved the ore problems that had defied mill men for decades. Mining companies scrambled to find the capital for flotation in their mills, and 1915 saw a wave of installations. Bastian refitted the North Star and Iowa mills for the syndicate. James O'Kelly did likewise at the Hamlet Mill. The American Oil Flotation Company planned a massive plant at the Silver Lake Mill, and flotation expert James H. Hyde installed the process at

[349] *Silverton Standard* (1/2/09): 1; *Silverton Standard* (12/27/13): 1.
[350] Henderson, 1926: 216; King, 1977: 183; Saxon, 1959: 7-17.
[351] Colorado Mine Inspectors' Reports: Gold King; Henderson, 1926: 50; *Mineral Resources*, 1914: 299.

the Sunnyside. Widespread utilization increased through 1916, with Bastian busy at the Highland Mary and Contention mills, and flotation installed in the Green Mountain and Kittimac plants. Because the process was new, its application was not yet universally successful. Bastian clearly understood the process and his projects functioned correctly, but most of the others experienced initial problems.[352] By 1917, flotation began to deliver on its promise of improved ore concentration. Not only did flotation separate the metal constituents from previously untreatable ore, but also it rendered even lower grades of payrock profitable to produce. The result was that mining companies revisited previously ignored veins, reopened old workings, and recovered huge volumes of low-grade material cast off as waste.

World War I lasted longer than anticipated, prolonging inadvertent stimulus of the mining industry. The prices and demand for industrial metals remained high, specifically interest in silver because of its political and economic value abroad. As silver approached $.98 per ounce in early 1918, Congress fixed the price and levied foreign interest to support a subsidy for silver mining and increase profits. In April, the federal government approved the Pittman Act, which fixed the value of trade silver at $1.00 per ounce internationally.[353]

Silver mining interests in the county reveled in a price not seen since the Sherman Silver Purchase Act of 1890. In contrast to market trends following previous silver subsidies, the value of the metal continued to climb instead of erode. The affect on mining came with caveats, however, that presented challenges to profitability. Because of the war, inflation for mining supplies, equipment, transportation, and smelting fees was equally keen. Skilled labor was increasingly difficult to find as fewer young men replaced older miners leaving the workforce. To complicate matters, the ore that the workers did discover continued to decline in quality, which forced mining companies to generate higher tonnages.[354]

Two other trends conspired against the profitability promised by the Pittman Act. The first interfered with the transportation of ore, concentrates, and supplies. Specifically, the federal Railroad Administration assumed control of all railroads as a wartime mobilization asset for two years. The administration proved inefficient at managing freight traffic, which reduced service, delayed the movement of materials, and increased freight rates by 25 percent. Congress authorized payment to railroad companies for maintenance and operating costs, but the values were usually underrepresented, leaving some railroad companies in such poor financial condition that they closed.[355]

In October 1918, a Spanish influenza pandemic struck the nation with force. The flu spread quickly through Silverton and some of the boardinghouses at the large mines. Hundreds of individuals fell ill, and doctors and volunteer nursing committees quarantined and attended to them. Most of those who were ill languished for weeks before recovering, but a significant number died, which instilled fear throughout the county. The environment and working

[352] Colorado Mine Inspectors' Reports: Sunnyside; "Mining News," *EMJ* (5/15/15): 879; "Mining News," *EMJ* (9/4/15): 412; "Mining News," *EMJ* (11/4/16): 845; *Silverton Standard* (4/17/15): 1; *Silverton Standard* (12/25/15): 1; *Silverton Standard* (7/22/16): 1.
[353] "Events and Economics of the War," *EMJ* (5/18/18): 926; "Industrial News from Washington," *EMJ* (4/27/18): 804; Saxon, 1959: 8.
[354] George E. Collins, "Mining in Colorado in 1918," *EMJ* (1/18/19): 152.
[355] "Editorial Correspondence," *EMJ* (6/29/18): 1191; Sloan and Skowonski, 1975: 319.

conditions at the mines contributed to who contracted the illness, how fast it spread, and the number of deaths. Altitude, extreme cold in poorly heated buildings, and air pollution augmented risk to miners. From the moment a miner entered the workplace, he was exposed to a challenging respiratory conditions. In addition, the underground environment was cold and damp, the work hard, and the commute from the tunnel portal to the boardinghouse frigid, especially when the miner was already saturated with moisture and sweat. Physically taxed by these conditions, the miner was predisposed to pathogenic illnesses easily transmitted in crowded boardinghouses with poor sanitation.

A second wave of flu swept the county in November, and it was worse than the first. A significant proportion of the population fell ill, several hundred died, and panic set in. Mining companies closed due to both sanitary reasons and attrition of workforces. The situation grew so severe that the conservative *Engineering & Mining Journal* reported: "Spanish influenza caused more than 130 deaths in Silverton district in the last three weeks. Mines shut down will have difficulty in resuming normal operations owing to labor shortage, many miners having left camp. Epidemic appears under control."[356] The epidemic, however, was nothing close to being under control. Most public halls and buildings became infirmaries and morgues, and as the dead accumulated, flu committees buried the bodies in wooden boxes or blankets. In January and March of 1919, two more waves of contagion swept through the region. Silverton suffered, and the mining industry had a difficult time recovering.[357]

Despite these challenges and hardships, the combination of an effective zinc separation process, improvements in other milling methods, and the increase in metals prices revived the county's mining industry. Statistics for the latter half of the 1910s quantify the revival. During this time, the county featured nine prospects, thirty-five small mines, twenty-six medium-sized operations, and seven large producers, a significant increase over the turn of the century. Ore production gradually increased from $273,000 in silver, $508,000 worth of gold, and $203,000 in lead, and $50,000 for zinc in 1914 to $477,000 in silver, $257,000 worth of gold, $673,000 in lead, and $310,000 in zinc by 1918. As during the late 1890s revival, the fact that most of the ore was low in grade is significant because a greater tonnage of material had to be mined and treated per dollar realized.[358]

The declaration of Armistice in 1918 brought a long-awaited end to the World War I, but also it set in motion an irreversible decline of mining in much of Colorado. The economic and political trends of the next two years belied the impending doom. As soon as the war was over, European nations began the costly and protracted process of reconstruction, which maintained the high demand and value of silver and industrial metals. The price of silver crept from $1.04 per ounce in 1918 to as high as $1.11 by the beginning of 1920. With metals values increasing for almost two years after the war's end and production in the county during 1920 a record

[356] "Mining News," *EMJ* (11/23/18): 932.

[357] *Denver Times* (10/23/18): 4; *Denver Times* (12/6/18): 17; Smith, 1992: 103; Louis Wyman, *Snowflakes and Quartz: Stories of Early Days in the San Juan Mountains* (Silverton: Simpler Way Books, 1993) 54.

[358] Henderson, 1926: 216 for production figures. The number of mines was derived from a survey of Colorado Mine Inspectors' Reports.

$3,617,000, the impending industry-wide collapse across the west came as an even greater shock.[359]

For a brief time during the late 1910s, prior to the collapse of mining, tungsten joined the county's portfolio of exploitable resources. Early prospectors and assayers were aware that some veins in the Cement Creek drainage possessed high percentages of tungsten but took little interest because almost no demand existed for the metal. During the late 1890s, European steel manufacturers, primarily Krupps in Germany, developed a means of using it to make hardened steel alloys. Within several years, American and British steel companies followed. At the time, tungsten was exceedingly rare and few profitable deposits had been identified, which agents from the steel makers aggressively pursued. When the agents learned of the rich deposits in Boulder County around 1900, they stimulated a tungsten rush there. Individuals elsewhere in Colorado began to pursue tungsten deposits in earnest.

Prospectors familiar with Cement Creek remembered that some veins featured tungsten. Individuals communicated this to speculators that were interested in the metal. Charles Poulot and Charles Voilleque, French metallurgists that specialized in rare metals, were the first experts to respond. They were already in western Colorado developing the first uranium mines in North America and made the short trip to Cement Creek to examine the tungsten reports. In 1900, they examined the Leslie claims in Dry Gulch, one mile west of Gladstone, and leased the Fisher Mill to run tests on the ore. William Schultz, a Denver speculator, arrived around the same time, leased the Evaline claims and operated the mill. Refitting the facility successfully yielded concentrate tungsten ore which stimulated further interest.[360]

In 1903, Lucus Abbie and Joe Kattenbocker produced tungsten ore at the Ohio Mine in Dry Gulch and treated the material in the Fisher Mill. They produced concentrates and shipped them to Germany. Shortly afterward, Chicago investors organized the Venetian Mining Company, bought the Evaline Mine and Fisher Mill, and planned on consistent production. The operation failed, stifling the local tungsten market for years.[361]

The county's tungsten resources drew serious attention again during World War I. Weapons manufacturers found that hardened steel made with tungsten was well-suited for battle, and demand the metal reached unprecedented levels. This stimulated a wave of prospecting and mine examination throughout the northwestern portion of the county in 1915, with several operations in production the following year. Cement Creek was the center of interest. The Colorado Metals Company assembled a small tungsten monopoly in 1915. The company leased the Galty Boy and Congress mines, purchased the Sterling, and leased and refitted the idle Yukon Mill to concentrate the ore. Colorado Metals then accepted custom ore in the mill and fostered development of other operations during 1916. Frank C. Grimes and George Haskell organized the Cascade Tungsten Mining Company to develop claims in Cascade Gulch, and James Clifford worked the Conyers-Clifford, both on Cement Creek. Small outfits also

[359] Henderson, 1926: 216; Saxon, 1959: 8.
[360] "Mining News," *EMJ* (7/7/1900); *Silverton Standard* (4/14/1900): 1; *Silverton Standard* (5/12/1900): 1.
[361] "Mining News," *EMJ* (5/16/03): 762; *Silverton Standard* (5/2/03): 1; *Silverton Standard* (3/12/04): 1.

developed other properties in the area. The San Juan Tungsten Company organized in 1918 to lease the North Star Mine and refit the mill for tungsten ore. Although tungsten continued to draw interest through the 1950s, World War I was the only concerted period of production. When the war ended in 1918, demand for the metal stalled.

Las Animas Mining District

After approximately twenty-five years of continuous, heavy production, Silver Lake Basin remained one of the most important centers in the county. This was due largely to the Mears and Slattery leasing syndicate, which continued its lease at the Iowa Mine and sent the ore down to the Iowa Mill via tramway. The Melville and Iowa-Tiger Leasing companies ran most of the operation, while the syndicate leased additional ground in 1914 in the form of Delsante & Company. In 1913, Mears, Slattery & Pitcher leased the idle Silver Lake Mine from ASARCo and rehabilitated the Stoiber Tunnel. The combined Iowa and Silver Lake workforce was large enough to justify reopening the Arastra post office. Mears and Slattery renewed the lease in 1916 under the firm Slattery, Delsante & Gillette, also known as S.D. & G. Company. The syndicate maintained a constant but limited production into 1917, when experienced miners noticed an eight-foot-wide vein in the walls of the Stoiber Tunnel. The vein's copper, silver, and gold content were a boon to Mears and partners.[362]

The Mears syndicate was not the only entity to work the Silver Lake and Iowa mines during the first years of World War I. Small parties of lessees, mostly Italians previously employed by the Stoibers, enjoyed ample production. The Unity Tunnel was also abuzz with lessees who worked ground above and below the tunnel level. Various partnerships pooled their capital and modified the idle Bleichert tramway at the Unity so that it terminated near the Iowa Mill, where the lessees sent their ore. The Iowa Mill was the center for production in and around Silver Lake Basin. To improve the recovery of metals, Louis Bastian installed flotation equipment in 1915. Even with flotation, the mill workers had a difficult time keeping up with the ore flowing in from all directions. In 1916 alone, the mill processed a weighty 700 tons of concentrates from Iowa ore, as well as around fifty tons from the nearby Mayflower Mine.[363]

The Mayflower, located amid the cliffs forming the east wall of Arrastra Gulch, was a relatively late development. As early as 1913, G.H. Malchus scraped together enough capital to develop the property, begin production, and build a Bleichert tramway from the lower tunnel down to a terminal adjacent to the Iowa Mill. While the distance to the mill was very short, the steep, loose scree slopes made a reliable road impossible, and hence a tramway was necessary for meaningful production. Malchus hired a crew to lengthen the development workings. As the Mayflower proved itself, ASARCo examined it as a replacement for the idle Silver Lake Mine and took an option in 1914, but let the deal fall through. In 1915, the American Oil Flotation Company leased the Silver Lake Mill from ASARCo with the intent of converting the plant for

[362] Bauer, et al, 1990: 13; Colorado Mine Inspectors' Reports: Silver Lake; *Mineral Resources*, 1916: 374; "Mining News," *MSP* (10/18/13): 628; Prosser, 1914.
[363] "Editorial Correspondence," *EMJ* (10/17/14): 718; "Mining News," *EMJ* (9/4/15): 412; "Mining News," *EMJ* (5/27/16): 962; "Mining News," *EMJ* (8/19/16): 365; "Mining News," *EMJ* (12/16/16): 1078.

custom flotation. The custom business, however, was slow, and American Oil sought its own mine to provide a steady stream of ore. The Mayflower was the logical choice because it lay almost directly on the Silver Lake tram system. American Oil took an option on the property and paid Malchus $3,000 in earnest money, before workers accidentally set fire to the surface plant. The sale failed to go through because American Oil ceased to function. The Mears and Slattery syndicate moved in quickly as Malchus, ASARCo, and American Oil had collectively demonstrated that the Mayflower had the potential to become a significant producer. In 1916, the syndicate organized the Mayflower Leasing Company and developed enough ore for an excellent production run.

Although the Iowa, Silver Lake, and Mayflower mines produced well, they did not satisfy the Mears syndicate. One of the syndicate members probably was aware that Edward Innis ignored a number of silver veins in the Highland Mary Mine in his search for the lake of gold. Around the turn of the century, lessees and the Gold Tunnel & Railway Company attempted to find and mine the veins with limited success. The Mears syndicate was convinced that they could make the Highland Mary pay well with proper management, ore concentration, and expert miners. In 1916, J.H. Slattery & Company leased the property from owner Highland Mary Mining & Milling Company.[364] Initially, Slattery's lease included the mine's upper workings and the surface plant. In the past, the mine's various operators completed eight levels with the Mountaineer, also known as Level No.1, as the highest, and the Innis Tunnel, also known as Level No.8, the lowest. The main surface plant and the mill erected by the Gold Tunnel & Railway outfit stood adjacent to the Innis Tunnel. As originally equipped, the mill failed to recover enough of the ore's metal content, so Louis Bastian put a crew to work remodeling the facility. While the crew refitted the mill with flotation, Slattery sent ore down to the Contention Mill, which Bastian remodeled earlier. By December the workers were finished, and the Highland Mary Mill turned out around two tons of concentrates per day.

In 1917, Slattery remediated the inefficiencies posed by the haphazard organization of the underground workings. According to conventional mining engineering, underground levels should be linked by vertical passages that allowed ore mined in the highest levels to be easily transferred down to the lowest with little handling. Miners could then haul the ore out to a mill or holding bins. The Highland Mary, by contrast, had little such organization. Instead of expending enormous sums on the necessary underground connections, Slattery diverted the ore completely via two aerial tramways. One leg descended from Level No.2 Tunnel down to a station at the Level No.7 Tunnel, and the second leg followed west Cunningham Gulch to the mill. While the cost of a segmented system was high, it allowed large crews in both tunnels to produce as much ore as the tram buckets could carry. The efficiency, success, and tonnage realized by the Slattery lease confirmed the syndicate's expertise.[365]

During 1917 and 1918, the syndicate operated the Iowa, Silver Lake, Mayflower, and Highland Mary mines, among the best producers in the Las Animas district. This began to

[364] Colorado Mine Inspectors' Reports: Highland Mary.
[365] Colorado Mine Inspectors' Reports: Highland Mary; "Mining News," *EMJ* (9/29/17): 579; "Mining News," *MSP* (3/17/17): 389.

change the following year. At the Iowa and Silver Lake, three shifts of miners worked around the clock until the influenza epidemic suspended operations. The October pandemic swept the crew and Slattery personally nursed the sick in the boardinghouse. When the second wave further decimated the crew in November, he closed the mines and had the boardinghouse fumigated. Like most of the region's other mine operators, Slattery had a difficult time finding replacement workers and only reopened the Iowa in 1919. At that time, Slattery renewed the lease for Iowa alone under the Southwestern Mining Company and the Melville Leasing Company, but cut the workforce. The syndicate did not renew the Silver Lake lease, heralding an end to its run. These issues indicated that the Iowa and Silver Lake workings were running out of ore. The Iowa Mine then remained one of the Las Animas district's best producers through 1920, when operations collapsed.

The Mayflower and Highland Mary operations regressed in a similar manner. At the Mayflower, a crew of thirteen miners sent ore down to the Iowa Mill through 1918 and 1919 but were discharged the following year. The mine remained quiet until 1922, when Slattery, John F. Barnett, and Leonard L. Aiken organized the Mayflower Mining & Milling Company to work the property with a crew of only six. This operation only lasted a year. The Highland Mary Leasing Company kept the mine and mill producing through 1918 and developed several veins. Slattery suspended operations during the flu epidemic, and when he resumed, hired only ten workers in part because production declined. In 1920, Slattery found that the mill was not worth operating, shut the facility down, and did not renew the lease when it expired. Between 1918 and 1920, the county lost four of its most important producers.[366]

In Dives Basin, west of and above the Highland Mary, Daniel McLean continued to work the Shenandoah Mine through his Dives Leasing Company. McLean suspected that the mountain shared by the Highland Mary, Trilby, and Shenandoah mines concealed a hidden vein system. While this notion was not unlike Innis' lake of gold, McLean's hypothesis was founded on geological knowledge. His miners extracted as much as four tons of ore per day from the Shenandoah and conducted exploration for the elusive vein system as finances allowed. In 1917, McLean formed the O.S. Leasing Company and included the Trilby in his operation. He hoped to find the system from within the Trilby workings and with the Shenandoah to create a single entity. The underground connection was not realized, but he did make several substantial discoveries and operated both mines as a single unit with great success. As one operation after another closed in the Las Animas district, the Dives Leasing Company assumed the role as the most important producer by 1920. However, in 1921, after only nine months of operations, McLean suddenly laid off the workforce of thirty and shut this mine down, as well.[367]

On the opposite side of Dives Basin, the North Star Mine saw activity after remaining long idle. In 1916, a group of lessees reopened the original workings and produced a small

[366] Colorado Mine Inspectors' Reports: Highland Mary, Mayflower; *Mineral Resources*, 1918: 861; "Mining News," *EMJ* (7/27/18): 195; *Silverton Standard* (8/16/19); Weed, 1925: 724.
[367] Colorado Mine Inspectors' Reports: Shenandoah-Dives , Trilby; "Mining News," *EMJ* (1/20/17): 167; "Mining News," *EMJ* (9/15/17): 499; *Silverton Standard* (3/31/17).

amount of ore, before accidentally set alight the tunnel house. The miners moved into the old base camp in Dives Basin, found the mine difficult to work, and ended production in 1917. The mine, a cornerstone of the Las Animas district for years, saw no further activity of note.[368]

The Big Giant Mine, in Little Giant Basin below North Star Peak, also saw renewed activity during the World War I revival. William Keith drove a tunnel to the Big Giant Vein and built a mill in 1895, but the ore was too complex and Keith abandoned the operation within several years. Peter Orella, who operated the Standard Bottling Works in Silverton as early as 1907, came to the conclusion that the vein had high potential Keith left undeveloped. When metal values began to increase in 1914, Peter Orella & Company leased the Big Giant, Contention Mill, and Contention tramway. He rehabilitated the surface plant and underground workings and connected the Big Giant with the Contention tramway. Originally, the Contention Mining Company built the tramway to connect the Contention Mill on the Animas River with the North Star Mine outlet at the head of Little Giant Basin. In 1902, the Black Prince Gold Mining Company bought the tramway and adapted it to their operation around one-half mile below the Big Giant. In so doing, the Black Prince company shortened the tramway, leaving a gap between the Black Prince terminal and the Big Giant. To span this distance, Orella built a double-rope reversible segment and reused the old Keith Mill structure as his upper terminal.[369] Orella wisely realized that the Contention Mill would probably not treat the complex Big Giant ore and sent batches to the Silver Lake and Highland Mary mills for testing. In 1916, Orella finally settled on the best treatment process and hired Louis Bastian to install a flotation flow path almost identical to that at the Highland Mary Mill. Once finished, the facility treated ore not only from the Big Giant, but also from independent customers. Although Orella continued to lease the mine, he bought the mill to retain his investment in the facility.[370]

During the fall of 1916, someone, probably Orella, collected up the tailings left in Little Giant Basin by the 1889 North Star Mill and sent them to the Contention Mill to be processed. The terminal at the Big Giant was the nearest place to load the tailings, but a deep chasm blocked easy access. To overcome this, Orella built another double-rope system that ascended from the terminal up to a loading station on the basin floor, where workers transferred the material. Orella's complicated tramway system now included the tailings segment from the upper basin down to the Big Giant terminal, the double-rope segment from the Big Giant terminal to the Black Prince, and the Bleichert tramway to the Contention Mill.[371]

Ore in every mine in the county was slightly different in character even when from the same geological formation, and so it was with the Big Giant. By 1917, Orella realized that despite the flotation installed by Bastian, the Big Giant ore was still too complex to be easily

[368] *Mineral Resources*, 1916: 374; "Mining News," *EMJ* (8/19/16): 365; "Mining News," *EMJ* (10/27/17): 777.
[369] Colorado Mine Inspectors' Reports: Big Giant; "Mining News," *EMJ* (11/28/14): 980; "Mining News," *MSP* (4/3/15): 534; *Silverton Standard* (10/17/04); *Silverton Standard* (11/13/15).
[370] Colorado Mine Inspectors' Reports: Big Giant; "Mining News," *EMJ* (11/4/16): 845; "Mining News," *EMJ* (4/7/17): 647.
[371] "Mining News," *EMJ* (10/21/16): 769; Eric Twitty, *Basins of Silver: The Story of Silverton, Colorado's Las Animas Mining District* (Montrose, CO: Western Reflections, 2006): 16.

treated. Because shipping the ore as crude material was not feasible, he closed the Big Giant by 1918 while continuing to run the mill as a custom facility.[372]

The Black Prince Mine, on the west floor of Little Giant Basin, was among the operations that responded to the high value of silver. J. Robert Crouse and H.A. Tremaine of Chicago recognized the property's potential because, like its Big Giant neighbor, the vein had never been developed to depth. Further, the property required little capital because it already featured a 500-foot tunnel and an excellent surface plant. In 1920, the investors organized the Crouse-Tremaine Mines Company, purchased some claims and leased others, and leased the Contention tramway and mill.[373] A crew completed necessary repairs and began driving a haulage tunnel. By the end of 1920, the Black Prince had all the makings of a great operation, which is what the Las Animas district needed to counter the decline of its other mines. The staff of the *Silverton Standard* was impressed with the progress: "One of the largest undertakings of 1920 will be ready for production during 1921. The Black Prince Group, under development by the Crouse-Tremaine Mines Company, has been improved with sufficient buildings etc. to enable the management to carry out with the greatest speed the development of the Black Prince and other veins of the group."[374]

By the spring of 1921, miners made the long-awaited breakthrough into the main vein. In driving the haulage tunnel, the engineer followed the proper practice of undercutting the formation at depth so miners could work the ore body from the bottom up. There was one problem, however, there was no ore. The vein was highly mineralized, but lacked payrock of economic worth. The company was forced to suspend operations.[375]

During the World War I boom, the Lackawanna Mine became the focus of an important project. In 1917, John M. Wagner, who owned a number of mines in San Juan and San Miguel counties, confidently purchased the group of claims. During the winter, he made a deal with William A. Way, R.E.L. Townsend, and Melvin Smith to lease the main complex as the Lackawanna Mining & Reduction Company. Although relatively inexperienced, Way was a respected Silvertonian. Born in Hancock County, Illinois in 1874 to a family of some means, Way attended Western Illinois Normal School and studied law at the Northern Indiana Law School. He came to Silverton around 1904 and practiced law under Judge Searcy until 1913, when he established a partnership with H.E. Curran. In 1917, Way married Hazel Fletcher of Salt Lake City and went into practice on his own. Townsend had slightly more direct experience with Animas River mines than Way and had previously leased several properties. The Lackawanna failed to meet expectations, and the partners dumped the lease during the year and moved on to other mines around Eureka.

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[372] *Mineral Resources*, 1917: 840; "Mining News," *EMJ* (10/13/17): 663; "Mining News," *EMJ* (10/27/17): 777.
[373] Colorado Mine Inspectors' Reports: Black Prince.
[374] *Silverton Standard* (1/1/21).
[375] Colorado Mine Inspectors' Reports: Black Prince.

In late 1917, a group of investors from the east assumed the Lackawanna Mine lease as the D.L. & W. Mining & Reduction Company. Under manager C.B. Sheehan, a crew of twenty attempted to ready the operation for work through the winter. One team accompanied master tramway builder O.F. Sackett to the Titusville Mine, dismantled the idle Huson tramway, and rebuilt it at the Lackawanna. The upper terminal stood near the main tunnel, and the lower terminal was on the Silverton Northern Railroad. A second group erected a concentration mill at the lower terminal. A third workforce developed ore and engaged in minor production. While the mill was under construction, the company leased the Silver Lake Mill to process high-grade ore that miners discovered in 1918. After sending the ore to the Silver Lake Mill, little more was forthcoming, however. The compressor house and mill subsequently burned, and after the company collected insurance money, it rebuilt the structures and dissolved.

Before Silver Lake Basin ran out of ore at the end of the 1910s, its mines were a centerpiece of Otto Mears' financial structure. Not only did they yield significant profits, but Mears commissioned an unusual project involving the mill tailings dump that formed an artificial beach on the shore of Silver Lake. Ironically, Edward Stoiber was concerned enough with the water quality of the lake to install a sewer system for his boardinghouses, but flumed at least 500,000 tons of mill tailings from the original mill into the lake's north end. Supposedly, Stoiber did so to store the tailings for future reprocessing. Samuel Hallett planned on treating the tailings in the second Silver Lake Mill after ASARCo acquired the property, but the logistics proved to be too complicated. The tailings were in essence a ready form of extremely low-grade ore and, although they had been treated once in Stoiber's original mill, the tailings retained enough metal content to be profitable. The costly steps of crushing and grinding had already been done and the tailings only required advanced concentration.

Advanced concentration was the specialty of Arthur Redman Wilfley, renowned engineer and metallurgist who split his time between Summit County and Denver. Born in Missouri in 1860, in 1878 Wilfley accompanied his father to join the Leadville rush, set up a sawmill, and profited from the lucrative demand for lumber. The family ultimately went to Kokomo, just over Fremont Pass from Leadville, where young Wilfley became a prospector and miner. In 1882, Victor G. Hills, an engineer and surveyor, offered him a job as assistant surveyor. Wilfley learned quickly, became a partner with Hills, and in 1885 leased the White Quail Mine under the firm of Wilfley, Clark & Company. Investors provided Wilfley with capital to build a mill, which he designed to concentrate low-grade ore. Thus began a protracted career focused on the efficiency of milling and concentration.[376]

Wilfley continuously tinkered with various apparatuses to improve their performance. In 1895, he developed a particularly effective appliance that he patented as the Wilfley vibrating table and began selling as a practical model in 1896. The Wilfley table featured a stationary chassis and an irregular, four-sided tabletop that vibrated rapidly. The tabletop was coated with linoleum and numerous fine riffles, and, as it oscillated, metal-rich particles settled against the

[376] Jay E. Niebur, *Arthur Redman Wilfley: Miner, Inventor, and Entrepreneur* (Denver: Western Business History Research Center, Colorado Historical Society, 1982): 12-23, 30.

riffles while a water spray washed the waste away. Sales were slow at first, but the Silver Crash only energized Wilfley because his device addressed making low-grade ore pay. Eben Smith, principal of the Mine & Smelter Supply Company, contracted with Wilfley for the rights to make and sell the table, and the device netted a fortune in the Rocky Mountain West. Wilfley continued inventing and tinkering and in 1903 developed a multi-deck vibrating table specifically to treat finely ground slurry usually piped out of mills as waste.[377]

Mears, aware of Wilfley's ingenuity and skill, approached him regarding a technical solution to make tailings remunerative. In 1913, Mears explained the project to Wilfley, and obtained money from his leasing syndicate. Mears and Wilfley selected a mill site on the north side of the Animas River opposite the mouth of Arrastra Gulch, which seemed illogical, as it necessitated moving the tailings from Silver Lake Basin down and across the river. The adverse climate, propensity to freeze, and difficulty of access made Silver Lake Basin a poor choice, and why Mears and Wilfley did not adjoin the new plant to the Iowa Mill in Arrastra Gulch is not known. The system that Mears and Wilfley devised for moving the tailings was also unconventional. Special sand pumps mounted on a barge vacuumed up the tailings and piped them over to the outlet of Silver Lake, whose fall was increased by a low dam. The torrent carried the suspended particles over Arrastra Gulch's cliff headwall and down to the base, where another dam diverted the current into a large wooden drain box. Excess water flowed out of the box and the tailings reverted to a slurry, which flowed into a wooden flume that descended steeply along the gulch's west side. A trestle carried the flume out beyond the mouth of the gulch and over the river to the mill.[378]

As a concentration facility, the Mears-Wilfley Mill was completely novel. The interior was relatively level and featured only a handful of apparatuses that were radically different. However, the most imposing were grossly enlarged versions of Wilfley tables 12'-wide and 48'-long with two decks, in addition to several twenty-four-deck shaking tables. Wilfley designed the contraptions to treat the tailings in economies of scale. The giant tables were for coarse particles, and the twenty-four-deck machines treated slurry of extremely fine material. The Mears-Wilfley Mill featured additional processing machinery, although Arrastra Creek naturally completed some of the classification and separation stages that mills usually executed. According to design, the custom facility could treat 600 tons of Silver Lake tailings per day.[379]

Mears' workers consumed nine months building the mill and flume system, while Wilfley perfected his machinery. One device was a sand pump capable of withstanding the high-impact tailings project. The deck shaking table, also known as a slime table after the material it treated, occupied Wilfley such that he installed a unit in the Iowa Mill for testing. By late summer, Mears and Wilfley opened the mill after a $22,000 investment, around $407,000 today.[380]

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[377] Niebur, 1982: 73-5, 82, 84-8, 132-4; Spence, 1993: 369.
[378] "Editorial Correspondence," *EMJ* (4/4/14): 729; Niebur, 1982: 162; Prosser, 1914; *Silverton Standard* (8/28/15); Tucker, 2003: 117.
[379] "Mining News," *EMJ* (5/16/14): 1027; Niebur, 1982: 159; Prosser, 1914; *Silverton Standard* (8/22/14).
[380] Niebur, 1982: 164; Prosser, 1914.

The novel enterprise ran into trouble early in 1915. The flume developed a number of leaks because the tailings slurry acted like liquid sandpaper and wore the wood rapidly. Instead of lining the existing plank trough with sheet iron, Mears opted for concrete, another innovation that drew the attention of engineers who became interested in the project. More problematically, Wilfley's new machinery failed to perform as expected, despite the results of tests that suggested otherwise. Mears ultimately replaced the machinery with flotation.

Following troubleshooting, Mears operated the mill around the clock during in the short working season. During the rest of the year, however, the mill recovered around $5,000 per month, and so well worth the trouble. Mears and Wilfley must have enjoyed high profits since the mill was relatively inexpensive and the basic work of mining and crushing the tailings was already complete. From 1915 through 1918, Mears' railroad hauled off dozens of rail cars of concentrates that fetched, in total over $100,000. The facility functioned smoothly into 1919 when Wilfley, in ill health, sold his interest to Mears. During the year, Mears closed the operation, having exhausted the richest and most debris-free tailings.[381]

Eureka Mining District

The Eureka Mining District followed the general trends of its southern neighbor, the Las Animas district, during World War I. Mining companies responded readily to the improved climate and suspended just as quickly when that climate soured in 1921. The principal difference was that some of the mining operations had greater staying power than those in the Las Animas district. The Sunnyside was one, as the county's greatest producer with a size and complexity similar to the waning Silver Lake. Before John Terry died in 1910, he groomed his two sons to replace him. Joseph focused on managing the mine and William the mills. William built the zinc recovery plant in 1911 and Joseph the aerial tramway and other buildings after they burned two years later. The zinc plant and tramway functioned well, which confirmed confidence in the abilities of the two sons.[382] William led the Sunnyside's response to the improved conditions of World War I. He improved the efficiency of the Eureka mill, increasing income and rendering even lower grades of ore profitable to produce. In particular, he enlarged the Huff Electrostatic plant and consulted with James H. Hyde to install flotation in 1915. Over the course of a year, the Terrys were so impressed with flotation that they moved the machinery up to the Midway Mill and installed a larger set in the Eureka plant, increasing metals recovery even further. The mill at Lake Emma performed general concentration. By this time, Joseph managed a workforce of ninety employees producing 180 tons of ore per day, double the usual average per worker.[383]

For years, the local ASARCo directors eyed the Sunnyside but were distracted by constant trouble with the Silver Lake. It may be that as the Silver Lake wound down during the mid-1910s, they had enough energy and capital to consider other producers and targeted the

[381] *Mineral Resources*, 1917: 840; "Mining News," *EMJ* (10/7/16): 688; "Mining News," *EMJ* (10/6/17): 622; "Mining News," *EMJ* (7/27/18): 195; Niebur, 1982: 166.
[382] Colorado Mine Inspectors' Reports: Sunnyside; "Mining News," *EMJ* (1/27/12): 236; "Mining News," *EMJ* (12/20/13): 1192.
[383] Colorado Mine Inspectors' Reports: Sunnyside; "Mining News," *EMJ* (8/28/15): 372; *Silverton Standard* (7/29/16): 1.

Sunnyside. It remains uncertain whether ASARCo approached the brothers first or the reverse, but by 1917, the two parties began discussions. The Terrys, nearing retirement, were open to selling, and ASARCo made them a generous offer.

Repeating the pattern established with its Silver Lake properties, ASARCo bought the Sunnyside, as well as the other principal mines on the ore system to ensure long-term reserves. The mining giant also enlarged the operation. In 1917, ASARCo organized the Sunnyside Mining & Milling Company and consolidated the Sunnyside, Washington, and Gold Prince groups. W.G. Sharpe was president, F.W. Batchelder secretary, and E.L. Young manager. Young planned a new mill at Eureka capable of treating 500 tons per day and to finish driving the Terry Tunnel from the mill site to undercut the vein system at great depth. Overall, ASARCo's plan was the largest undertaking in the county since the Gold Prince operation. Young sent a crew of forty to dismantle the Gold Prince plant and incorporate the materials and equipment into the design. At the same time, Andrew Coyle gained the contract to drive a raise up into the old workings from the Terry Tunnel.[384]

The town of Eureka was already bustling because of the existing Terry Mill and nearby operations. New construction filled the available housing and provided business for local merchants. With the Sunnyside Mill finished in 1918, the town's permanent population reverted to around 250 people, an increase from prior years. Workers lived in several boardinghouses, received shaves and haircuts from Robert White, purchased candy and other treats from J.C. Hopper, saw physician William Carter when ill, and patronized C.F. Worden's billiard hall. Local residents purchased goods in J.F. Warnock's mercantile and feed and fuel at the McJunkin station. Visiting dignitaries lodged and dined at the Eureka Hotel and had the A.L. Lashbaugh livery tend their animals. Eureka was also home to several mining companies and assayers.[385]

At first, ASARCo had equally poor luck with the Sunnyside as at Silver Lake. A portion of the surface plant caught fire in 1917, and the following year burned to the ground. The new Sunnyside Mill was ready, but the destruction at the mine shut the operation down. The company hired a workforce of eighty to rebuild, and they made progress until the influenza epidemic, avalanches, and power blackouts stalled the effort. After more than a year, the new surface plant was ready and larger than ever. ASARCo continued Terry's practice of providing superior housing for the miners. The boardinghouse and bunkhouse each had three stories, dozens of rooms, and hot water, steam heat, and showers. Off shift, the miners visited the commissary equipped with billiards and a theater for films, while a doctor provided services. In total, the complex housed 220 workers, as many as Stoiber employed at the Silver Lake twenty years earlier.[386]

The ASARCo directors exhaled a sigh of relief during the summer of 1919 when the host of problems seemed to have passed. The new surface plant was finished, the mill ready, and the influenza epidemic over. A crew of 270 brought the mine into full production and doubled the

[384] George E. Collins, "Mining in Colorado in 1917," *Engineering & Mining Journal* (1/19/18): 143; Colorado Mine Inspectors' Reports: Sunnyside; Henn, 1999: 34; "Mining News," *EMJ* (4/14/17): 689; "Mining News," *EMJ* (4/28/17): 689; "Mining News," *EMJ* (6/15/18): 1109.
[385] *Colorado Business Directory*, 1918: 587; *Colorado Business Directory*, 1919: 480.
[386] Colorado Mine Inspectors' Reports: Sunnyside; *Mineral Resources*, 1919: 783; "*Mining News*" *EMJ* (6/9/17): 1043.

county's total output. However, in 1920, the national recession, an abrupt drop in the prices of industrial metals, and a decrease in demand forced ASARCo to suspend operations yet again. The company laid off hundreds of workers who left. Despite its massive investment, ASARCo responded to what appeared to be another countywide collapse of mining.[387]

The headwaters around Animas Forks and the Mineral Point district were nearly forgotten during the World War I revival. ASARCo's removal of the Gold Prince Mill was the largest project in either area, although several small ventures tried to get going during the revival. One was the idle Frisco-Bagley Tunnel, which eastern investors attempted to reopen in 1917. The other was the Columbus Mine on the north edge of Animas Forks. W.M. Johnson & Company produced from the Norton Vein until the early 1910s. In 1915, Arthur Johnson lengthened the Columbus Tunnel, the lowest of three entries, in an attempt to reach the Columbus Vein, and extracted ore from the upper workings to pay for the work. In 1917, A.S. Sturgeon, the subsequent operator, intermittently tried developing the ore formations. In 1918, Johnson returned as manager for the Gnome Mining Company, which resumed driving the lowest tunnel to the Columbus Vein. A crew of eight miners labored into 1919, but the vein did not offer profitable ore at depth, and Johnson closed the mine.

The central portion of the Eureka district was a complete contrast to the Animas Forks area. Perhaps the Sunnyside stimulated confidence among investors, but at any rate Minnie and Maggie gulches in particular saw three substantial operations gain momentum during the revival. However, just as they were on the brink of prosperity, these succumbed to the typical problems. The Intersection Mine at the head of Minnie Gulch yielded gold ore regularly since the Intersection company initially developed the property in 1910. After producing $177,000, the miners simply ran out of ore in 1917 and were unable to find more. With no ore, the company closed the mine, which had already lasted longer and generated more profits than expected.[388]

Farther down the gulch, D.W. Fleming was at work on the Caledonia, originally known as the Beaton Group where James Beaton developed a gold and silver vein during the 1880s. In 1905, Fleming organized the Peerless San Juan Mining Company to develop the vein at depth, built a mill in 1909, and on the eve of production, suspended due to the effects of the 1907 recession. In 1918, he reorganized the outfit as the Caledonian Mining Company and resumed where he left off. Little work was required to bring the Caledonia into production, and he ran the mill on low-grade ore and sent the higher grades of material to the Durango Smelter. This lasted into 1920, when the ore changed character at depth and miners exhausted the shipping-grade material. Unfortunately, the mill was unable to treat the remaining low-grade ore, but Fleming lacked the capital to refit the facility. In response, he scaled back operations, conducted development, and sought more money. In 1921, economic woes and a collapse in metals prices discouraged his investors, and he suspended work.

[387] Colorado Mine Inspectors' Reports: Sunnyside; Henn, 1999: 34; Marshall and Zanoni, 1998: 127; "*Mining News*" *EMJ* (9/6/19): 421.
[388] Colorado Mine Inspectors' Reports: Intersection.

During the late 1900s and early 1910s, the Kittimac Mines Company struggled with the Kittimac Mine, around one-half mile east of the Caledonia. The Kittimac paralleled the Caledonia, in part because it tapped the same ore system. The Kittimac had extensive underground workings, a mechanized surface plant, and a mill unable to treat the complex payrock. Unlike Fleming, however, the Kittimac company had enough capital to refit its mill under the guidance of an expert. In 1915, James Hyde installed Huff Electrostatic separators to recover zinc and flotation machines to provide the final separation of other metals. In 1916, after nearly four years puzzling out problems with the ore, the company successfully ran the mill for several months to demonstrate its effectiveness, then leased the entire operation out.[389]

The lessee was George A. Beaton, son of James Beaton, who had made a considerable fortune from the Caledonia Mine during the 1880s. George Beaton organized the Kittimac Mining & Milling Company to work the property. To avoid the pitfalls of earlier operators, Beaton hired his own experts to manage the mine and the mill. P.M. Collins of the American Oil Flotation Company ran the mill and improved the flotation process, and Augustus Malchus oversaw operations. Malchus was also involved with the Mayflower in Arrastra Gulch. Almost from the beginning, the mill did not recover adequate metals content and had to be refitted again. Later in 1916, the mill finally functioned as expected, and as an added benefit, miners discovered a rich pay chute underground during 1917. The operation became profitable, but short-lived as the ore declined in quality. Mired in debt, the Kittimac Mining & Milling Company was unable to meet its payments, causing the owner, Kittimac Mines Company, to default on its debts and declare bankruptcy. The Kittimac Mines Company, however, remained in possession of the mine and spent 1918 operating it to realize some income. Probably to evade creditors, principal Daniel Carey dissolved the company in 1919, found new investors, and moved the assets to the Sullivan Mines Company of Wyoming in hopes of resuming production. Carey was unable to work the mine, however, and the property remained quiet for several years. Finally, in 1921, Carey interested Pennsylvania investors who organized the San Juan Consolidated Mining & Milling Company to lease and bond the property. They hired a crew of five miners who rehabilitated the surface plant and began driving exploratory workings underground. As the nation's economic climate worsened, the new firm gave up.[390]

Above Middleton, experienced engineer Etienne Ritter continued preparing the property for long-term production for the Hamlet Mining & Milling Company. Workers refit the mill, pushed Level No.6 Tunnel to undercut the old workings, and developed the vein. In 1914, a portion of the mill burned, granting Ritter the opportunity to rebuild with flotation. In 1915, Ritter finally brought the operation into production, only to discover that the mill was still not effective enough. Before he was able to determine why, it burned to the ground. Insurance paid for a new, properly designed plant. By the end of 1916, Ritter started the operation for a second time and found that the new mill functioned perfectly. To keep the company from defaulting on

[389] Colorado Mine Inspectors' Reports: Kittimac; "Mining News," *EMJ* (9/19/14): 549; "Mining News," *EMJ* (10/19/15): 619.
[390] Colorado Mine Inspectors' Reports: Kittimac; "Mining News," *EMJ* (7/22/16): 201; "Mining News," *EMJ* (10/7/16): 688; "Mining News," *EMJ* (12/2/16): 999; Weed, 1922: 622; Weed, 1926: 648.

its debt payments, Ritter expedited production and had three shifts working around the clock. In 1917, the same two problems that plagued other companies in the region changed this. Miners reached an end of the easily treated ore, and the mill had difficulty with the remaining material. For the next two years, Ritter was caught in an endless cycle of intermittent production due to inconsistent payrock, searching for treatable material, and adjusting the mill. In 1919, investors were unwilling to spend any more money on the operation and suspended work. They leased the operation to Al Koltz in 1920. Koltz encountered the same problems, hired Louis Bastian to install the latest flotation equipment, and had no better luck. The Hamlet saw no further activity of note.

The east side of Cunningham Gulch, in the southern portion of the Eureka district, was another center of activity during the World War I revival. After remaining idle, the Green Mountain and Pride of the West mines became the focus of a well-engineered and coordinated effort, and the Gary Owen, quiet for at least a decade, also joined the county's roster of producers. These three mines, the Highland Mary, and several small operations sent so much ore out of Cunningham Gulch that the *Silverton Standard* offered special recognition: "Cunningham Gulch is the most active section of the county. Nearly all the old mines are going, and several new ones have started up."[391]

The Garry Owen, on the east side of Stony Gulch, was among the few mines to operate relatively free of problems through the revival. How the property escaped extensive development in the past is unclear. Experts suggested that it lay on the northeast end of the same ore system as the Green Mountain and Pride of the West, the two principal producers in the southern portion of the Eureka district. And yet, the Garry Owen attracted little interest. Philip Flynn, one expert, was convinced that the mine would yield if properly developed. During the early 1910s, he spent his available capital buying the associated claims but had little money left for necessary work. In 1917, Flynn organized the Wide West Mining Company, obtained investors, and leased the property to keep the operators separate from ownership. He employed William Pantalone as superintendent over a crew of twelve that built a surface plant and drove development workings. By 1918, Flynn's suspicions proved correct, and the miners struck ore rich enough to ship to the Durango Smelter without first being concentrated. Because Flynn was the first to tap the vein system, he found enough payrock to sustain sound production into 1922.[392]

The Green Mountain and Pride of the West, in contrast, were among the county's oldest producers and lay on the same vein system. Despite extensive development, the mines still offered plenty of ore for two principal reasons. The vein system possessed vast reserves, but past operators gave up because the payrock resisted every attempt at concentration. No one had yet tried flotation. In 1916, two separate companies cooperated to profit from the Green Mountain and Pride of the West. J.H. Bird & Company leased the Green Mountain, which featured three tunnels and a mill on the floor of Cunningham Gulch, all connected by tramway. The Pride of

[391] *Silverton Standard* (7/28/17): 1.
[392] Colorado Mine Inspectors' Reports: Gary Owen; *Silverton Standard* (3/10/17): 1.

the West Mining Company, managed by A.W. Harrison, leased the Pride of the West, which featured several tunnels, a power plant, and no mill. Both outfits prepared their mines for production, and the Pride company offered to refit the Green Mountain Mill with flotation. As part of the agreement, the Pride company realigned the Green Mountain tramway to serve its own needs, which was no loss for Bird because ore could be hauled out the lowest Green Mountain tunnel and directly into the mill. In 1917, the Pride company hired Bastian to install flotation, and it was successful from the beginning.

During the spring, both operations began production with great promise. Under Harrison, the Pride company generated around fifty tons of ore per day and ran it through the mill, while the Bird lease slowly sputtered to a stop. Bird turned his lease over to ASARCo during the summer, and the mineral giant brought the Green Mountain into regular production. ASARCo's interest in the mine was twofold. One was to profit from the ore, and the second to provide a stream for the Silver Lake Mill and offset the dwindling custom business. Thus, instead of treating ore in the Green Mountain Mill, located at the mine portal, ASARCo shipped the material to the Silver Lake plant instead. The mill was busy, however, on payrock from the Pride. The split arrangement continued through 1918, when dwindling ore reserves caused ASARCo to end its lease. The Pride company more than made up for the loss and was so productive, the mine assumed the status of fifth most important producer in the county. Around this time, Joseph Terry, flush from the sale of the Sunnyside, replaced Harrison. Terry's experience was immediately put to a test in 1919 when the company temporarily ran out of ore. The investors considered what to do, acceded to recommendations of an exploration campaign, and then stalled in 1921 due to the poor economic climate.[393]

Cement Creek Subdistrict

Other than the tungsten rush, the Cement Creek subdistrict was relatively quiet during the World War I except for two principal operations. The most important was the Gold King Mine, lifeblood of Gladstone and the Silverton, Gladstone & Northerly Railroad. The Mears and Slattery syndicate therein leased one of the county's top producers. The mine achieved this status during the early 1910s, and Bastian's groundbreaking 1914 application of flotation in the Gold King Mill only increased the yield. In 1917, the syndicate failed to renew its lease, and Willis Kinney seized the opportunity to regain the mine. Kinney must have understood that the syndicate rarely quit a lease unless the ore was gone, but he established the Gold King Extension Mines Company and put a workforce of eighty in search of ore and rehabilitating the mill for greater efficiency. Although fifty of the workers lived in Gladstone, the town's population was insufficient to support any business other than the Gold King boardinghouse. In 1919, Kinney located enough payrock to support intensive operations. With rehabilitation finished, he divided the workers into three shifts and kept them busy around the clock producing ore and running the mill. Kinney enjoyed this pattern until the economic climate of 1921 forced him to suspend.[394]

[393] Colorado Mine Inspectors' Reports: Pride of the West; *Mineral Resources*, 1918: 861; "*Mining News*" *EMJ* (7/28/17): 189.
[394] Colorado Mine Inspectors' Reports: Gold King; *Mineral Resources*, 1918: 862; "*Mining News*" *EMJ* (8/17/18): 325.

The Silverton, Gladstone & Northerly Railroad stopped running in conjunction with the Gold King, which adversely impacted the other principle operation in the Cement Creek drainage. In 1917, the Henrietta Copper Mining Company purchased the Henrietta in Prospect Gulch as justified by the increase in metals prices. The Henrietta was ready to produce because its surface plant and tramway were intact, and the Mears and Slattery syndicate provided rail service at the bottom terminal. The company hired experienced engineer E.W. Walter to reopen the property. Once the mine was in sound condition, Walter leased it to the Adam & Eve Mining Company, which enjoyed production until the profitable ore was gone in 1918. Walter employed a small crew to find more ore through 1921, when the economy soured and the railroad stopped running.[395]

Mineral Creek Mining District

The Mineral Creek Mining District remained depressed during the World War I revival, even though it featured what had been some of the county's most important mines. Unlike Silver Lake Basin or the Sunnyside Mine, the district's large operations were depleted at the turn of the century and had little profitable payrock left to offer. In contrast to the central portion of the Eureka district, the small and medium-sized mines did not attract interest either. The Coming Wonder was one exception, located on Anvil Mountain north of Silverton. The property overlay the Crown Jewell Vein which, like the Garry Owen in Cunningham Gulch, saw almost no development since the mid-1890s. Thus, three seasoned miners felt that Coming Wonder was an appropriate name for their new venture, sure to be highly productive, and formalized in 1916 as Andrean, Jackson & Gustafson. After only one year, however, Nels Anderson & Company replaced the trio, conducted additional development, and enjoyed sound production through 1917. The firm generated so much ore that the directors built a double-rope reversible tramway to lower it down to a shipping point. In 1918 Ed Johnson assumed the lease. Johnson specialized in leasing small mines and had just finished with the Aspen when he organized the Anvil Leasing Company. Under Johnson, a small crew kept the Coming Wonder in production for three years. In 1921, the declining economy shut the operation down.[396]

In Silverton, business owners and residents eagerly anticipated the impending reopening of the Hercules and North Star mines. Although owned by separate parties, both ceased work in 1911 or 1912 due to problematic ore, were foreclosed upon, and put up for auction in 1915. The North Star sold first. The size, condition, and history of property met the criteria favored by the Mears and Slattery syndicate. They formally purchased through the S.D. & G. Leasing Company, one of their many subsidiary organizations. Louis Bastian immediately refitted the mill with flotation, and Matt Delsante employed a small crew rehabilitating critical underground

[395] Colorado Mine Inspectors' Reports: Henrietta; "Mining News," *EMJ* (4/7/17): 647; "Mining News," *EMJ* (10/6/17): 622; *Silverton Standard* (6/9/17): 1.
[396] Colorado Mine Inspectors' Reports: Coming Wonder; "Mining News," *EMJ* (9/29/17): 579.

workings. In 1916, they began production, some miners sending low-grade ore from old stopes, others prospecting underground for fresh material. The North Star, however, lived up to its reputation for difficult ore and was among the few operations that truly challenged Bastian's expertise. His flotation process did not recover enough of the ore's metals content, so he refit the mill in 1916 with flotation machines of his own design. Miners generated ore from the North Star workings through 1917, when they began to run out of profitable grades of material. As production decreased, Delsante kept the mill busy with ore hauled from the syndicate's other leases, such as the Detroit-Colorado and Silver Lake. By the end of 1918, the syndicate was satisfied that they had exhausted the last vestiges of ore out of the North Star and let the lease lapse.[397]

Even though the value of metals remained high, the North Star gradually declined until it too succumbed to the economic troubles of 1921. The San Juan Tungsten Company leased the mine, refitted the mill, tried producing tungsten, and failed. Phillip Sartori subsequently leased the mill and used it to treat ore from the Silver Ledge Mine, hoping that it was more efficient than the Silver Ledge Mill. Matt Delsante returned in 1920, when his North Star Leasing Company leased the nearby Gladstone Mine and needed the mill to treat ore. Delsante built a tramway up to the Gladstone and enjoyed sound production through 1921. Except for a few limited partnerships, no one took an interest in the North Star workings for more than a decade afterward.[398]

The Hercules revived more slowly initially than the North Star. B.S. Robinson, Joseph M. Boyce, and other investors organized the Dora Consolidated Mining Company and purchased the operation in early 1916. The company split management of the mine and mill for efficiency. W.R. Chase oversaw teams of miners who began an exploration campaign and generated some ore, while John Hughes prepared the mill for its first run in almost ten years. When the entire property was ready for production, the company increased the workforce to sixty-five, employed at an efficient strategy tiered on the different grades of ore. Specifically, Hughes processed simple material on-site in the Little Dora Mill and sent complex payrock, usually with a high zinc content, to the Silver Lake Mill's custom flotation plant. This lasted into 1919 when, like other principal mines, miners exhausted the profitable grades of ore. The company conducted some development work, resumed production in 1920, but closed the next year.[399]

The Silver Ledge, at the head of Mineral Creek, was the district's third and last major operation during the World War I revival. In 1914, after Joseph Warner and William Feigel failed at their custom milling venture, Louis Bonavida and Baptiste Matties leased the mine, unwatered the shaft to the 400-foot level, and conducted development in new ground. They struck fresh ore, enticed Feigel to prepare the mill for operations, and had both in production by the end of the year. The operation did well into 1916, when Bonavida died, although his wife

[397] Colorado Mine Inspectors' Reports: Colorado Metals Co., North Star; "Mining News," *EMJ* (7/29/16): 242; "Mining News," *EMJ* (11/4/16): 845; *Silverton Standard* (1/22/16): 1; *Silverton Standard* (7/29/16): 1; *Silverton Standard* (10/14/16): 1; *Silverton Standard* (6/16/17).
[398] Colorado Mine Inspectors' Reports: North Star; "Mining News," *EMJ* (12/7/18): 1013; *Silverton Standard* (9/13/19): 2; *Silverton Standard* (10/4/19): 1; *Silverton Standard* (1/1/21): 1; *Silverton Standard* (8/13/21): 1.
[399] Colorado Mine Inspectors' Reports: Dora, Hercules; *Mineral Resources*, 1916: 374; *Mineral Resources*, 1918: 862; *Mineral Resources*, 1920: 588; "Mining News," *EMJ* (3/25/16): 581; "Mining News," *EMJ* (8/26/16): 404.

Jennie assumed his duties so the operation could continue. She held the lease, managed business affairs, and worked with Fiegel to refit the mill. Further adjustments became unnecessary because in 1917, the facility burned. Sartori now had to haul his ore to the North Star Mill, which impacted profitability. In response, Sartori leased the mill in 1919 and ran it until miners exhausted the Silver Ledge, which he closed later in the year.

Ice Lake Mining District

The Ice Lake Mining District's quiet state during the late 1910s gave no hint that a revival was under way in the rest of San Juan County. The only significant operation was the Bandora, which saw intermittent activity at best. William Sullivan, the mine's longtime operator, produced silver ore on a limited basis until around 1912, when he suspended operations because the best payrock was gone. When metals values began to creep upward, Sullivan waited until 1916 and reopened the Bandora, ostensibly under the Sullivan Mines Company. He employed a small crew that altered between occasional production and vein development on a seasonal basis into 1920, when metals prices reached their peak. Sullivan exploited the positive market to sell to Henry Wycoff and other Denver mine speculators, before metals prices fell within a year. Wycoff prepared for production and even contemplated moving the Yukon Mill onto the property, before the 1921 depression struck.[400]

Major Decline, 1921 - 1932

The spike of industry prosperity fostered by World War I ended by 1921 throughout Colorado. The impending collapse struck with full force as almost the entire mining industry failed, including the long-term producers. Conditions conspired against meaningful recovery. Within the county, nearly all the known profitable ore bodies had been discovered, developed, and worked to exhaustion after forty-five years of continuous activity. With the exception of a few late-comers such as the Little Nation, Coming Wonder, and Garry Owen, the county offered little potential for new discovery. In addition, the disappearance of custom concentration mills ensured that the small operations had nowhere to process their low-grade ore. Outside the county, as peace returned to the United States and Europe demand for and value of industrial metals returned to lower pre-war prices. Furthermore, a deep, postwar depression crept over the entire United States.

Those outside the county had only to consider statistics to recognize collapse. In 1921, the mining industry generated a lowly $5,000 worth of gold, $64,000 in silver, $25,000 in lead, and no zinc, tiny fractions of the previous years. Whereas miners produced $3,617,000 in 1920, this diminished to $100,000 in 1921 and slightly double that for the following year, the least amounts since 1882. The number of active mines fell proportionally. After 1921, the county had around twenty small outfits, six medium-sized mines, and two large producers. Compared with wartime, the small outfits fell by almost one-half and the rest by 75 percent. Only the late 1880s

[400] Colorado Mine Inspectors' Reports: Bandora; "Mining News," *EMJ* (8/21/20): 382; "Mining News," *EMJ* (11/13/20): 968.

recession compared. The loss of jobs and ruined economy forced nearly half the population to leave. In 1910, the county was home to around 3,000 individuals, and fewer than 1,700 remained to make a living as they could.[401]

With a decrease in business came a reduction in railroad traffic. James Pitcher closed the Silverton Railroad. Otto Mears, who had purchased the Silverton, Gladstone & Northerly Railroad, ended service to Gladstone. Only the Sunnyside Mine reopened in 1922 along with a handful of other companies hoping to profit from silver.[402] As early as 1920, however, the Federal Reserve targeted the Pittman Act, creating insecurity in the silver market. Western legislators and capitalists rallied in response, contested the anti-Pittman sentiments, and safeguarded the Act in 1922. This kept the county's mining industry alive, as federal statisticians noted the situation from a broad perspective:

> The situation in the Colorado metal-mining industry during the first half of 1922 was disappointing, but there was a marked improvement as the year drew to an end, particularly in November, when the prices for lead and zinc warranted hopes of a stable market. There was also an increased interest in investigation of the industry by capitalists. The price of $1 an ounce for silver derived from domestic ores under the Pittman Act was all that kept many Colorado mines in operation in 1922.[403]

Just as the region seemed to be on the verge of low-level stability, however, the comptroller general forced the Pittman Act to expire at the end of 1922. Silver reverted to its former value of around $.65 per ounce, and the state mining industry fell apart. Coupled with a broad economic shift toward finance and business, the expiration sealed the fate of silver mining in Colorado.[404]

Between 1923 and 1929, county residents left or found alternative sources of income. Silverton miner Zeke Zanoni and Ouray resident Roger Henn recounted the distillation of liquor to meet an enormous demand fostered by the Volstead Act, also known as Prohibition. Ethnic Slavs and Italians produced wine. Henn noted that Ouray was a natural center for these activities because of its remoteness and limited access. If Ouray was a sound location, Silverton was even better and conducted as much business. Zanoni claimed that in Silverton, small saloons and distilleries paid $25 per month to operate, large businesses provided $125, and the fees guaranteed protection against federal raids.[405]

Those workers who knew nothing other than mining faced a difficult struggle because their skills were specialized and narrow. With no better means of income, many individuals continued to mine with the lowered expectations of mere subsistence rather than finding bonanzas. They sporadically leased blocks of ground in what had been the richest properties,

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[401] Henderson, 1926: 216 for production figures; Schulze, 1977: 1920. The number of active mines was derived from a survey of Colorado Mine Inspectors' Reports.
[402] Sloan & Skowronski, 1975: 321.
[403] *Mineral Resources*, 1922, V.1: 527.
[404] "End of Pittman Silver Purchases Cut Profits Sharply," *EMJ* (12/1/23): 960; "News from Washington," *EMJ* (7/28/23): 165.
[405] Henn, 1999: 50-2; Marshall and Zanoni, 1998: 12.

secreting out small ore shoots and scraping together low-grade payrock left by previous outfits. The leases tended to be short-lived as the subsistence miners moved from claim to claim frequently. Production was limited to several tons per day. The lessees possessed resources opposite to the strategy of economies of scale. Specifically, they had plenty of time, very little capital, and expected little income, favoring hand-labor over mechanization. In an era of relatively inexpensive and readily available machinery, the prevalence of such methods effectively reversed fifty years of technological advancement, but also facilitated subsistence survival.

Another subsistence strategy was gathering low-grade ore already brought to the surface and abandoned by previous companies. While few companies willingly discarded profitable ore outright, improved milling technologies, especially flotation, rendered this material profitable. all The lessee sorted through waste rock dumps to recover formerly discarded payrock. Sorting was well-suite to these impoverished lessees because it was ready at hand and required virtually no capital or equipment except for shovels and screens. The work was not easy, though, and lessees withstood alternately wind, storms, brilliant sun, frigid temperatures, or snow. During the latter half of the 1920s, enough lessees braved the elements to constitute a small ore sorting industry focused on the formerly richest mines.

In addition to the subsistence miners, a handful of capitalized companies maintained some semblance of heavy industry in the county. They were few at the beginning of the 1920s and increased in number as general economic conditions improved during the decade. All shared similar characteristics that included proximity to transportation corridors, mines with histories of production, profitable grades of ore, and an increasing reliance on machinery. Only a few of the old mines in the county met these criteria, with the exception of the Eureka and Las Animas districts. None of the operations were trouble-free except for the Sunnyside and Mayflower, popularly known as the Shenandoah-Dives.

In 1922, ASARCo revived its subsidiary, Sunnyside Mining & Milling Company, and reopened the Sunnyside. The Sunnyside company had no intention of permanently closing after investing heavily in the property and resumed where it left off. A fortunate 162 miners were offered jobs underground and an additional fifty-four positioned at the surface plant and two mills. They produced and milled an impressive 500 tons of ore per day, double the normal average per worker. The Sunnyside was already the largest employer and accounted for nearly all the county's output, and yet the company enlarged the operation.[406]

Management understood that the high rate of production would eventually exhaust the known ore reserves and began a major development campaign in response. Most of the extant workings were on the original Sunnyside property, so the company had wisely purchased all adjoining claims in 1917 to support long-term operations. In 1922, the directors moved towards development, beginning with Ruben McNutt's old Washington. Miners started sinking the Washington Shaft with three compartments instead of the usual two to maximize anticipated production. By 1923, they reached the vein, drove development workings, and made available an

[406] Colorado Mine Inspectors' Reports: Sunnyside.

entirely new ore reserve. In response, the company increased the workforce to 360 and hired an additional 40 miners in 1926. An astounding 800 tons of ore poured out of the mine around the clock and passed down the tramway to the mill at Eureka. The amount of concentrates supported the Silverton Northern Railroad and constituted a huge percentage of the Durango Smelter's business. During 1926, the company reached production capacity and ensured its future by expanding the underground workings into most of the adjoining ground including the Gold Prince claims to the northeast and the old Mogul property to the northwest. Most of the ore was low in grade, but the company sustained operations for the rest of the decade.[407]

Although the Sunnyside was the county's most important operation, Charles Chase developed the Mayflower into a close second. Chase was convinced that in the Las Animas district, past mining operations gutted most of the high-grade ore in the upper reaches of the veins but left vast deposits of low-grade material at depth. Chase, an exacting engineer, based his educated opinion on twenty-five years of experience with deep mining in the San Juans. Born in Hartford, Wisconsin, in 1876, Chase's mining engineer father who brought the family to Georgetown during the 1880s. Charles went east to Minneapolis for schooling, graduating in 1893. He returned to Colorado, studied metallurgy at the University of Colorado, and sought work in the mining industry after graduating in 1898. Arthur Winslow hired him as surveyor and assayer at the Liberty Bell Mine at Telluride, from whence Chase became general manager. While at the Liberty Bell, Chase played various roles in the violent strikes that swept Telluride at the turn of the century. Overall, he proved responsive to reasonable union demands such as better living conditions, but he sided with the company and mine owners' association in the face of violence. When the industry slowed after the 1907 recession, Chase broadened his experience elsewhere. By the 1910s, he managed the Mogul Mining Company of South Dakota and the Primos Exploration Company's molybdenum operations at Empire, Colorado. Chase subsequently became chair of the Colorado chapter of the American Institute of Mining Engineers.[408]

As a consulting engineer in the 1920s, Chase secured a group of investors in Kansas City interested in starting a mining venture and suggested they focus on the San Juans. Surveying the areas with the greatest cumulative records of production, Chase visited the Las Animas district in 1925 and concluded that miners never reached the bottom of the low-grade veins around North Star Peak and Silver Lake Basin. Further, he found that the veins were part of a larger disseminated system. If they could be mined in economies of scale from a deep haulageway, the veins could provide returns for years.[409]

Chase contacted his Kansas City investors and found them keenly interested. Fortunately for Chase, the investors already had considerable experience with large-scale mining ventures and, in particular, James W. Oldham had organized the Wellington Mines Company, which operated one of Breckenridge's largest properties since 1906. Chase recommended that Oldham

[407] Colorado Mine Inspectors' Reports: Sunnyside; Marshall and Zanoni, 1998: 127; *Mineral Resources*, 1923: 636.
[408] Stone, 1918, V.2: 91; Reuben O. Norman, *Who's Who of Denver 1931-1932* (Denver: The Blue Book Company, 1932): 47.
[409] Charles A. Chase, *Shenandoah-Dives and North Star Mines 1925*.

and associates fund exploratory work at the North Star to confirm the continuation of the veins, and, if the hypothesis held true, that they acquire the mines around North Star Peak.[410]

Meanwhile, Chase planned a mining operation on the same scale as the Sunnyside. He consulted with engineer O.R. Whitaker to confirm his supposition that the North Star claims could only be accessed from underneath via a long haulage tunnel. The Mayflower was an ideal candidate because it already had a tunnel at low elevation, a location suitable for a tramway down to a mill on the Animas River. The tunnel would have to be lengthened to 5,000 feet to undercut North Star Peak, which presented the drawback of a high cost. Whitaker estimated that driving the Mayflower Tunnel would require eighteen months and $400,000, close to $4 million today. The investors did not flinch, however, and moved forward at once. In 1926, they organized the Shenandoah-Dives Leasing Syndicate and authorized Chase to buy the North Star, Shenandoah, Dives, and Mayflower mines.[411] Besides the location, Chase recognized that the Mayflower possessed several qualities that would save the organization capital. First, the tunnel already offered a small surface plant that could support underground work from the outset. Second, the tunnel accessed several veins capable of providing immediate income. Third, the tramway was serviceable and would carry ore down to the Iowa Mill, which Chase leased in 1928. Oldham and associates were pleased with Chase's careful planning. For the next several years, two crews of miners drove the Mayflower Tunnel toward North Star Peak and extracted 100 tons of ore per day from the existing veins. They sent the material down to the Iowa Mill, which also received ore from the Colorado-Mexico Mining Company, which had leased the Iowa workings since 1926.[412]

In 1929, the financial crash destabilized the economy again, and the situation in San Juan County worsened. Financial experts at first thought that market sectors were merely undergoing short-term adjustments, but as bank security and stock values continued to slide downward, they forecast a recession similar in scale to 1907. Between September and November, however, a financial panic pushed the nation into the Great Depression. All aspects of business and commerce imploded, thousands became unemployed, capital evaporated, and goods and services were curtailed or became no longer available. Under President Herbert Hoover, the nation's economic climate worsened through the early 1930s. Industry came to a standstill, and the prices for silver and industrial metals dropped to new lows. Silver fetched a mere $.29 by 1931. At the same time, copper decreased to $.11 per pound and lead to $.05 per pound.[413]

The Great Depression was unlike any economic bust that San Juan County or the nation had experienced. Few if any mining companies could pay their operating costs, let alone realize a profit. The Sunnyside suspended work in 1930. The county was devastated. Not only did the region lose most of its income, but now at least 30 percent of its residents were unemployed. Other principal mines closed. The abrupt halt to mining caused a ripple effect that worsened

[410] Chase, 1925; "Mining News," *EMJ* (10/30/20): 885; Weed, 1918: 711.

[411] Chase, 1925; Colorado Mine Inspectors' Reports: Mayflower; O.R. Whitaker, *Report on Shenandoah-North Star-Terrible-Mayflower Group* 1926.

[412] Colorado Mine Inspectors' Reports: Iowa, Mayflower; *Mineral Resources*, 1928: 855.

[413] *Minerals Yearbook*, 1937: 115; Saxon, 1959: 7-9, 14-7.

already poor conditions. With almost no freight traffic, the Denver & Rio Grande Extension reduced service between Silverton and Durango, and James Pitcher mothballed the Silverton Northern in 1930. ASARCo declared that it would close the Durango Smelter because the volume of business was insufficient to pay for the operating costs. By 1931, without a smelter, the little mining that survived ceased.[414]

The Shenandoah-Dives Mining Company, in the Las Animas district, was the only outfit to continue as the depression deepened. Prior to the crash, Chase contracted with Stearns-Roger to build a mill that rivaled the Sunnyside facility in size across the river from the Silver Lake facility. He also hired engineer Frederick C. Carstarphen to build a tramway between the mine and mill.[415]

The unique Carstarphen tramway drew industry attention. In broad form, the system operated like the Bleichert tramways that proliferated throughout the San Juans, but the set of towers and means of powering the traction cable differed. To save construction costs, minimize maintenance, and increase longevity, Carstarphen erected eleven steel towers instead of more numerous timber structures. In the upper terminal, the traction cable did not wrap around a giant sheave wheel, but instead made several ninety-degree bends around small pulleys powered by two motors. Approximately two miles in length, the Carstarphen Tramway was the longest operating system in the San Juans and transported buckets around the circuit in only forty-five minutes.[416]

When the Great Depression struck, the mill and tramway were almost finished, leaving Oldham and associates in a difficult position. Chase required more capital before he could produce ore in the economies of scale necessary to offset the declining value of silver. If Oldham and associates balked, they stood to lose the investment up to that point. Oldham and associates gritted their teeth, provided the funds, and waited for Chase to bring his vision to completion. In 1930, Chase finally began operating the mine and mill as a single ore production entity. A crew of fifty miners generated hundreds of tons of ore per day and another thirty-five workers provided support services and ran the mill. Profitability, however, remained elusive because the value of silver was half of the price that Chase used for his economic calculations in 1925.[417]

The difficult conditions required Chase to scrutinize all operating costs and efficiency measures. He personally inspected the mine and mill and constantly improved operations. During one visit to the machine shop, Chase discovered workers leaving broken domestic items for the repair when the opportunity arose. Over time, this practice had snowballed such that it was unclear how Chase might react. However, Chase congratulated a worker on an efficient use of time and the importance of the service. Chase understood that the Mayflower Mine was also a major community institution.[418]

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[414] Sloan and Skowonski, 1975: 335; Smith, 1992: 114.

[415] Dawn Bunyak, *Frothers Bubbles and Flotation: A Survey of Flotation Milling in the Twentieth Century Metals Industry* (Denver: 1998): 59, 63; Colorado Mine Inspectors' Reports: Mayflower; *Mineral Resources*, 1929: 954; *Mineral Resources*, 1930: 1072.

[416] Bunyak, 1998: 60-2; Colorado Mine Inspectors' Reports: Mayflower.

[417] Colorado Mine Inspectors' Reports: Mayflower; *Mineral Resources*, 1929: 954; *Mineral Resources*, 1930: 1072.

[418] Wyman, 1993:71.

Las Animas Mining District

To the residents of Silverton and Howardsville, every mining operation in the Las Animas district was essential and three revived ventures were welcomed during the 1920s. Joseph E. Dresback organized to take over the Highland Mary Mine when the Mears and Slattery syndicate ended its lease. While relatively young, Dresback was a trusted local businessman. Born in Bellevue, Ohio in 1891, Dresback came with his family to Silverton as a boy. In 1909, he took a job as clerk in the First National Bank of Silverton, then worked as an agent for Mears' Silverton Northern Railroad beginning in 1914. Dresback joined the army and went to Europe during World War I, returning in 1919 to marry. Dresback revived his railroad career and replaced C.W. Montgomery as auditor of Mears' railroads. Four years later, he was appointed manager of the Silverton Northern.[419] Because the Highland Mary Mine was vast, Dresback assumed that he could still find fresh ore in the underground workings. In 1923, he organized the Highland Leasing Company, put a small crew to work bringing low-grade ore out of old stopes, and began an examination for new veins. The company kept ten miners busy through 1927.[420]

C.H. Smith, J.E. Storey, and F.P. Despain held the same optimistic outlook about the Lackawanna Mine. In 1926, the three Utah investors organized the Lackawanna Mining Company and hired a crew of ten to rehabilitate the surface plant and underground workings for production. Instead of immediately extracting ore, however, they waited to build a concentration mill. Upon completion in 1928, the mill was equipped with flotation to treat the Lackawanna's complex ore. Initially, the mill generated enough concentrates to justify a shipment to the Durango Smelter.[421]

The Little Nation Mine was one of the few operations that not only weathered the previous collapse, but thrived. In 1923, the Little Nation Mining Company pursued plans to make the mine a sound producer. Within a year, the company built a new mill on the north edge of Howardsville, completed an aerial tramway, and developed the Royal Charter Vein, the principal ore body. The mill featured a modest conventional flow path and flotation, a combination known to work on the area's complex ore. The mill, however, did not recover the ore's metal content as expected, and manager A.G. Marsh concluded that it would have to be refitted. The investors would part with no more capital, however, forcing Marsh to suspend operations in 1924, which contributed to growing pessimism in the Animas River drainage.[422]

In 1927, William Way, a Silverton lawyer who had leased the Lackawanna in 1917, eyed the idle Little Nation. He felt that with proper management and close attention to the

[419] Sloan and Skowonski, 1975: 320; *Who's Who in Colorado: A Biographical Record of Colorado's Leaders in Business, Professional, and Public Life* (Boulder: Colorado Press Association, University of Colorado, 1938) 1032.
[420] Colorado Mine Inspectors' Reports: Highland Mary; *Mineral Resources*, 1923: 637; *Mineral Resources*, 1926: 761; *Mines Register*, 1937: 409.
[421] Colorado Mine Inspectors' Reports: Lackawanna; Horn, 2004; *Mineral Resources*, 1928: 856.
[422] Colorado Mine Inspectors' Reports: Mermac; *Mineral Resources*, 1923: 637; *Mineral Resources*, 1924: 566.

concentration process, the mine would pay. Way interested F.J. Bruening and Dan Harroun in a lease and they hired a crew of eighteen. The operation started well, but shut down after a year.[423]

In the Las Animas district, most mining companies and lessees active during the Great Depression tried their best to maintain operations and wait for a recovery. In 1928, E.A. Hiett, president of the Highland Mary Mining & Milling Company, had decided that the company would work the Highland Mary and no longer lease the property out. Immediately after Hiett brought the mine into production, the economy forced him to curtail operations. He maintained a small crew through 1930, when he reluctantly suspended operations.[424] In 1929, William Way and partners tried again with the Little Nation Mine, on the assumption that the economy would improve. However, not only did economic conditions worsen during 1930, metals values continued to fall. Way suspended operations in 1931.[425]

Eureka Mining District

In the Eureka Mining District, all the principal companies, except for the Sunnyside, suspended operations pending better times. The wait was too long for many, who dissolved by the mid-1920s. A few companies with patient investors retained one or two workers, employed largely to provide security and prevent equipment theft. When the economy recovered later, a few companies reopened several of the Eureka district's most important producers, particularly in Cunningham Gulch. When the Great Depression descended, mining companies and lessees tried their best to maintain operations. As the situation worsened, those outfits with debt were unable to meet their obligations and disappeared.

The northern portion of the Eureka district was quiet except for the Mountain Queen, among the mines brought back into meaningful production after the early 1920s collapse. In 1924, Mike Babich, Pete Dunk, and A.R. Walker leased the property, brought in their own equipment, and unwatered the shaft in preparation for production. By secreting out small ore chutes and extracting fill from old stopes, they generated around five tons of ore per day. Even though the mine was largely exhausted after forty years of intermittent activity, they found enough payrock to sustain the lease for three years before moving.[426]

The Buffalo Boy reopened concurrently with the Mountain Queen. In 1925, the Vertex Mining Company signed a lease, hired a crew of twenty-five, and invested capital to modernize infrastructure. The company installed an air compressor underground and provided workers with a boardinghouse equipped with a rare hot-air furnace. For three years, Vertex enjoyed sound production of medium-grade ore with significant profits going to shipping and smelting. Thus, in

[423] Colorado Mine Inspectors' Reports: Mermac; *Mines Register*, 1937: 810; *Mineral Resources*, 1927: 559.
[424] Colorado Mine Inspectors' Reports: Highland Mary; *Mineral Resources*, 1929: 954.
[425] Colorado Mine Inspectors' Reports: Iowa, Mermac; *Mineral Resources*, 1929: 855; *Mineral Resources*, 1930: 1072
[426] Colorado Mine Inspectors' Reports: Mountain Queen.

1929, the company built a mill at the mouth of Stony Gulch, the seed for a major improvement campaign. The mill featured flotation to ensure the efficient recovery of gold, silver, lead, and zinc. Vertex commissioned a tramway to lower the payrock to the new mill, a boardinghouse, and new surface facilities. Like Chase and the Mayflower, these plans were under way when the economy collapsed in 1929, and Vertex finished the costly improvements probably under the presumption that the economy would correct itself within a short time. Vertex brought the mining and milling combination into full production in 1930 only to suspend as metals prices tumbled.[427]

The Pride of the West Mining Company leased the Pride of the West in 1916, enjoyed heavy production until 1921, and then scaled back and waited for conditions to improve for the mining industry. By 1926, the company directors lost interest and failed to renew the lease. C.M. Lane saw value in the Pride, Garry Owen, and Old Hundred, and assembled the properties. In 1928, Lane organized the Pride Mining Company and prepared each property for heavy production. At the Pride, he financed a new mill at the lowest tunnel and linked the upper tunnels via tramway. At the Old Hundred, Lane directed a crew of ten to refit the mill with flotation and develop the vein. At the Garry Owen, a larger workforce repaired the surface plant and built a new tramway to Old Hundred Mill. Lane now controlled the three mines, as many tramways, two mills, and a powerhouse.[428] When the Great Depression began, Lane's empire crumbled under debt. He relinquished the lease on the Garry Owen and Old Hundred and turned the Pride over to the Altamont Mining Company. Both outfits attempted to produce through 1930 and then suspended.[429]

In 1928, Samuel Martin reappeared and perpetrated another investment scheme. Under the Treasure Mountain Gold Mines & Power Company, he acquired the so-called Martin Group near Middleton and promoted a tunnel project that he claimed would open up vast ore reserves. Martin forecast that the mine would yield enough ore to justify an electric trolley to haul the material to Middleton. Martin hired a workforce of fifty to build a substantial surface plant at the mouth of the Martin Tunnel. Martin intended for the surface plant to inspire confidence among investors and not to support work underground, which was the actual purpose of a surface plant. As proof, there was no work underground to support because the Martin Tunnel never progressed more than around 20 feet in length. The workers labored seasonally until 1929, when the economic collapse preceding the Great Depression exposed Martin's fraud.[430]

Great Depression Era Revival, 1933 – 1939

In 1932, Franklin Delano Roosevelt was elected president and the next year launched a variety of programs to revive the nation's economy. A year later, Roosevelt and advisors devised

[427] Colorado Mine Inspectors' Reports: Buffalo Boy; *Mineral Resources*, 1929: 953; *Mineral Resources*, 1930: 1073.
[428] Colorado Mine Inspectors' Reports: Garry Owen, Old Hundred, Pride of the West; *Mineral Resources*, 1929: 953.
[429] Colorado Mine Inspectors' Reports: Garry Owen, Old Hundred, Pride of the West; *Mineral Resources*, 1930: 1073.
[430] Colorado Mine Inspectors' Reports: Martin Group.

a plan intended to simultaneously devalue the dollar while reviving metals mining on a broad scale. The dollar was taken off the gold standard and the Federal Reserve bought gold at inflated prices. The plan stimulated gold mining as expected. In 1934, Roosevelt signed into law the Gold Reserve and Silver Purchase acts in hopes that they would resuscitate mining. The Gold Reserve Act raised the price of gold from around $20.67 to $35.00 per ounce and the Silver Purchase Act raised the value of silver from around $.48 to $.70 per ounce.[431]

Roosevelt's plan, combined with widespread destitution, unemployment, and New Deal programs, stimulated a revival of mining across the west. Experienced miners reopened properties known to still possess ore, and inexperienced laborers formed an operational workforce. Adding to the growing interest, advances in milling technologies rendered previously uneconomical ores profitable. Thus, mining companies began producing low-grade ore, but not with the expectation of high profits. Instead, they were satisfied with subsistence. Overall, the revival was minor compared to decades past, but the west, including Colorado, witnessed a return to the old mining districts on a scale not seen since World War I.

San Juan County responded slowly to improved conditions and incentives instituted by the Roosevelt administration. Few individuals with the resources for meaningful development took interest in abandoned properties. As the decade progressed, conditions improved just enough to resuscitate the industry and allow the county to join the rest of Colorado in its Depression-era mining revival. The demand for industrial metals increased slightly as some manufacturing resumed. Investors more freely funded mining ventures, seeking security in gold, which some of the county's mines were known to have produced in high volumes.

Statistics reflect how the county responded to the Depression-era revival. In 1933, the county generated $742,000 worth of ore, which increased to a substantial $2,323,000 by 1938 before declining. These figures indicate the county's overall production trends, but are slightly skewed because the Shenandoah-Dives alone contributed disproportionately more than the rest of the county's mines combined. The number of mines active during the 1930s better reflects the trend that the industry followed. Between 1930 and 1933, before Roosevelt's programs, there were five substantial prospects, ten small mines, two medium-sized operations, and the Sunnyside and Shenandoah-Dives mines as the large producers. When the Sunnyside closed in 1930, the Shenandoah-Dives was the only significant operation remaining. Between 1934 and 1939, numbers tripled to eight prospects, twenty-eight small mines, eight medium-sized operations, six large producers, and several placer mines. Despite the increase, county population declined significantly. The county had 1,900 residents in 1930 and only 1,400 in 1940.[432]

The strong interest in gold inspired ventures that varied widely in scale and sophistication. Some of the older miners searched their memories to recall likely sources of gold. Those without capital considered the idle mills that specialized in separating the gold content from ore whose leftover concentrates might be an easy source of the metal. In 1932, Forest Goody used a placer machine to recover gold from tailings at the Gold King Mill. Two years

[431] Robert S. McElvaine, *The Great Depression: America, 1929-1941* (New York: 1993): 164; Saxon, 1959: 7-8, 12, 14, 16.
[432] Schulze, 1977: 1930; Schulze, 1977: 1940. The number of mines was derived from a survey of Colorado Mine Inspectors' Reports.

later, unemployed individuals prospected the Silver Lake Mill site with some success. Other miners returned to the impoverished gold placers around Eureka and in Cunningham and Arrastra gulches and gleaned gold. Organized companies joined the return to placer mining and in 1934, rehabilitated the Buffalo Placer near Eureka with hydraulics.[433]

In terms of established hardrock mines, the Shenandoah-Dives continued to be the foundation of the county's economy and its largest employer. Chase's miners consistently proved that the veins under North Star Peak featured more low-grade ore at greater depths than previously suspected. Chase believed the Silver Lake Basin offered similar deposits, and that they would significantly increase the available reserves of payrock and hence extend the life of the mine. In 1937 or 1938, he commissioned the Silver Lake Cross Cut, intended to encounter the Silver Lake Vein first, followed by other mineralized formations. Miners bored the crosscut around the clock for several months before trouble swept the Shenandoah-Dives company.[434]

Chase had tried to reduce operating costs by demanding concessions from the workforce, but the miners and mill workers were unwilling to concede. The parties came to a stalemate in 1939, and the workers, who were thoroughly unionized, threatened to strike, which would have been disastrous to both sides. Chase figured that the threats were idle, and if not, such an action would be short-lived because the miners had no other hope of employment. He miscalculated, and the entire workforce struck in June and shut down the mine. Although unintentional, this caused independent companies that relied on the Mayflower Mill for custom concentration to falter. Residents in the county became polarized, but because Shenandoah-Dives miners and their sympathizers made up a majority of the population, the strike continued through the summer. Backed by investors with deep pockets, Chase waited out the workers fearful of losing their jobs. By the end of summer, the workers grew tired of their reduced union compensation and voted to return to work with no concessions. The union flexed its muscle, but Chase was now free to resume production on a greater scale then ever.[435]

By 1940, Chase's miners finally reached the Silver Lake Vein after thousands of feet, and the vein not only featured ore, but some of the material was higher in grade than expected. Chase originally had a lease agreement with ASARCo, and when ASARCo realized just how much ore Chase found, the company became keenly interested in mining its own property. Adept at business as well as mining, Chase secured a reverse lease arrangement where ASARCo paid him to use the Mayflower Tunnel as a point of access for the Silver Lake ground. The deal was a good one for Shenandoah-Dives. ASARCo provided royalties, maintained the crosscut, drove additional development workings, and assumed the financial risks should the Silver Lake and adjacent veins not pan out as hoped. The contract provided the Shenandoah-Dives company with income for eight years.[436]

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[433] Colorado Mine Inspectors' Reports: Gold King; *Minerals Yearbook*, 1935: 229, 231; *Minerals Yearbook*, 1936: 268.
[434] Colorado Mine Inspectors' Reports: Mayflower.
[435] *Durango Herald Democrat* (6/29/39); *Minerals Yearbook*, 1940: 277; *Silverton Standard* (7/14/39).
[436] Colorado Mine Inspectors' Reports: Silver Lake; *Minerals Yearbook*, 1942: 340.

The Silver Lake Crosscut was important for several reasons in addition to improving the profitability of the Shenandoah-Dives company. The passage increased ore production contributing to the local economy at a critical time. As the Great Depression dragged on, the meager revival in the county began to wane as miners cleaned out the last vestiges of ore from the handful of properties in production. For a brief time, it appeared that the Sunnyside Mine would fill the void left as independent mines began to close.

In 1937, the Sunnyside company announced that it was reopening its enormous mine, which created a furor of excitement. The company hired a crew of 177 workers, to prepare the surface facilities and underground workings. By September, the mine generated so much ore that it attained the status of Colorado's largest gold producer for 1937. The company did not convey, however, that the accessible ore reserves were almost gone and extensive work required to develop more. Imitating Chase, the company commissioned a deep tunnel from Eureka to undercut the entire property from the lowest elevation possible, but such a project required years. The existing ore bodies would not last that long at the current rate of production, and were in fact gutted within two years. The Sunnyside company was unwilling to pour money into the tunnel without returns from the rest of the mine. In 1939, as soon as the ore was gone, the company laid off the workforce, suspended the deep tunnel, and permanently closed the mine.[437]

The trend that the mining industry followed during the early 1940s originated in the Depression-era revival. Beginning in 1939, the county saw a wave of mines close because there was no longer enough low-grade ore even to sustain subsistence. And yet, from a broad perspective, the county's production figures remained deceivingly high because of the outstanding efficiency of the Shenandoah-Dives company. Depending on sources, by 1941, the county featured between ten and twenty-four active mines that produced less than $100,000 in metals, not including the Shenandoah-Dives. These figures did not fill ASARCo with confidence that it would be able to reopen the idle Durango Smelter. ASARCo mothballed the smelter at the beginning of the Great Depression due to a lack of ore and patiently waited for mining to resume. When the volume of ore and concentrates did not increase, the company dismantled the smelter in 1941. Although the smelter had been idle for years, its loss assured that the possibility of another meaningful revival was remote.[438]

Las Animas Mining District

For much of the county's history, the Las Animas Mining District seemed to offer endless ore reserves. In reality, however, the most extensive ore reserves lasted around fifty years, already an impressive span of time. But when the Great Depression began, nearly all veins had been exhausted of even their low-grade payrock, leaving little even for subsistence mining. Because of this, nearly all mines remained quiet and the Depression-era revival passed the

[437] Burbank and Luedke, 1969: 56; Colorado Mine Inspectors' Reports: Sunnyside; *Minerals Yearbook*, 1938: 276; *Minerals Yearbook*, 1939: 303.
[438] A survey of Colorado Mine Inspectors' Reports suggests ten active mines, although the 1941 *Minerals Yearbook* (p. 298) claims the figure was twenty-four.

district by. And yet, several properties seemed to offer enough potential to interest several successful ventures.

One was the Mabel, whose gold ore had been forgotten since around 1890. The mine was small and isolated in Deer Park at the district's southwestern corner. F.R. Steelsmith and others examined the property and found that the free-gold ore was largely gone, but the complex material would be profitable if a mill could be erected at the site. Building a mill was a challenge, however, because the mine was accessible only via pack trail. In 1933, Steelsmith organized the San Juan Mining Company and bought the property. In 1934, the mining crew used mules to drag in the components for a compact but highly functional surface plant and a small mill powered by a gasoline engine. The following year, manager J.B. Tusant began operations, and the mill recovered some gold bullion and generated concentrates. The workers returned on a seasonal basis until the mine finally closed in 1940.[439]

Concurrently, C. Lorimer Colburn examined the Trilby Mine at the mouth of Dives Basin. Dan McLean was the last to work the property around 1917. Colburn understood that some deep veins offered enough gold to support a limited operation, and he was careful not to stray into the adjoining claims purchased by Charles Chase. Colburn was a trained engineer who spent much of the 1910s working for the Bureau of Mines. In 1934, he returned to private industry as president of the Highland Mary Mining & Milling Company. Colburn entertained the idea of reopening the Highland Mary as well, but remained unable to convince his backers. In 1936, Joseph M. Bradley replaced Colburn as president and had better luck convincing investors. Either Bradley or Colburn, who remained as engineer, offered them a plan to extract ore from the Trilby and apply the proceeds to the Highland Mary. Bradley hired a large crew who rehabilitated the surface plant, upper workings, and portions of the lengthy Innis Tunnel. By 1939, Bradley brought the Highland Mary back into production and trucked the ore to the Mayflower Mill for concentration.[440]

As the company's situation improved, Bradley instituted several improvements to lower operating costs. He insisted on a new mill to prevent profit loss by sending the ore to the Mayflower. Bradley also found that the best ore was located in the mine's midlevel workings, which had no direct connection with the surface. Instead, miners had to haul the payrock out through a maze of passages and then down to the proposed mill. This inefficiency could be remediated by a new tunnel bored directly into the midlevel workings. In 1940, Bradley refit the existing mill with modern equipment, and the metallurgist proved his expertise by designing a facility that successfully recovered metals from the start. Bradley bored the new Bradley Tunnel and built a tramway down to the mill. By year's end, the operation was in full production and assumed the role of one of the county's most important mines.[441]

[439] Colorado Mine Inspectors' Reports: Maybell; *Mines Register*, 1937: 830.
[440] Colburn, 1936; Colorado Mine Inspectors' Reports: Highland Mary; *Mines Register*, 1937: 409.
[441] Colorado Mine Inspectors' Reports: Highland Mary; *Minerals Yearbook*, 1941: 311.

Eureka Mining District

After more than fifty years of activity, the Eureka district mines were bankrupt of easily accessed payrock, and few outfits were willing to risk the capital required to extract the meager amounts of ore that lay deep in the underground workings. As a result, the Eureka district was relatively quiet during the Depression-era revival, except for the principal mines on the east wall of Cunningham Gulch. The Green Mountain had been quiet since the late 1910s, but the Pride of the West was never fully abandoned. When the Great Depression began, owner A.W. Harrison kept several miners employed maintaining the property and conducting minor work underground to maintain title to the claims. Thomas B. Stearns and Tyson S. Dines were aware that both mines still possessed gold ore, and because they were adjoining properties on the same general ore system, the two mines could be worked as one. Dines backed several companies during the World War I revival and acquired a number of mines in the district during the 1920s. Stearns lived in Denver, invested heavily in mining during the Great Depression, and had ample resources from his connections with the machinery manufacturer Stearns-Roger. When President Roosevelt signed the Gold Reserve Act into law in 1934, the partners quickly organized Pride of the West, Inc.

The new company hired sixteen miners who conducted the usual rehabilitation work and built a new tramway to a loading station on the road to Howardsville. Within the year, they started trucking ore to the Mayflower Mill while metallurgists attempted to refit the mill that a predecessor company erected in 1928. By 1936, the company finished the mill and pulled the Green Mountain into the operation. Crews divided among the two mines generated thirty tons of ore per day from the Green Mountain and fifty at the Pride. The company eagerly anticipated running the refitted mill at capacity, but the troublesome ore of Cunningham Gulch thwarted efficiency, even with flotation. Dines directed miners to ship the payrock to the Mayflower Mill while an engineer resolved the metallurgical issues. By 1938, miners exhausted the ore worth shipping, and Dines suspended further work until the mill was back on line.[442]

The answer to the ore problem was clear but costly. An entirely new set of machinery was required, and the metallurgist recommended building a dedicated mill anew instead of adapting the existing plant at the Pride. Dines and Stearns decided that if they were going to pay for a new mill, they would offset the cost by soliciting custom concentration in addition to processing payrock from their own operation. For this reason, they chose Howardsville as the site, and Dines reorganized the company in 1940 to allocate capital.[443] The Pride company pushed mill construction through 1940. When tested, it was so well-engineered and orderly, the local mine inspector came away impressed after an examination. To make up for lost time, the company resumed heavy production and ran the mill at capacity. The operation passed into World War II as one of the county's largest producers.[444]

[442] Colorado Mine Inspectors' Reports: Pride of the West.
[443] Colorado Mine Inspectors' Reports: Green Mountain, Pride of the West.
[444] Colorado Mine Inspectors' Reports: Pride of the West.

While Dines and Stearns prepared to work the Pride of the West in 1934, John Gilheany watched from above while he did likewise at the Philadelphia upslope. The Philadelphia lay dormant for decades, until Gilheany signed a lease in 1934, began limited operations, and shipped ore to the Mayflower Mill. He reinvested some profits in improvements, which allowed him to bring yet more payrock out of the workings. By 1936, Gilheany doubled his crew to eight and maintained sound production through 1940, when work suspended.[445]

In 1934, Charles H. Kimball of West Virginia, backed by investors from Pennsylvania, purchased the Old Hundred Mine with the expectation of high returns. They organized the Old Hundred Gold Mining Company, bringing the old, upper workings into production first and applying the income toward developing the lower reaches of the vein. In 1935, the company hired a workforce of ninety, rehabilitated the entire property, built new buildings at the lower tunnel, and engaged in exploration. When the company deemed the mine was ready, fifty miners generated payrock while thirty workers ran the mill and surface facilities. In 1937, the operation collapsed, due to insufficient ore.[446]

In addition to old mines, several organizations from the district's past resuscitated during the Depression-era revival. The increase in gold and silver values brought Edmond C. Van Diest to reconsider the Fredericka and Ridgeway mines, which he initially developed during the early 1900s under the Eureka Exploration Company. Van Diest reorganized the outfit as the Metals Exploration Company, and in 1936 worked first the Fredericka and then the Ridgeway. The Fredericka was a short-lived affair that lasted for one year. The Ridgeway was more intensive and represented the emerging trend for companies to sort waste rock without ever reopening a mine's underground workings. In 1937, W.C. Service established the Ridgeway Gold Mining Company and leased the Ridgeway exclusively to recover low-grade ore from the waste rock dump. Service found that there was enough material to justify a tramway, which extended one mile to the road in Maggie Gulch. By 1938, Service ran out of waste rock and reopened the underground workings after all. He shipped 10 tons of payrock to the Mayflower Mill per day through the rest of the year.[447]

C.R. Walker reopened the Mountain Queen according to a similar pattern. In 1938, he leased the property from owner Tyson Dines, bulldozed an access road, and hauled off waste rock as low-grade ore. When this was gone by 1940, Walker hired five miners who installed a hoisting system and reopened the shaft. In 1941, they conducted exploration and found stringers of ore missed during the mid-1920s. These small chutes sustained minor production into World War II.

Mineral Creek Mining District

Although Silverton was center to the county's mining industry, it was unable to legitimately claim the title of true mining town until the 1890s, when the large mines on Sultan

[445] Colorado Mine Inspectors' Reports: Little Fannie.
[446] Colorado Mine Inspectors' Reports: Old Hundred; *Minerals Yearbook*, 1937: 333.
[447] Colorado Mine Inspectors' Reports: Fredericka, Ridgeway.

Mountain employed armies of miners who established residence there. In 1920, the mines closed and workers moved on, but Silverton remained a mining town in spirit. In 1935, Silverton reclaimed its status when Warren C. Prosser reopened the Hercules and North Star properties.

Prosser was an experienced mining engineer who worked in Colorado, and especially the San Juans, over several decades. He was also a gifted writer and contributed articles regularly to mining periodicals. He understood the difficulties of mining in San Juan County, especially how problematic the ore was, and yet he bought one of the most troubled properties. In particular, Prosser purchased the North Star after it closed in 1921. At the end of the decade, he organized the North Star-Sultan Mining Company and gradually rehabilitated the Sultan Tunnel, surface plant, and mill. His goal was to make the mine attractive to lease, but the Great Depression delayed interest.[448]

In 1934, with the values of gold and silver high, Prosser organized the Mystery Gold Mining Company and bought the adjacent Hercules complex. The North Star had surface facilities and an operational mill, and the Hercules greater potential to offer ore. Prosser aggressively pursued the lease idea, hired a large workforce, and began developing both properties through the Sultan and Hercules tunnels. In 1936, Prosser added the Little Dora and expanded his project to include linking all three mines.[449] Prosser leased out blocks of ground as quickly as his miners could condition them. In 1936, Intermountain Shares, Inc., managed by Bill Rich, worked the Wheal Alfred Mine with great success. At the same time, the Culver Leasing Company, backed by Dale Culver, produced soundly from the Little Dora and Hercules veins. Small parties worked other sections, and Prosser's own miners also produced regularly. In 1939, Roy Blakely sorted through the waste rock dump at the Empire Tunnel for low-grade payrock. None of these outfits, however, including Prosser's, remained operational by 1940.[450]

A handful of other ventures scattered elsewhere in the Mineral Creek district provided employment and some ore during the Depression-era revival. Since 1927, J.E. Carney and Thomas H. Woods tinkered with the Brooklyn, on the west side of Anvil Mountain, and hoped to bring the property into production some day. In 1935, Carney and Woods established the Brooklyn Mining Company, improved the surface facilities, and began shipping payrock. By 1936, they were successful until miners brought out the last of the ore in 1941. The Bonner joined the Brooklyn in 1936, producing regularly until 1940. Otto Anesi was the first to work the Silver Ledge since it closed in 1920. With little capital, he was unable to unwater the shaft, however, and was limited to the mine's upper levels. He generated small amounts of ore in 1939 and 1940. The Bandora Mine was still owned by the Sullivan family, which leased the remote property to Wilbur Maxwell & Associates in 1936. Maxwell rehabilitated the mine, produced payrock, and then turned the property over to the Blanco Mining Company in 1938. Blanco realized minor profits until 1940.[451]

[448] Colorado Mine Inspectors' Reports: North Star.
[449] Colorado Mine Inspectors' Reports: Little Dora, North Star.
[450] Colorado Mine Inspectors' Reports: Little Dora, North Star.
[451] Colorado Mine Inspectors' Reports: Bandora, Brooklyn, Silver Ledge; *Minerals Yearbook*, 1937: 333; *Minerals Yearbook*, 1941: 311.

World War II, 1941 - 1945

During the early 1940s, a combination of domestic and international events created a socio-economic environment that made mining perhaps even more difficult than during the Great Depression. The world slipped into war just as the United States showed signs of a long-awaited economic recovery. The improving economy coupled with mobilization for another sweeping conflict fostered a renewed demand for industrial metals and other minerals. On the surface, this seemed to offer the mining industry hope for a recovery. When the United States was drawn into World War II following the December 7, 1941 attack on Pearl Harbor, the federal government initiated programs to organize and control economic, material, and labor resources for the mobilization effort. With domestic resources of supreme importance, the government passed legislation addressing mining. War Production Board Ruling L-208, much to the dismay of mine owners across the west, mandated suspension of gold mining by October 1942 on grounds that it did not contribute to the war effort. Other legislation addressed the values of those metals sanctioned by the government. When the United States entered the war, the value of industrial metals and silver ascended to record levels, such that the War Production Board placed price caps to prevent profiteering. Finally, the Reconstruction Finance Corporation and Smaller War Plants Corporation, federal agencies, provided low-cost loans to mining companies willing to reopen idle mines and prospect for new metal deposits.[452]

The three rulings were not necessarily beneficial to San Juan County. Without being able to produce gold, many mining operations suspended work. Others skirted the issue by claiming their focus was industrial metals and any gold realized was a byproduct. Companies merely had to demonstrate that their ore possessed high percentages of industrial metals, which many did. The low-cost loan program had little impact locally, because few, if any, companies used the program to reopen mines, suggesting that the ore was impoverished. Price caps had the greatest impact, diminishing financial incentive to produce ore. As a result, World War II was not a time of recovery for the county as it was for other mining regions in Colorado, and in fact the industry regressed from the previous period. Between 1942 and 1945, the county possessed only two prospects, nine small outfits, four medium-sized mines, and two large producers, one-third the outfits operational during the Great Depression. Ore production, largely from the Shenandoah-Dives, increased slightly. Government statisticians noted that nationwide production of gold and silver fell to their lowest points since 1935.[453]

The Shenandoah-Dives, Highland Mary, and Pride of the West mines were the three largest producers in the county during the war. Not only did their operators contribute the bulk of the county's output, but they anchored the rest of the industry. In particular, each company ran a concentration mill and accepted ore from independent outfits on a custom basis. In so doing, they filled the void created when the Durango Smelter closed. Concentrates subsequently shipped by

[452] *Minerals Yearbook*, 1942: 80; Saxon, 1959: 17.
[453] *Minerals Yearbook*, 1942: 79. The number of active mines was derived from a survey of Colorado Mine Inspectors' Reports.

rail to the Golden Cycle Smelter in Colorado Springs or to the A.V. plant in Leadville. Without local ore treatment, the handful of independent companies may not have been able to remain in business.

The Shenandoah-Dives continued as the most important county employer, with the Highland Mary a distant second. Charles Chase ran the Shenandoah-Dives like the ore factory that it was. Joseph Bradley pursued a similar course at the Highland Mary on a smaller scale. The Pride of the West was among those mines that realized profit from gold but was able to continue production because its ore met War Production Board criteria for industrial metals content. Manager Fred A. Brinker maintained maximum production and in 1942 reopened the Green Mountain. To accommodate the higher volume of ore, Pride of the West, Inc., increased capacity at the mill at Howardsville. During the war, the company employed around sixty workers and processed 100 tons of ore per day.[454]

Previously quiet, the Cement Creek drainage attracted renewed interest. The Lark, a small mine on the west side of the drainage near the Henrietta, saw only minor development until World War II. In 1943, William H. Steel realized that the Lark Vein still offered ore and leased the property. Steel bulldozed a road to the Lark and began production with little preparatory work. He utilized the income and capital from the Lark Mining Company to buy the property, build surface facilities, and drive a lower tunnel. In 1944, the tunnel, linked with the rest of the underground workings and enjoyed a sound yield for the rest of the war.[455] The Lead Carbonate, amid the peaks east of Gladstone, also had escaped significant development during the previous sixty-five years of mining in the county. In 1940, owner Vaughn Jones reopened the tunnel and brought it into minor production, but suspended when the war began. He improved the surface plant in 1944 and began production on a meaningful scale. Jones continued through 1945, when he sold the property.[456]

Post-World War II Recovery, 1946 – 1954

The end of World War II marked a major turning point in the United States, a period of almost unrivaled prosperity. The economy soared as returning soldiers engaged in consumerism; coupled with post-war construction; and a nascent Cold War, which fostered demand for industrial metals on a huge scale. In theory, this climate should have stimulated mining. The increased value of metals was certainly an incentive. While the prices for gold and silver changed little, copper almost doubled to $.21 per pound, and lead and zinc more than doubled from $.06 to $.13 per pound. In tandem, improvements in mining and milling technology greatly reduced the cost of producing and treating ore.[457]

[454] Colorado Mine Inspectors' Reports: Green Mountain, Pride of the West.
[455] Colorado Mine Inspectors' Reports: Lark.
[456] Colorado Mine Inspectors' Reports: Lead Carbonate; *Minerals Yearbook*, 1940: 306.
[457] Saxon, 1959: 9, 14, 16, 17, 37.

By contrast, the prices for silver and gold remained static, but their values relative to the dollar actually declined slightly because of inflation. In 1947, foreign nations successfully lobbied the federal government to reduce tariffs on imported industrial metals, which were completely repealed in 1950. Eight years later, the Paley Commission actively fostered mining overseas in hopes that countries with strong economic ties to the United States would not ally with the Soviet Union. Mining in the west had an increasingly difficult time competing.[458]

Another disincentive was the dwindling labor pool. Youth less frequently engaged in mining. As a result, the older miners did not find dedicated individuals interested in carrying on the tradition of hardrock mining. The greatest challenge, however, was the insurmountable argument that the veins in San Juan County were bereft of ore.

Cumulatively, these factors ended intensive mining in the county. Through the mid-1950s, the county enjoyed one last push of activity. During the latter half of the 1940s, the industry slightly recovered. Between 1946 and 1949, the county featured twelve prospects, twenty-five small mines, nine medium-sized operations, and three large producers. While the number of active mines paralleled the Great Depression, ore production doubled. During the depression, mining companies, anchored by the Shenandoah-Dives, generated between $900,000 and $1.6 million. By the late 1940s, the output ranged from $2.3 million to $2.7 million. In concert with increases in production and number of mines, the population of the county rose slightly. In 1940, 1,400 people resided in the county, rising by seventy by 1950.[459]

Statistics indicate that, during the early 1950s, the postwar revival began to wane. Between 1950 and 1954, the county had ten prospects, fifteen small mines, seven medium-sized operations, and one large producer. Ore production peaked in 1951 at $3.3 million and then dropped off as two important mines closed. In 1951, the Highland Mary suspended, and the county's yield decreased to $2.8 million. In 1953, the Shenandoah-Dives stopped producing ore, and county output plummeted to $816,000. When the mill stopped treating custom ore later in 1953, many of the county's mines closed, and total production dropped to $151,000. The Shenandoah-Dives, Highland Mary, and Pride of the West, flush with success from heavy wartime production, led the county's mining industry into the postwar recovery. These three operations changed little and joined new ventures organized in 1946 and 1947, primarily in the Eureka district.

Las Animas Mining District

The Osceola Mine was one of the first properties reopened in the Last Animas district after the war ended. The Osceola Vein, on the east side of Cunningham Gulch, had been prospected early in the county's history, but only the upper portion saw any work of substance. In 1946, O.L. Larson determined that the lower extent probably offered ore worth extracting and leased the mine under O.L. Larson & Associates. Larson then built a surface plant at the lower

[458] Bunyak, 1998: 79; Saxon, 1959: 37, 39.

[459] Production figures from *Minerals Yearbook*, 1946-1950 and S.M. Del Rio, *Mineral Resources of Colorado: First Sequel* (Denver: State of Colorado Mineral Resources Board, 1960) 272. The number of mines was derived from a survey of Colorado Mine Inspectors' Reports. See Schulze, 1977: 1950 regarding population statistics.

tunnel, drove exploratory workings, and struck the vein. By 1947, he brought the mine into production and shipped ore to the Mayflower Mill. For unknown reasons, Larson did not return the next year. A.B. Crosby, who specialized in leasing proven mines, recognized enormous potential and assumed the lease. In 1948, he and J.H. Harvey organized the Osceola Mining & Milling Corporation to provide capital for more development and buy the Lackawanna Mill. A handful of miners generated around six tons of ore per day, processed the material in the mill. The operation changed hands in 1951 but remained a sound producer for several years.[460]

The Silverton Mining Company owned the Mighty Monarch at the base of Kendall Mountain, which it reopened in 1947 after it lay quiet for nearly fifty years. The ore was complex and high in zinc content. The company rehabilitated the lower tunnel, extracted ore, and shipped the material to the Mayflower Mill. The returns were poor, and in 1948 the company built a test mill of its own. Workers trucked in and assembled portable components and tried processing the ore with conventional methods. The ore proved too difficult, and the operation ceased. The mill removed elsewhere.[461]

The Little Nation ranked with the Osceola in importance. Beginning with Henry Frecker's work on the Royal Charter Vein during the 1900s, the mine saw a series of operators that invested more than they recovered. The principal reason was that the ore resisted concentration, including flotation, but was not rich enough to pay for long distance shipping to advanced mills. In 1942 and 1943, the Mermac Mining Company trucked ore to the Mayflower Mill, but this was not economical. When values increased following World War II, the Royal Charter ore became profitable to produce. In response, the Little Nation Leasing Company leased the mine in 1947 and became the first outfit to work it on a profitable basis for a sustained period. The company ignored the surface facilities, tramway, and mill at Howardsville, so carefully designed in the 1920s, and instead brought in portable equipment. Workers bulldozed roads and began trucking ore to the Mayflower Mill. The operation remained small, but profitable, until the Mayflower Mill stopped accepting custom ore in 1953.[462]

Eureka Mining District

The Eureka Mining District hosted the greatest number of mining ventures following the war. The northern portion, in particular, saw a number of old mines reopened. The region attracted little interest after the late 1890s revival and so still had low-grade ore to offer. The Burrows Mine initially developed by the McIntyres of Animas Forks during the mid-1870s, reached its potential in 1947. At that time, H.G. Knapp & Associates leased the claim, which featured only an open-cut and a tunnel. Knapp bulldozed a road, brought in portable equipment, and began extracting ore. Miners then drove a lower tunnel to develop deeper portions of the vein and enjoyed seasonal work until 1953, when the Mayflower Mill closed.[463]

[460] Colorado Mine Inspectors' Reports: Osceola; *Minerals Yearbook*, 1947: 1371.
[461] Colorado Mine Inspectors' Reports: Mighty Monarch.
[462] Colorado Mine Inspectors' Reports: Mermac; *Minerals Yearbook*, 1948: 1465; *Minerals Yearbook*, 1953, V.3: 270.
[463] Colorado Mine Inspectors' Reports: Burrows.

The Columbus Mine near Animas Forks saw more activity in the few years after World War II than in the decades prior. William Erikson reopened the mine in 1943 to meet wartime demand for industrial metals and found the property a ready-made producer. The mine featured a haulage tunnel driven to the Columbus Vein at the turn of the century, but the vein lay fallow because the ore was low in grade. By the 1940s, trucking and the Mayflower Mill rendered the ore profitable, and Erikson brought the mine into production. He gradually increased the workforce during the war, and afterward hired more. In 1947, Erikson's crew generated fifty tons of ore per day, but trucking consumed so much money, Erikson considered building a concentration mill. In 1950, he finally erected a small plant at the mine, but was a little late to maximize the benefit that it provided. He ran the mill through 1951, when his miners exhausted the ore reserves underground. Exploration conducted in 1952 failed to find more payrock, which forced Erikson to close the mine and dismantle the mill.[464]

The Gold Prince Mine reopened, nearly fifty years after the monumental failure of the Gold Prince Mines Company. The Sunnyside Mining Company bought the property in 1917 for the Sunnyside Extension Vein, which the company worked at depth prior to closing in 1930. The vein's upper, northeastern section still offered low-grade ore, which attracted the Venture Leasing Company in 1951. Company principal William Gianetto understood the ore was complex and might not be profitable, so he distributed small batches to different mills for testing. William Gianetto grew satisfied that he had found a process that would concentrate the ore. He purchased the Slick Rock Mill at Ouray and rebuilt it on the old tramway terminal foundations at the mine. In 1953, Gianetto began operations, but shortly afterwards ceased. Perhaps the mill did not recover the metals content Gianetto hoped for, or the Mayflower no longer accepted his concentrates. For some reason, he did no further work at the property.[465]

W.L. Chase exemplified the practice of serial leasing common in the county. In 1947, his Great Eastern Mining Company leased the Great Eastern, Silver Wing, Sioux City, and Klondyke, all in and around Burns Gulch. Moving from one property to the next, a crew of nine miners conducted exploratory drilling, extracted shallow ore, and planned to develop the deeper reaches of the veins through the Silver Wing Tunnel. By 1950, the company aggressively developed the area's veins and leased the Pride of the West Mill at Howardsville to process ore. During the year, a crew of thirty-six generated 100 tons of ore per day, and although the volume fell during 1951, the operation was productive until it suspended in 1954.[466]

The Great Eastern Mining Company leased the Pride of the West Mill in 1951 after the owner, Pride of the West, Inc., ran out of ore in both the Pride and Green Mountain mines. As noted, the Pride company was among the three largest and most consistent producers in the county through the Great Depression and post-war recovery years. Emulating the familiar pattern, the Pride ore system had a limited amount of payrock, and company directors paused to consider their options. At the end of 1950, after fifteen years of heavy production, the company

[464] Colorado Mine Inspectors' Reports: Columbus; *Minerals Yearbook*, 1950: 1459.
[465] Colorado Mine Inspectors' Reports: San Juan County, Gold Prince.
[466] Colorado Mine Inspectors' Reports: Great Eastern.

discharged most workers and stopped the mill. To keep some income flowing in, the company leased the mill to Great Eastern and the mines to several small parties. In 1954, the company halfheartedly attempted to operate the Pride and hired a small crew of eight miners, who worked alongside almost as many lessees. By 1955, the company withdrew, leased the Pride mine and mill, and closed the Green Mountain Mine entirely.[467]

The Old Hundred Gold Mining Company was among the last outfits to operate an aerial tramway in the county. In 1948, the Old Hundred company bought its namesake mine and the Gary Owen with the intent of operating them together. The outfit rehabilitated the mill and tramways to both mines and enjoyed successful production for several years. Because the mill was able to process only some of the ore, miners trucked additional material to the Mayflower plant. When the Mayflower closed, the Old Hundred company lost a significant share of its revenue stream and suspended operations.[468]

Cement Creek Subdistrict

The Cement Creek drainage enjoyed its highest level of activity since the late 1890s immediately following World War II. The Lead Carbonate and Lark mines anchored the activity. Vaughn Jones operated the Lead Carbonate through the war and demonstrated its capacity as a sound and reliable source of ore. In 1946, he sold the property to H.P. Ehrlinger, Fred Archibald, and John Archibald, all experienced leasing other mines in the county. The new owners prepared the mine for production by erecting new facilities, including an ore concentration mill at Gladstone. Ehrlinger and partners produced and milled approximately fifty tons of ore per day through 1952 and then leased the entire operation to the Bonita Mining Company. The mill allowed the company to survive when the Mayflower plant closed. The mill earned additional income by treating some custom ore for local independent outfits. In 1955, Wyoming Tungsten Mines assumed the lease, ran the mill through the next year, and then shut down the mine.[469]

William H. Steel's Lark Mining Company converted the Lark from a shallow prospect into a sound producer, and Steel ran the mine into the post-war recovery period. In 1947, his other company, the U.S. Oil & Development Company, absorbed the Lark. U.S. Oil had much greater financial resources, which Steel directed toward the adjoining Henrietta and Ohio mines. In 1950, Steel acquired both complexes, shut the Lark down, and sent his miners to the Henrietta. At the same time, he leased the Ohio to Ed Walby and Milo Williams. Walby and Williams remained committed to the economy of tramways, which they repaired and used the double-rope system at the Ohio. Meanwhile, Steel's miners generated twelve tons of ore per day in the Henrietta until 1954, when he suspended the Henrietta, but leased the Lark to the Columbine Leasing Company and subsequently the Ruhter Mining Company.[470]

[467] Colorado Mine Inspectors' Reports: Pride of the West; *Minerals Yearbook*, 1949: 1439; *Minerals Yearbook*, 1951: 1469.
[468] Colorado Mine Inspectors' Reports: Garry Owen; *Minerals Yearbook*, 1950: 1459; *Minerals Yearbook*, 1952, V.3: 238.
[469] Burbank and Luedke, 1969: 60; Colorado Mine Inspectors' Reports: Lead Carbonate; *Minerals Yearbook*, 1946: 1408.
[470] Colorado Mine Inspectors' Reports: Henrietta, Lark, Ohio.

Mineral Creek Mining District

The post-war recovery did not impact the Mineral Creek Mining District to the same degree as the rest of the county. Most activity focused on modern prospecting and small leases, confirming that the mines had little profitable ore left to offer. Although the North Star and a few others remained active, they operated for brief periods by limited parties. The Silver Ledge was the only to yield briefly a significant amount of ore. During World War II, Joseph Bradley purchased the Silver Ledge, but because the Highland Mary consumed his attention, Bradley did little with the Silver Ledge except lease it to the San Juan Mining & Milling Company in 1947. The company used core drills to prospect the vein to the north of the shaft and located ore. Instead of encountering payrock within the vein, the company discovered a completely new formation on the vein's west side. The new formation was so close to the surface that the company could extract ore with heavy equipment instead of incurring the high cost of underground development. With bulldozers and power shovel, the company stripped away the overburden in 1949, exhumed high volumes of payrock, and trucked the material to the Mayflower Mill and the American Zinc Mill at Ouray. The operation lasted three years, when the Silver Ledge saw no further activity.[471]

Coda

Although the Shenandoah-Dives Mining Company closed the Mayflower Mill in 1953, the mining industry in the county slowly atrophied. From the mid-1950s onward, the industry was highly unstable and dissipated in importance. The statistics for the latter half of the 1950s reflect this decline. The county's output fluctuated wildly between a high of $537,000 in 1956 and a low of $36,000 in 1961. Because the Shenandoah-Dives and Mayflower were idle, these figures represent the volatility of independent outfits. Between 1955 and 1959, the county featured only seventeen prospects, nine small mines, two medium-sized operations, and one large producer, among the fewest in the county's history.

Finding ore became increasingly difficult after seventy-five years of prospecting and production, for the payrock truly was exhausted in most known mines. Those companies that stayed in business employed strategies of mobility and serial leasing rather than allegiance to specific properties. The companies specialized in secreting out small pockets of high-grade ore scattered throughout the county. To do so, companies used drilling programs, portable equipment, and experts to chase ore reserves as they could. Because most pockets lay within known veins, most activity remained in the historic centers.

The Argyle Mining & Milling Company and Technical Services Company were among the county's typical outfits during the 1950s. Barney Blackmore organized the Argyle company around a lease he obtained on the Pride of the West. In 1954, Blackmore trucked his ore to the Pride of the West Mill, which he also ran beginning in 1955. At the same time, the Osceola Mine came up for lease. Blackmore and partners realized they could operate both mines and lease the

[471] Colorado Mine Inspectors' Reports: Silver Ledge; *Minerals Yearbook*, 1947: 1465.

Pride of the West Mill to treat the ore. The Argyle company also accepted custom payrock for treatment from other outfits. The arrangement generated surplus capital, which the company applied to exploration of other properties, including the Black Hawk Mine in the Cement Creek drainage. Most went bust, but the Argyle produced small lots of ore for brief periods of time from disparate leases. In 1958, the Pride company left the mining business altogether and offered the Argyle company its property. Two years later, however, during a brief spike in interest in the region's mines, the Argyle company also left the mining business.[472]

While Blackmore's miners extracted ore from the Osceola Mine in 1955, the Technical Services Company did likewise from another section of the property, which it leased. J.C. Grant established the company, popularly known as Tec-Ser, early in the 1950s to conduct drilling and minor property development. The company moved toward speculation and eventually became interested in leasing mines. The Osceola was among the company's most successful operations and yielded ten to twenty tons of ore per day, which was also shipped to the Pride Mill. Argyle and Tec-Ser speculated with the same properties at different times, such as the Black Hawk leased by Argyle in 1955 and by Tec-Ser the following year. Tec-Ser also worked the Lucky Jack, Caledonia, and other properties for brief times. In 1957, the company left the region.[473]

In the late 1950s the Mayflower Mill announced reopening. The Shenandoah-Dives company had suspended operations in 1953 because it was out of ore and lacked capital to develop new formations that geologists discovered through sample drilling. To secure capital, the organization merged with the Marcy Exploration Company, a uranium company in Durango, forming the Marcy-Shenandoah Corporation in 1957. The company reopened the mill to custom business, which caused a surge of excitement among mining outfits still in existence. This proved short-lived, however. The company shut down the mill almost immediately because the mining industry could not provide enough ore to offset operating costs.[474]

Mining interests in the county interpreted the mill closure as a sign that Marcy-Shenandoah was canceling its plans. As a result, most outfits suspended operations. Marcy-Shenandoah, however, prepared to refit the mill, bring the Shenandoah-Dives Mine back into production, and complete deep development that the Sunnyside company had abandoned in 1938. The Shenandoah-Dives Mine would serve as a temporary source of ore, and the deep workings on the Sunnyside property meant to provide a long-term stream of payrock. In 1959, Marcy-Shenandoah leased the Sunnyside from ASARCo and drove the American Tunnel to strike the Sunnyside and Washington veins under Lake Emma. Unlike the old Sunnyside company, Marcy-Shenandoah did not site the tunnel at Eureka, but instead started from the Gold King Tunnel at Gladstone. Marcy-Shenandoah enlarged the tunnel, and renamed it the American. But before Marcy-Shenandoah made progress, it sold to the Standard Uranium Corporation, based in Moab, Utah, in 1960. Standard Uranium reorganized as Standard Metals to include the new assets and pushed ahead with the original plan.[475]

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[472] Colorado Mine Inspectors' Reports: Osceola, Pride of the West; *Minerals Yearbook*, 1955, V.3: 284; *Minerals Yearbook*, 1957, V.3: 301; *Minerals Yearbook*, 1958, V.3: 238.

[473] Colorado Mine Inspectors' Reports: Lucky Jack, Osceola; *Minerals Yearbook*, 1957, V.3: 301.

[474] Bunyak, 1998: 80.

[475] Bunyak, 1998: 80; Colorado Mine Inspectors' Reports: American Tunnel; *Minerals Yearbook*, 1959, V.3: 238.

To provide immediate income, Standard Metals reopened the Shenandoah-Dives Mine and Mayflower Mill and worked them together. Miners sent some ore to the mill in 1960 and increased production in 1962. Meanwhile, workers drove the American Tunnel to the impressive length of two miles, connected it with the old Sunnyside workings, and began hauling ore out by the trainload. The volume was sixty tons per day in 1962, which continued to increase beyond the 800-ton record that the Sunnyside company established during the late 1920s. The American Tunnel was a complete success and funneled a constant stream of ore into the late 1970s. As a result, the county's yield increased to more than $4 million per year.[476]

During the 1960s, the number of active operations decreased to six small mines, one medium-sized outfit, and one large producer. Continuing the trend of the 1950s, these were based around limited pockets of ore and therefore tended to be short-lived and inconsistent.[477] From 1960 through the 1970s, independent outfits further waned in stability and production, and the county's mining industry became synonymous with Standard Metals. In 1970, a failed copper mine in Arizona bankrupted Standard Metals, and the Washington Mining Company assumed the American Tunnel. Washington continued heavy production until 1978, when weak ground in the highest workings collapsed and drew Lake Emma's waters into the mine. The day was fortunately Sunday, when no miners were at work, or they would have perished. The force of the water rushing through the passages and out the tunnel scoured the interior of the mine and destroyed nearly all structures and equipment. The operation never recovered, despite attempts by three successive companies to bring the tunnel back into production. The American Tunnel, the county's last significant mine, closed definitively in 1991.[478]

[476] Colorado Mine Inspectors' Reports: American Tunnel, Mayflower; *Minerals Yearbook*, 1960, V.3: 246.
[477] The number of active mines was derived from a survey of Colorado Mine Inspectors' reports.
[478] Colorado Mine Inspectors' Reports: American Tunnel; Henn, 1999: 35; Marshall and Zanoni, 1998: 203.

Section E 2: Mining and Milling Methods, Technology, and Equipment

Following is a discussion of the general methods and technologies used to find and extract metals from the hardrock and placer deposits of San Juan County. In many cases, specific methods and technologies correspond to particular periods of significance, while others apply over the course of the county's mining history from 1860 through 1991. This portion of the text has been adapted from Section E of a previous Multiple Property Documentation Form, *The Mining Industry in Colorado* (revised 2008).[529] This adaptation is with permission from authors Jay Fell and Eric Twitty. Content relevant to mining in San Juan County is presented in an edited format. Inapplicable property types from the statewide context were deleted. Embedded illustrations were removed in compliance with more recent National Park Service guidance.

Placer Mining

The Nature of Placer Deposits

For thousands of years, humankind prized gold for its rarity, appearance, malleability, and chemical stability. Gold oxidizes and forms compounds only under unusual physical circumstances and otherwise remains in its native state. Superheated fluids and gases associated with geothermal and magmatic activity tend to deposit gold in the forms of veins, replacement bodies, and disseminated deposits in rock formations. Typically, mountain-building events such as those that uplifted the San Juans created the fluids, gases, and the geologic conditions for gold ore, which often included other metals such as silver, lead, and zinc.

Over the course of eons, erosion attacked the mountains and dismantled the ore veins that cropped out on ground-surface. Most of the minerals and metals were washed into waterways where they suffered reduction and dissolution, both physically and chemically, and decomposed into sediments. Stream action concentrated the sediments on the floors of drainages, and high runoff mobilized the sediments and washed them downstream.

Because gold is soft and inert, however, it neither dissolves nor forms chemical compounds and only slowly disintegrates through physical reduction. Hence, as erosion freed gold from its parent veins, the particles migrated into nearby drainages and slowly sifted downward into the gravel floors due to their weight. As each high runoff event mobilized and shifted the stream gravel, the gold particles worked their way down toward the bedrock floor where they became concentrated and remained for thousands of years. Over time, water carried the gold from small, steep gulches near the parent veins into streams and then rivers.

Because erosion is an unending process, fresh gold was constantly freed from its parent veins while the older material continued to accumulate on the bedrock floors. Hence, fine gold

529 Jay Fell and Eric Twitty, *The Mining Industry in Colorado Multiple Property Documentation Form* (Denver: Office of Archaeology and Historic Preservation, Colorado Historical Society, 2008).

disseminated throughout the upper strata of a stream's gravel often represented a richer deposit at depth. Overall, miners termed gold-bearing gravel *placer deposits* and referred to broad areas of such gravel as *placer fields*.

In San Juan County, prospectors and miners encountered three principal types of placer deposits. The first consisted of what were known as *gulch placers* or *gulch washings*, and these consisted of rich, gold-bearing gravel lining the floors of minor drainages that were often steep. Because gulch placers lay near a parent vein, offered few places for fine material to settle out, and were subject to high-energy stream flows, the gravel tended to be coarse, the gold particles large and rough, and the gravel beds thin.

Miners recognized the second type of deposit as a *river placer*, and it was created when streams introduced gold into the Animas River. The water currents sifted the gold downward into the lower levels of the gravel, where the particles became concentrated. The third type, informally known as *blanket deposits*, was limited to relatively arid areas that featured gold veins at ground-surface. Erosion and weathering attacked the veins and freed the gold, but runoff was not sufficient enough to immediately shunt the metal into waterways, leaving a veneer of gold-bearing soil easily processed by hand.

Prospecting for Placer Gold

While some of the placer deposits lent themselves to specific types of extraction processes, all could be discovered by basic prospecting. All a prospector need do was excavate pits in stream gravel and reduce the material in a gold pan. The presence of a few flakes of gold from the upper gravel suggested the potential for more at depth, spurring the prospector to dig deeper pits. By the late 1850s, experienced prospectors understood that the worth of a deposit could only be accurately assessed by testing gravel from near bedrock, which required considerable labor to expose. If the prospector confirmed the presence of placer gold in profitable quantities, he was ready to begin mining.

Placer Mining Methods

One of placer mining's main attractions was that it was within practical and economic reach of both individual miners and organized companies. Gulch placers and gold-bearing soil saw mining by individuals who worked by hand, and by companies with complex systems that depended on infrastructures. River placers, however, tended to be the domain of capitalized companies because they required capital investment for flumes, long sluices, and workforces to excavate high volumes of material.

When working by hand, individual miners often employed pans, cradles, and small sluices to separate gold from gravel. Miners merely excavated pits and trenches into streambeds, and when they approached bedrock, the miners shoveled the gold-bearing material into a cradle or sluice. A cradle was a portable wooden box with a rounded bottom, a slanted board featuring riffles, and a lever. The miner rocked the cradle back and forth while introducing water, which

washed off the gravel and left the heavy gold trapped behind the riffles. A sluice was a small, portable wooden flume with riffles nailed to the floor. The miner placed it in a stream and shoveled gravel into the interior, and the flow of water washed the light gravel away. When miners exhausted the gold-bearing gravel in their pits and trenches, they shifted laterally, began new excavations, and filled the old pits with new tailings. Over time, this created hummocky assemblages of tailings piles, pits, trenches, and buried excavations.

Organized mining companies had the same goals as individual miners, only they relied on infrastructures to process gravel in high volumes from groups of claims. Companies often erected systems of sluices, work stations, water-diversion structures to move streams out their beds to expose gravel, and ditches and flumes to deliver water to otherwise dry areas. The sluices tended to be lengthy and featured either several branches feeding into a trunk line or several parallel sluices. Common sluices ranged from 2' wide and as deep, to 4' wide and 4' deep. They stood on timber piers supported by timber or stacked rock footers and featured a relatively gentle gradient so fine gold was not washed off. Workers usually installed the sluices in trenches and shoveled the surrounding gravel into the current flowing through the device. After prolonged excavation, workers reduced the height of the surrounding gravel until the sluice bed manifested as a raised berm.

When the sluice floor became choked with fine sediment, a worker closed the headgate and shut off the water flow so the gold caught behind the riffles could be recovered. Workers stepped down into the sluice and, under watch of a guard or superintendent, began removing large gold particles and scraping out gold-laden sand. The particles were collected and weighed while the sand was treated with mercury, which amalgamated with gold dust that was too fine to be easily picked out. After cleanup operations, the sluice was ready for more gravel and a worker opened the headgate, admitting water again.

While hand-methods were highly effective for gulch and blanket placers, the costs of labor were too high and the rate of processing too limited for most extensive deposits. By nature, these deposits tended to feature fine gold disseminated through broad, deep gravel beds that had to be mobilized and processed in economies of scale for profitability. Such conditions required the investment of considerable capital to build the infrastructures necessary to achieve production in economies of scale, and mining companies arranged their infrastructures to carry out several distinct methods.

One of the most popular and earliest was known as *booming*, and it involved the sudden release of a torrent of water into placer workings from a nearby reservoir. The rush of water mobilized and carried gravel en masse through sluices, where riffles often retaining mercury collected the gold. To facilitate both the consumption of high volumes of water and the processing of large tonnages of gravel, companies formally engineered their infrastructures. Networks of supply ditches pirated water from area streams and directed it to the placer mine and the reservoir, distribution ditches shunted the liquid into the sluices, and boom ditches carried water from the reservoir into the workings. All featured headgates, and the sluice systems were as noted above.

Hydraulic mining, developed in California and practiced in San Juan County, was another method for processing thick gravel beds in economies of scale. A monitor, also known as a giant, was the key instrument in hydraulic mining. A monitor was a large nozzle that emitted a jet of water under pressure so great that miners were unable to swing sledge hammers through it. A worker played the jet against gravel banks, which crumbled and liquefied, and with the help of booming, were washed into sluices. The infrastructure for hydraulic mining was similar to that for booming with additional components for the monitors. To create the necessary pressure, ditches delivered water to a reservoir located far upslope from the mine, and a flume or pipe directed water into a structure known as a pressure box. The structure was basically a rectangular tank made of planks retained by stout framing at least 6' wide, 6' high, and 8' long. A pipe known as a penstock, often at least 24" in diameter, exited the structure's bottom and descended to the mine, decreasing in diameter incrementally to increase the water current's velocity and pressure. The pipe entered the placer workings and connected to a monitor located on a strategically placed station, which commanded a full view of the gravel banks.

Hardrock Mining

The Nature of Hardrock Ore Deposits

Although placer gold initially drew prospectors to San Juan County, it was hardrock ore that kept them in the region. In general, profitable minerals and metals found in the hard, metamorphic and igneous rock formations of the mountains constituted hardrock ores. In the county, the principal precious and semiprecious metals were silver and gold, while the principal industrial metals were lead, zinc, and copper. Uranium drew interest but saw little production, and a few companies extracted small tonnages of tungsten between 1900 and around 1920.

The common traits shared by most of the hardrock ores, which influenced how companies mined them, were the nature of the ore formations. Most of the ore formations were functions of the volcanism that built the San Juan Mountains. During these periods, superheated, plastic magmatic bodies slowly intruded the basement rocks deep under the surface and exerted great pressure. As these bodies made their way upward, pockets of liquid rock and superheated fluids and gases attempted to escape through paths of least resistance. Faults and fissures provided these paths, and they ranged from microscopic to several feet in width and tended to be oriented vertically. As the gases and fluids lost pressure and heat during ascent, insoluble minerals first precipitated out on the fault walls, followed by soluble minerals and metals with low melting points. The result was irregular and mineralized bands or seams impregnated with metals, which the mining industry recognized as *veins*. Most veins were barren of metals while some offered disbursed ore and a few featured rich pockets or stringers, and nearly all terminated less than 1,000 feet deep. While this is a great oversimplification of San Juan County's geology, some understanding is necessary to appreciate how the mining industry extracted ore.

Prospecting for Hardrock Ore

Finding the ore formations was the first step in hardrock mining, and this was the task of prospectors. Popular history suggests that individual or pairs of prospectors found rich gold and silver veins by simply excavating pits with pick and shovel, or wandered the countryside until they encountered rich outcrops. In actuality, successful prospecting involved a basic knowledge of mineralogy and geology, hard work, patience, and strategy and planning. Prospectors also rarely worked alone because parties ensured safety and security, increased the likelihood of finding ore through group efforts, and hastened the examination and sampling of mineral bodies.

The process of prospecting often began with a cursory survey of an area of interest where prospectors sought geological and topographical features suggestive of ore bodies. They often examined visible portions of bedrock for seams, outcrops of quartz veins, dykes, unusual mineral formations, and minerals rich with iron. Where vegetation, sod, and soil concealed bedrock, prospectors also scanned the landscape for anomalous features such as water seeps, abrupt changes in vegetation and topography, and changes in soil character.[530]

If an area offered some of these characteristics, the party of prospectors may have shifted to more intensive examination methods. One of the oldest and simplest sampling strategies, employed for locating gold veins, began by testing steam gravel for gold eroded off a parent vein. By periodically panning samples, a party could track the gold upstream, and when members encountered the precious metal no more, they knew they were near the point of entry. The party then turned toward one of the stream banks and began excavating test pits and panning the soil immediately overlying bedrock in hopes of finding a continuation of the gold. They tested samples horizontally back and forth across the hillslope in attempts to define the lateral boundaries of the gold flecks, then moved a short distance upslope and repeated the process. Theoretically, each successive row of pits should have been shorter than the previous one, since erosion tended to distribute gold and other minerals in a fan from their point sources. By excavating several rows of pits, the prospectors were able to project the fan's upslope apex where, they hoped, the vein lay. Employing such a sampling strategy occasionally paid off, but the party of prospectors had to undertake considerable work digging prospect pits with pick and shovel, hauling soil samples to a body of water over rough terrain, and panning in cold streams. It seems likely that the French party discovered the Little Giant Mine with these methods.[531]

One of the greatest drawbacks to systematic panning was that it detected only gold but missed silver and industrial metals, which were actually San Juan County's claim to fame. To find minerals in addition to gold, prospectors scanned the stream gravel and other areas of exposed soil for what they termed *float*, or isolated fragments of ore-bearing rock. As with free-gold, natural weathering fractured ore bodies and erosion transported the pieces downslope, often in the shape of a fan. If the prospectors encountered ore specimens, they walked transects to define the boundaries of the scatter, narrowing the search to the most likely area. Applying the

[530] Charles A. Bramble, *The ABC of Mining: A Handbook for Prospectors* (Santa Monica: Geology, Energy & Minerals Corporation, 1980 [1898]) 11-13; Robert Peele, *Mining Engineer's Handbook* (New York: John Wiley & Sons, 1918): 381-5; George Young, *Elements of Mining* (New York: John Wiley & Sons, 1946) 19-26.
[531] Bramble, 1980: 11-13; Peele, 1918: 381-5; Young, 1946: 19-26.

same methods used to locate gold veins, prospectors excavated groups or rows of pits and traced ore samples until they could project where the vein supposedly lay. With high hopes, the prospectors sank several prospect pits down to bedrock and chipped away at the material to expose fresh minerals.[532]

If the exposed bedrock suggested the presence of an ore body, the party of prospectors may have elected to drive either a small shaft or adit with the intent of sampling the mineral deposit at depth and confirm its continuation. After clearing away as much fractured, loose bedrock as possible with pick and shovel, a pair of prospectors began boring blast-holes with a hammer and drill-steels. They often bored between twelve and eighteen holes, 18" to 24" deep, in a special pattern designed to maximize the force of the explosive charges they loaded. Prior to the 1880s, prospecting parties usually used blasting powder, and by the 1890s, most converted to stronger but more expensive dynamite. Until economic ore had been proven, the operation was classified as a *prospect adit* or *prospect shaft.*

Deep Exploration and the Development of Ore Bodies

A *prospect* differed greatly from a *mine*. A prospect was an operation in which prospectors sought ore. The associated workings ranged from groups of pits to shallow adits or shafts with as much as hundreds of feet of horizontal and vertical passages. A mine, by contrast, usually consisted of at least several hundred of feet of workings and a proven ore body. All mines began as prospect operations, and when prospectors determined the existence of ore, the activity at the mineral claim often shifted at first to quantifying how much ore existed, and then to profitable extraction.

The general methods by which prospectors and miners searched for and extracted ore and equipped their mines to do so were universal throughout the west. San Juan County was no exception, and the methods fell into common patterns. The most elementary was converting the prospect into a mine once a company proved ore. Usually, the company hired a crew of miners who proceeded to enlarge the prospect adit or shaft and systematically block out the mineral body. At the point where a tunnel or shaft penetrated the formation, miners developed it with internal workings consisting of *drifts* driven along the vein, *crosscuts* extending 90 degrees across the vein, internal shafts known as *winzes* which dropped down from the tunnel floor, and internal shafts known as *raises* which went up. Drifts and crosscuts explored the length and width of the ore, and raises and winzes explored its height and depth.

Miners and prospectors consciously sank shafts or drove adits in response to fundamental criteria. A shaft was easiest and the least costly to keep open against fractured and weak ground, and it permitted miners to stay in close contact with an ore body as they pursued it. A shaft also lent itself well to driving a latticework of drifts, crosscuts, raises, and winzes to explore and block out an ore body.

[532] Ibid.

Mining engineers discerned between vertical and inclined shafts. One contingent of engineers preferred inclined shafts because mineral bodies were rarely vertical and instead descended at an angle. In addition, inclined shafts needed smaller, less expensive hoists than those used for vertical shafts. The other camp of engineers, however, claimed that vertical shafts were best because maintenance and upkeep on them cost less. Vertical shafts had to be timbered merely to resist swelling of the walls, while timbering in inclines had to also support the ceiling, which was more expensive, especially when the passage penetrated weak ground. Inclined shafts also required a weight-bearing track for the hoist vehicle, which, including maintenance such as replacing rotten timbers and corroded rails, consumed money.

An adit or tunnel, by contrast, was easier and faster to drive and required significantly less capital than a shaft. Some mining engineers determined that the cost of drilling and blasting a shaft was as much as three times more than an adit or tunnel. Prospectors and mining engineers alike understood that adits and tunnels were self-draining, they required no hoisting equipment, and transporting rock out and materials into the mine was easier. However, adits and tunnels were not well-suited for developing deep ore bodies because interior hoisting and ore transfer stations had to be blasted out, which proved costly and created traffic congestion. One other problem, significant where the rock was weak, lay in the enormous cost of timbering the passages against cave-in. While the exact differentiation between a tunnel and an adit is somewhat nebulous, mining engineers and self-made mining men referred to narrow and low tunnels with limited space and length as *adits*. Passages wide enough to permit incoming miners to pass outgoing ore cars, high enough to accommodate air and water plumbing suspended from the ceiling, and extending into substantial workings have been loosely referred to as *tunnels*.[533]

Despite the hypothetical advantages of shafts and tunnels, in some cases factors beyond miners' or engineers' control governed the actual choice. Geology proved to be a deciding criterion; steep hillsides, deep canyons, and gently pitching ore bodies lent themselves well to exploration and extraction through tunnels. In many cases prospectors who had located an outcrop of ore high on a hillside elected to drive an adit from a point considerably downslope to intersect the formation at depth, and if the ore body proved profitable, then the mining company carried out extraction through the adit.[534]

One additional, significant factor influenced the decision to sink a shaft instead of driving a tunnel. Historians of the west aptly characterized intense mineral rushes as frenzies of prospectors who blanketed the surrounding territory with claims. In most districts, including those in San Juan County, the recognized hardrock claim was 1,500' long and 300' to 500' wide, which left limited work space both above and below ground. A shaft was the only means to pursue a deep ore body within the confines of such a claim.[535]

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[533] Eric Twitty, *Riches to Rust: A Guide to Mining in the Old West* (Montrose, CO: Western Reflections, 2020) 36.

[534] Colliery Engineer Company, *Coal & Metal Miners' Pocketbook* (Scranton: Colliery Engineer Company, 1893) 257; International Textbook Company, *A Textbook on Metal Mining: Steam and Steam-Boilers, Steam Engines, Air and Air Compression, Hydromechanics and Pumping, Mine Haulage, Hoisting and Hoisting Appliances, Percussive and Rotary Boring* (Scranton: International Textbook Company, 1899) A40:8.

[535] *Morrison's Mining Rights*, Denver, CO, 1899:17, 20; Peele, 1918:1474.

The Mine Surface Plant

Driving underground workings required support from facilities on the surface. Known among miners and engineers as the *surface plant*, these facilities were equipped to meet the needs of the work underground. Large, productive mines boasted sizable surface plants while small prospect operations had simple facilities. Regardless of whether the operation was small or large, the surface plant had to meet five fundamental needs. First, the plant had to provide a stable and unobstructed entry into the underground workings. Second, it had to include a facility for tool and equipment maintenance and fabrication. Third, the plant had to allow for the transportation of materials into and waste rock out of the underground workings. Fourth, the workings had to be ventilated, and fifth, the plant had to facilitate the storage of up to hundreds of thousands of tons of waste rock generated during underground development, often within the boundaries of the mineral claim. Generally, both productive mines and deep prospects had needs in addition to the above basic five requirements, and their surface plants included the necessary components.

The basic form of a surface plant, whether haphazardly constructed by a party of inexperienced prospectors or designed by experienced mining engineers, consisted of a set of *components*. In terms of underground operations, the entry usually consisted of a shaft collar or a tunnel portal, and transportation arteries permitted the free movement of men and materials into and out of these openings. At tunnel operations, miners usually used ore cars on baby-gauge rail lines, and at shafts, a hoisting system lifted vehicles out of the workings. Materials and rock at shaft mines were usually transferred into an ore car for transportation on the surface. The surface plants for all types of mines included a blacksmith shop where tools and equipment were maintained and fabricated, and large mines often had additional machining and carpentry facilities. Most of these plant components were clustered around the tunnel or shaft and built on cut-and-fill earthen platforms made when workers excavated material from the hillslope and used the fill to extend the level surface. Once enough waste rock had been extracted from the underground workings and dumped around the mouth of the mine, the facilities may have been moved onto the resultant level area. The physical size, degree of mechanization, and capital expenditure of a surface plant was relative to the constitution of the workings below ground.

In addition to differentiating between surface plants that served tunnels from those associated with shafts, mining engineers further subdivided mine facilities into two more classes. Engineers considered surface plants geared for shaft sinking, driving adits, and underground exploration to be different from those designed to facilitate ore production. Engineers referred to exploration facilities as *temporary-class plants*, and as *sinking-class plants* when associated with shafts. Such facilities were by nature small, labor-intensive, energy inefficient, and most important, they required little capital. *Production-class plants* on the other hand usually represented long-term investment and were intended to maximize production while minimizing operating costs such as labor, maintenance, and energy consumption. Such facilities emphasized capital-intensive mechanization, engineering, planning, and scientific calculation.

Mines underwent an evolutionary process in which the discovery of ore, the driving of a prospect shaft or tunnel, installation of a temporary plant, upgrade to a production plant, and eventual abandonment of the property all were points along a spectrum. Depending on whether prospectors or a mining company found ore and how much, a mine could have been abandoned in any stage of evolution. Engineers and mining companies usually took a cautionary, pragmatic approach when upgrading a sinking plant to a production plant. Until significant ore reserves had been proven, most mining companies minimized their outlay of capital by installing inexpensive machines adequate only for meeting immediate needs.

Mining engineers extended the temporary and production-class classifications to structures including machine foundations. Because of a low cost, ease of erection, and brief serviceable life, timber and hewn log machine foundations were strictly temporary while production-class foundations consisted of concrete or masonry. The structure of wooden foundations usually consisted of cribbing, a framed cube, or a frame fastened to a pallet buried in waste rock for stability and immobility. The construction and classification of machine foundations is of particular importance because they often constitute principal evidence capable of conveying the composition of the surface plant.[536]

Surface Plants for Tunnels

The surface plants for tunnels and shafts shared many of the same components. Yet, because of the fundamental differences between these two types of mines, the designs and characteristics for each were different. Following is a list and description of the principal components found at most tunnel operations.

The Tunnel Portal

The tunnel portal was a primary component of both simple prospects and complex, profitable mines. Professionally trained mining engineers recognized a difference between prospect adits and production-class tunnels. Height and width were the primary defining criteria. A production-class tunnel was wide enough to permit an outgoing ore car to pass an ingoing miner, and headroom had to be ample enough to house compressed air lines and ventilation tubing. Some mining engineers defined production-class tunnels as being at least 3½' to 4' wide and 6' to 6½' high, and anything smaller, they claimed, was merely a prospect adit.[537]

Mining engineers paid due attention to the tunnel portal because it guarded against cave-ins of loose rock and soil. Engineers recognized *cap-and-post timber sets* to be best suited for supporting both the portal and areas of fractured rock further in. This ubiquitous means of support consisted of two upright posts and a cross-member, which miners assembled with precision using measuring rules and carpentry tools. They cut square notches into the timbers,

[536] Eric Twitty, *Reading the Ruins: A Field Guide for Interpreting the Remains of Western Hardrock Mines* Masters Thesis (Denver: University of Colorado, 1999): 30-2.
[537] Peele, 1918: 459; George Young, *Elements of Mining* (New York: John Wiley & Sons, 1923): 463.

nailed the cap to the tops of the posts, and raised the set into place. Afterward, the miners hammered wooden wedges between the cap and the tunnel ceiling to make the set weight-bearing. Because the tunnel usually penetrated tons of loose soil and fractured rock, a series of cap-and-post sets were required to resist the ground, and they had to be lined with *lagging* to fend off loose rock and earth. In areas penetrating swelling ground, the bottoms of the posts had to be secured to a floor-level cross-timber or log footer to prevent them from being pushed inward. Wood used for the purposes of supporting wet ground decayed quickly and had to be replaced as often as several times a year. Professionally trained mining engineers claimed that dimension lumber was best for timber sets because it decayed slowly and was easy to frame, but high costs discouraged its use where logs were available.[538]

Mine Transportation

Miners working underground generated tons of waste rock that had to be hauled out, while tools, timbers, and explosives had to be brought in. As a result, both prospect operations and large, paying mines had to rely on some form of a transportation system. The conveyances used by prospectors had to be inexpensive, adaptable to tight workings, and capable of being carried into the backcountry. To meet these needs, prospect outfits often used wheelbarrows on plank runways. Mining engineers recognized the functionality of wheelbarrows but classified them as strictly serving the needs of subsurface prospecting because of their light duty.[539]

Outfits driving substantial underground workings required a vehicle with a greater capacity. The vehicle most outfits chose was the ore car, which consisted of a plate iron body mounted on a turntable riveted to a rail truck. Cars were approximately 2' high, 4' long, and 2½' wide. They held at least a ton of rock and had a swing gate at the front to facilitate dumping. Further, the body pivoted on the turntable to permit the operator to deposit a load of rock on either side of or at the end of the rail line.

Ore cars ran on rails that mine supply houses sold in standard sizes. The units of measure were based on the rail's weight-per-yard. Light-duty rail ranged from 6 to 12 pounds per yard, medium-duty rails included 12, 16, 18, and 20 pounds per yard, and heavy rail weighed from 24 to 50 pounds per yard. Prospecting outfits usually purchased light-duty rail because of its transportability and low cost. Mining engineers erecting production-class transportation systems had miners use at least medium-duty rail because it lasted longer.[540]

The specific type of rail system installed by a mining outfit reflected the experience and judgment of management, the financial status of the company, and the extent of the underground workings. The basic system used in nearly all Colorado mines consisted of a main line that extended from the areas of work underground, though the surface plant, and out to the waste rock dump. Productive mines and deep prospect operations usually had spurs underground extending to tunnel faces, stopes, and ore bin stations. Substantial mines with extensive surface

[538] International Textbook Company, 1899: A40-42.
[539] Twitty, 2002: 36.
[540] International Textbook Company, 1899: A40, 53; Young, 1923: 192.

plants also featured spurs on ground-surface extending to different parts of the waste rock dump, to a storage area, and to the mine shop. Many large mines built special stake-side, flatbed, and latrine cars for the coordinated movement of specific materials and wastes.

Mining engineers understood that hand-tramming single-ore cars were the most cost-effective transportation at small and medium-sized operations. But at large mines, they strongly recommended pulling trains with draft animals. As mining matured through the nineteenth century, miners learned that mules were the best animals suited for work underground because they were reliable, strong, of even temperament, and intelligent. The electric locomotive, termed an *electric mule* by some miners, arrived in the west during the 1890s. The early machines consisted of a trolley car motor custom-mounted onto a steel chassis, and they took their power from overhead *trolley lines* strung along the mine's ceiling.

The spread of electric mules to San Juan County proved slow. Locomotives required special mechanical and electrical engineering, were too big for the tortuous workings of most mines, and required considerable capital. A small locomotive cost $1,500 and $7.50 per day to operate. A mule, on the other hand, cost only $150 to $300 to purchase and house, and between $.60 and $1.25 to feed and care for per day.[541]

Upgrades to the rail line presented the engineer with additional costs. Mules were able to draw between three and five ore cars weighing approximately 2,500 pounds each, for which16-pound rails spiked at an 18" gauge proved adequate. But electric locomotives and their associated ore trains usually weighed dozens of tons, and as a result they required broad tracks of heavier rail. Mining engineers recommended that at least 20-pound rail spiked 24" apart on ties spaced every 2' be laid for small to medium-sized locomotives. Heavy locomotives required rail up to 40-pounds per yard spiked at 36" gauge. The reason for the heavy rails and closely spaced ties was that the machines pressed down on the track and perpetually worked uphill against the downward-flexed rails. This wasted much of the locomotive's power and energy, and engineers sought to minimize the sag with stiff rails on a sound foundation.[542]

Some mining engineers criticized the fact that electric locomotives were tied to the fixed route defined by the trolley wires. To remedy this problem, electric machinery makers introduced the storage battery locomotive around 1900, which had free reign of the mine's rail lines. Despite its independence, very few of San Juan County's mining companies employed battery-powered locomotives because they were costly and required a recharging facility.

A few mining engineers espoused the compressed air locomotive, which consisted of a compressed air tank fastened to a miniature steam locomotive chassis. These locomotives were able to negotiate tight passageways, had plenty of motive power, spread fresh air wherever they

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[541] General Electric Company, *Electric Mine Locomotives: Catalogue No. 1045* (Chicago: General Electric Power and Mining Department:, 1904) 23; Peele, 1918: 862, 871.

[542] Colliery Engineer Company, *Coal Miners' Pocketbook* (New York: McGraw-Hill Book Co., 1916): 767; International Textbook Company, *International Library of Technology: Hoisting, Haulage, Mine Drainage* (Scranton: International Textbook Company, 1906): A55, 6; International Textbook Company, *International Correspondence School Reference Library: Rock Boring, Rock Drilling, Explosives and Blasting, Coal-Cutting Machinery, Timbering, Timber Trees, Trackwork* (Scranton: International Textbook Company, 1907): A48, 2; International Textbook Company, *Mine Haulage: Rope Haulage in Coal Mines, Locomotive Haulage in Coal Mines, Mine Haulage Systems, Calculations, and Cars* (Scranton: International Textbook Company, 1926) 1; Young, 1923: 192.

went, operated on the ubiquitous 18" rail gauge, and did not require complex electrical circuitry. However, compressed air locomotives cost as much as their electric cousins and required a costly compressor capable of delivering air at pressures of 700 to 1000 pounds per square inch. Locomotives and the necessary improvements were well beyond the financial means of most of San Juan County's mining outfits. The companies continued the traditional method of pushing single cars by hand.

The Mine Shop

Every mine required the services of a blacksmith who maintained and fabricated equipment, tools, and hardware. The common rate for driving a tunnel with hand-drills and dynamite in hard rock was approximately 1' to 3' per 10-hour shift. Over the course of such a day, miners blunted drill-steels in substantial quantities, and for this reason, the blacksmith's primary duty was to sharpen those steels.[543]

To permit the blacksmith to work in foul weather, mining companies erected buildings to shelter the shop. The building tended to be small, simple, and rough, and operations lacking capital often relied on local building materials such as logs. Prospecting and mining outfits almost invariably located the shop adjacent to the tunnel portal or shaft collar to minimize unnecessary handling.

In general, blacksmiths required few tools but much skill for their work. A typical basic field shop consisted of a forge, bellows or blower, anvil, quenching tank, hammers, tongs, swage, cutter, chisels, hacksaw, snips, small drill, workbench, iron stock, hardware, and basic woodworking tools. Prior to the 1910s, outfits deep in the backcountry often dispensed with factory-made forges and used local building materials to make vernacular versions. The most popular type of custom-made forge consisted of a gravel-filled, dry-laid rock enclosure usually 3' by 3' in area and 2' high, and miners in forested regions substituted small logs. A tuyere, often made of a 2' length of pipe with a hole punched through the side, was carefully embedded in the gravel, and its function was to direct the air blast from the blower or bellows upward into the fire in the forge.

The size of a shop and its appliances were functions of capital, levels of ore production, and era. The shops at small mines typically featured a forge and blower in one corner of the building, an anvil and quenching tank next to the forge, a work bench with a vice along one of the walls, and a lathe and drill press. The appliances were usually manually operated.

A greater availability and affordability of steam engines and air compressors during the 1890s brought power appliances within reach of many companies. Typical shops at medium-sized mines featured traditional facilities augmented with power appliances such as lathes or drill presses. Because medium-sized mines had materials handling needs exceeding those at small mines, forges were typically either 4' x 4' free-standing iron pan model, a gravel-filled iron tank 4' in diameter and 2' high, or a 3' x 3' gravel-filled wood box. In addition to the above

[543] Herbert C. Hoover, *Principles of Mining* (New York: McGraw-Hill Book Co., 1909) 150; International Textbook Company, 1907:A48, 13; Peele, 1918: 184; Young, 1946: 87.

appliances, many shops at large mines were also equipped with a mechanical saw, grinder, and pipe threader, which may have been power-driven.

The physical composure of a shop building reflects the financial state of a mining company. In general, the buildings were rough and vernacular in design and construction. Vernacular is defined as an adaptation of conventional forms and construction to the conditions, function, capital, and materials available to the mining outfit. The buildings were rarely designed by professional architects and instead were planned to meet specific needs. Outfits with limited financing used local building materials while well-capitalized mining companies often erected frame buildings. Two traits shared by most shops were windows for natural light and earthen floors to minimize the risk of fire started by loose embers.

At large, substantial mines, the primary function of shop laborers continued to be drill-steel sharpening. But when compressed-air powered rock drills, used to bore blast-holes, became common during the 1890s, the sooty blacksmiths changed their sharpening methods. The noisy and greasy machines produced high volumes of dulled drill-steels and broken fittings. Contrary to today's popular misconceptions, San Juan County's mining outfits did not immediately adopt rock drills when they were introduced during the late 1870s. Instead, the conversion required thirty years, and during the period, blacksmiths became proficient in sharpening both hand-steels and machine drill-steels, each of which had specific requirements.[544]

In the first decade of the twentieth century, mining equipment manufacturers introduced drill-steel sharpening machines to expedite the sharpening process. The early drill-steel sharpeners, similar in appearance to horizontal lathes, were costly and few were employed in San Juan County. The Silver Lake Mines Company was among the few organizations to use the early sharpeners. During the 1910s, rock drill makers introduced compact units that stood on cast iron pedestals bolted to timber foundations. Both moderate and well-financed mining companies in the county installed the revised types with increased frequency through the 1910s. Most companies with limited funds, on the other hand, continued to rely on traditional forge sharpening methods for decades afterward.

The most profitable mining companies equipped their shops with additional power appliances for advanced fabrication. The power hammer permitted a single blacksmith to complete work requiring a team of two. Well-capitalized companies installed factory-made models consisting of a heavy plate iron table fixed to the top of a cast iron pedestal, and a piston hammer that pounded items with tremendous force. Those companies unwilling to buy the factory-made hammers instead adapted heavily worn but operational rock drills. The drill was fixed onto a stout vertical timber, and when a shop opened the air valve, the drill's chuck rapidly tapped an iron table.[545]

Mine Ventilation

[544] International Textbook Company, *International Library of Technology: Mine Surveying, Metal Mine Surveying, Mineral-Land Surveying, Steam and Steam Boilers, Steam Engines, Air Compression* (Scranton, International Textbook Company, 1924) A24, 1.
[545] Twitty, 1999: 77.

The use of explosives, open flame lights, laboring miners' respiration, and natural gases often turned the atmosphere in underground workings into an intolerably stifling and even poisonous environment. Mining outfits approached this problem by installing one or a combination of two basic ventilation systems. The first, *passive ventilation*, relied on natural air currents to remove foul air, but it proved marginal to ineffective in dead-end workings. *Mechanically assisted systems*, the second, were production-class in duty and required elementary engineering.

Some prospecting outfits cleverly combined passive and mechanical means. One of the simplest was a canvas windsock on a wooden pole, which drew air from breezes and directed it through canvas tubing or stovepipes into the underground workings. The drawback was poor performance on calm days. Another system involved convection currents created by ordinary woodstoves to draw foul air out of the underground workings. The stove stood near the mine opening, and ventilation tubes extended from the stove into the underground workings. When a fire burned in the stove, the hot gases rising up the stovepipe created a vacuum in the ducting and siphoned foul air out of the mine.[546]

A few prospecting operations employed primitive mechanical systems for ventilation. These outfits used large forge bellows or small, hand-turned blowers to force air through stovepipes or canvas tubing into the workings. A bellows effectively ventilated shallow adits and shafts, but it lacked the pressure to clear gases from deep workings. Hand-turned blowers cost more money and took greater effort to pack to remote locations, but they forced foul air more surely from workings.

The simple windsocks and hand-turned blowers were insufficient for medium-sized and large mines, and engineers applied better methods. One of the most popular involved an *incast* air current balanced by an *outcast* current laden with the bad air. Multiple mine openings proved to be the most effective means of achieving a flushing current, and temperature and pressure differentials acted as the driving forces.[547]

Mechanical ventilation proved to be the most effective, but also was more expensive than passive systems. One of the most popular and effective was the use of power-driven fans and blowers, offered three basic varieties by machinery manufacturers. Engineers termed the first design, dating to the 1870s, the *centrifugal fan*, and miners knew it as the *squirrel cage fan*. This machine consisted of a ring of vanes fixed to a central axle, much like a steamboat paddle wheel, enclosed in a shroud. As the fan turned at a high speed, it drew air in through an opening around the axle and blew it through a port in the shroud. Manufacturers produced centrifugal fans in sizes ranging from one to over ten feet in diameter. The small units were employed for both mining and a variety of other purposes such as ventilating industrial buildings, and the largest units saw extensive application in coal mines. The second type of fan also acted on centrifugal principles, but it consisted of a narrow ring of long vanes encased within a curvaceous cast-iron

[546] Twitty, 1999: 51.

[547] International Textbook Company, 1899: A41, 133; International Textbook Company, *Coal and Metal Miners' Pocket Book* (Scranton: International Textbook Company, 1905) 381; Robert S. Lewis, *Elements of Mining* (New York: John Wiley & Sons, Inc:, 1946 [1933]) 454; Peele, 1918: 1038; Young, 1923: 255.

housing. The *propeller fan*, the third type of blower, was similar to the modern household fan, and it too was enclosed in a shroud.

Surface Plants for Shafts

The surface plants that supported work in shafts incorporated many of the same components as those for tunnels. However, due to the vertical nature of shafts, their surface plants also included hoisting systems, which had to meet specific engineering requirements. Typical hoisting systems installed by outfits in San Juan County consisted of a hoist, headframe, power source, and hoisting vehicle. As always, the financial state of the outfit, physical accessibility, and the quantity of proven ore governed the sophistication and cost of the system.

Shaft Form and Hoisting Vehicles

Experienced prospectors and mining engineers recognized that crude prospect shafts were inadequate for anything other than a cursory examination of the geology underground. Where a prospecting outfit strongly suspected or had confirmed the existence of ore, they sank a better, more formal shaft conducive to deep exploration and production. By the 1880s, mining engineers distinguished between temporary-class and production-class shafts.

Engineers understood that the size of a shaft directly influenced how much ore could be hoisted out of the ground. Temporary-class shafts often featured one large compartment 3½' x 7' in the clear or less. During the 1880s, engineers established a standard for the composition of production-class shafts. The convention dictated the division of the interior into a *hoisting compartment* and a *manway*, also known as a *utility compartment*, as well as guide rails in the hoisting compartment for a hoisting vehicle. Further, mining engineers defined the hoisting compartment as being at least 4' x 4' in the clear. By the late nineteenth century, the definition expanded as a result of larger vehicles. Mining engineers felt that a 4' x 5' hoisting compartment was better suited for ore production, and 5' x 7' was best.[548]

Mining engineers also came to recognize the utility of balanced hoisting. The use of one hoisting vehicle to raise ore became known as *unbalanced hoisting*, and while this system was very inefficient in terms of production capacity and energy consumption, it was the least costly and hence most commonly employed. *Balanced hoisting* relied on the use of two vehicles counterweighing each other, so that as one vehicle rose the other descended. Such a design required two hoisting compartments and a double-drum hoist, which constituted a considerable expense. But the hoist only had to do the work of lifting the ore, and as a result this system was energy efficient and provided long-term savings. Some companies anticipating production over an extended period of time invested the capital in balanced systems. The Sunnyside Mining Company did exactly that during the late 1910s when it sank its Washington Shaft.

[548] Lucien Eaton, *Practical Mine Development & Equipment* (New York: McGraw-Hill Book Company, 1934) 13; International Textbook Company, 1905: 261; Peele, 1918: 251; Young, 1923: 171, 461.

Mining companies in San Juan County chose from four basic types of hoisting vehicles. The first was the *ore bucket*, the second was the *ore bucket and crosshead*, the third was the *cage*, and the last was the *skip*. The ore bucket found great favor at prospects and small mines because its shape and features were well suited to primitive conditions. The typical ore bucket consisted of a body with convex sides that permitted the vessel to glance off shaft walls without catching on obstructions. Manufacturers forged a loop into the bail to hold the hoist cable on center and riveted a ring onto the bottom of the bucket so the vessel could be upended once it had reached the surface.

Mining companies engaged in deep shaft sinking took great risks when they used ore buckets. To prevent the bucket from catching on the shaft walls and emptying its contents onto the miners below, some mining companies installed a hybrid ore bucket hooked to a frame that ran on guide rails the length of the shaft. The frame, known as a *crosshead*, held the ore bucket steady and provided miners with a platform to stand on, albeit dubious, during their ascents and descents. Besides safety, another advantage was that miners working underground were able to switch empty buckets with full ones. Many small, poorly financed companies favored this type of hoisting vehicle because of its low cost. In any form, mining engineers considered ore buckets as temporary-class hoisting vehicles.

A mining industry institution for over 120 years, the cage consisted of a steel frame fitted with a deck for miners and rails for an ore car. Nearly all cages used in San Juan County featured a stout cable attachment at top, a bonnet to fend off falling debris, and steel guides that ran on special fine-grained 4” x 4” hardwood rails. After a number of grizzly accidents in which hoist cables parted, mining machinery makers installed special safety-dogs on cages designed to stop an undesired descent. Most dogs were toothed cams controlled by springs kept taut by the weight of the suspended cage. If the cable broke, the springs retracted, closing the cams onto the wood rails.

Cages proved highly economical because mining companies did not have to spend time manipulating ungainly ore buckets. When the cage stopped at a station underground, a miner merely pushed on an ore car, and when the cage was at the surface, another worker withdrew the car. But cages presented mining companies with several drawbacks. One of the biggest lay in boring a shaft that had enough space not only for the cage, but also to accommodate timbering for the guide rails.

Cornish mining engineers originally developed the skip for haulage in the inclined shafts of Michigan copper mines during the 1840s and 1850s, and they became popular in Colorado’s mines. The skip consisted of a large iron or wood box on wheels that ran on a rail line. The vehicles had little deadweight, held much rock, and, because they ran on rails, could be raised quickly. Skips were lighter than cages because they did not have the combined deadweight of the vehicle and ore car, resulting in energy savings. Skips also offered the benefit of being quickly filled and emptied, resulting in a rapid turnover of rock. Shortly after the turn of the century, western mining companies began replacing cages with skips for use in vertical shafts. The change gained momentum slowly through the 1900s, accelerated during the 1910s, and by the 1930s most large and many medium-sized mines used skips.

Hoists

When either prospectors or mining companies sank a shaft, they had to install a hoist to raise material out of the underground workings. Like other surface plant components, hoists came in a wide range of sizes, types, and duties. Hoists designed for prospecting adhered to *sinking-class* characteristics, and hoists intended for ore production met *production-class* specifications. The *hand windlass* was the simplest form of sinking-class hoist, and prospectors used it for shallow work. The windlass was a manually powered winch consisting of a spool made from a lathed log fitted with crank handles. Because the windlass wound by hand, its working depth was limited to approximately 100'. Prospectors sinking inclined shafts had the option of using what was termed a *geared windlass* or *crab winch*, which offered a greater pulling power and depth capacity. Geared windlasses cost much less than other types of mechanical hoists and were small and light enough to be packed into the backcountry. The winch was not easily used at vertical shafts, however, because its frame had to be anchored onto a well-built timber structure.[549]

[549] Twitty, 2002:145.

Table E 2.1: General Hoist Specifications: *Type, Duty, and Foundation*

Hoist Type	Hoist Class	Foundation Size	Foundation Footprint	Foundation Profile	Foundation Material
Hand Windlass	Shallow Sinking		Rectangular	Wood frame over shaft	Timber
Hand Winch	Shallow Sinking	3’ x 3’.	Square or Rectangular	Flat	Timber
Horse Whim: Malacate	Shallow Sinking	7’ - 10’. diameter	Ovoid Depression	Cable Reel Axle Located in Pit	Timber
Horse Whim: Horizontal Reel	Sinking	4’ x 4’.	Rectangular	Timber Footers in Depression	Timber
Horse Whim: Geared	Sinking	4’ x 4’	Rectangular	Timber Footers in Depression	Timber
Steam Donkey	Sinking	Portable	Rectangular	None	None
Gasoline Donkey	Sinking	Portable	Rectangular	None	None
Single Drum Gasoline	Sinking	2.5’ x 8’ to 4’ x 14.5’	Rectangular	Flat	Timber or Concrete
Single Drum Gasoline	Sinking	2.5’ x 8’ to 4’ x 14.5’	T-Shaped	Flat	Timber or Concrete
Single-Drum Steam	Sinking	6’ x 6’ and smaller	Rectangular	Flat	Timber or Concrete
Single-Drum Steam	Light Production	6’ x 6’ to 7.5’ x 10’	Square or Rectangular	Flat	Concrete or Masonry
Single-Drum Steam	Moderate Production	7.5’ x 10’ and larger	Rectangular	Irregular	Concrete or Masonry
Double-Drum Steam	Moderate Production	4’ x 7’ to 7’ x 12’	Rectangular	Irregular	Concrete or Masonry
Double-Drum Steam	Heavy Production	7’ x 12’ and larger.	Rectangular	Irregular	Concrete and Masonry
Single-Drum Geared Electric	Sinking	5’ x 6’and smaller	Square or Rectangular	Flat	Concrete
Single-Drum Geared Electric	Production	6’ x 6’and larger	Square or Rectangular	Flat	Concrete
Single-Drum Direct Drive Electric	Production	5’ x 6’ and larger	Square or Rectangular	Flat	Concrete
Double-Drum Geared Electric	Heavy Production	6’ x 12’	Rectangular	Irregular	Concrete
Double-Drum Direct Drive Electric	Heavy Production	6’ x 12’	Rectangular	Irregular	Concrete

(Reproduced from Twitty, 2002: 319).

Prospect operations often worked at depths greater than the limitations presented by windlasses, forcing them to install more advanced hoisting systems. The *horse whim* proved popular because it was relatively inexpensive, portable, and simple to install. Through the 1860s, the mining industry accepted the horse whim as a state-of-the-art hoisting technology for both

prospecting and ore production. But by the 1870s, practical steam hoists came of age, and the status accorded to horse whims began a downward trend. By around 1880, mining engineers felt that horse whims were well-suited for backcountry prospecting, but too slow and limited in lifting power for ore production. Regardless, mining companies with little income continued to use whims in San Juan County into the 1910s.

Prospect outfits could select from several types of horse whims. The simplest and oldest, christened by Hispanic miners as the *malacate* (mal-a-ca-tay), consisted of a horizontal wooden drum or reel directly turned by a draft animal. Early malacates featured the drum, a stout iron axle, and bearings fastened onto both an overhead beam and a timber foundation. Prospectors usually positioned the drum to rotate in a shallow pit lined with either rockwork or wood planking. The cable extended from the drum through a shallow trench toward the shaft, it passed through a pulley bolted to the foot of the headframe, then up and over the sheave at the headframe's top. The draft animal walked around the whim on a prepared track, and the prospectors usually laid a plank over the cable trench for the animal to walk across. The controls consisted of brake and clutch levers mounted to the shaft collar, and connected to the apparatus by wood or iron linkages that passed through the trench.[550]

Mining machinery makers offered factory-made horse whims that were sturdier and performed better than the older handmade units. The *horizontal reel horse whim* consisted of a spoked iron cable reel mounted on a timber foundation embedded in the ground, and it performed like the malacate. These whims remained popular among poorly funded prospect operations into the 1900s. The *geared horse whim* appeared in Colorado during the 1880s, and it remained popular among prospectors into the 1910s. The machine consisted of a cable drum mounted vertically on a timber frame, and a beveled gear that transferred the motion from the draft animal's harness beam. Geared whims were faster, could lift more than horizontal reel models, and featured controls and cable arrangements like the other types of whims. A horse whim required a headframe over the shaft, and the structures were small, simple, and temporary-class in duty. Prospectors favored a tripod, tetrapod, or a small four-post derrick that was just wide enough to straddle the shaft.[551]

Prospect operations working deep shafts began using steam hoists by around 1880. These systems required a relatively substantive infrastructure that had to be planned and engineered, and hence they were beyond the financial means of poorly financed outfits. Steam hoisting systems included a heavy hoist and boiler, cable, pipes, headframe, and foundations. The mining company also had to provide a reliable source of water and fuel for the boiler. After around 1880, the *geared single-drum duplex steam hoist*, known simply as single-drum steam hoist, was the most popular type. These hoists became the ubiquitous workhorse for shaft mining and featured a cable drum, two steam cylinders flanking the drum, reduction gears, clutch, brake mechanism, and throttle.

[550] Twitty, 2002: 161.
[551] Twitty, 2002: 162.

Mining engineers selected the specific model and size of hoist primarily according to budget and secondarily on speed and anticipated depth of the workings. Nearly all sinking-class hoists had bedplates smaller than 6' x 6' in area and were driven either by gearing or by a friction-drive mechanism. A friction drive consisted of rubber rollers that pressed against the hoist's drum flanges, and while these systems cost less than geared hoists, they were slow and apt to slip under load. The sinking-class hoists had strength often less than 40 horsepower, a slow speed of 350' per minute, and a payload of only several tons. Regardless, many mining companies used these hoists for ore production.[552]

Steam equipment presented two sets of problems for those prospect outfits working deep in the backcountry. Not only did the outfits have to haul and erect the hoisting system, but also continuously fed it fuel and water, which was costly. In the early 1890s, the Witte Iron Works Company and the Weber Gas & Gasoline Engine Company both developed practical petroleum engine hoists, which alleviated these issues. These innovative machines were smaller than many steam models, required no boilers, and their concentrated liquid fuel was by far easier to transport than wood or coal.

Despite the potential advantages of petroleum hoists, mining companies in San Juan County did not immediately embrace the apparatuses. Steam technology, the workhorse of the Industrial Revolution, held convention in the mining industry into the 1910s for several reasons. First, many mining companies were by nature conservative and continued to rely on steam out of familiarity. Second, petroleum engine technology was relatively new and not yet widely used, especially for hoisting. The outfits employing petroleum hoists during the 1890s found the engines to be cantankerous and their performances limited. Further, petroleum hoists were slow with speeds of 300' to 400' per minute, had lifting capacities of at most 4,500 pounds, and were restricted to working depths less than 1,000'. For these reasons, professionally educated mining engineers felt the hoists were barely adequate for sinking duty, and total acceptance took approximately fifteen years.[553]

The petroleum hoists available to San Juan County's mining outfits were similar in form to old-fashioned steam donkey hoists. A large, single-cylinder engine was fixed to the rear of a heavy cast-iron frame and its piston rod was connected to a heavy crankshaft in the frame's center. Manufacturers located the cable drum, turned by reduction gearing, at the front, and the hoistman stood to one side and operated the controls. Because the early petroleum engines were incapable of starting and stopping under load, they had to run continuously, requiring the hoistman to delicately work the clutch when hoisting and to disengage the drum and lower the ore bucket via the brake.

For production-class hoists, steam technology maintained supremacy into the 1920s, when electric motors were finally advanced enough. Machinery manufacturers offered production-class steam hoists in a wide array of sizes, as well as with *first-motion* or *second motion* drive trains. First-motion drive, also known as *direct-drive*, meant that the steam engine's

[552] Twitty, 2002: 319.
[553] Twitty, 2002: 173.

drive rods were coupled directly onto the cable drum axle, like how the drive rods were directly pinned onto the wheels of a steam locomotive. Second-motion, also known as a *geared-drive*, consisted of reduction gearing like the sinking-class hoists discussed above.

The difference in the driving mechanisms was significant in both performance and cost, and each served a distinct function. Gearing offered great mechanical advantage, permitting the use of small steam cylinders and a compact footprint. First-motion hoists, on the other hand, required the cable drum be mounted at the ends of large steam cylinders so the drive rods could gain leverage. Where the footprint of geared hoists was almost square, the footprint of first-motion hoists was that of an elongated rectangle with the long axis oriented toward the shaft. First-motion hoists were high-quality production-class machines that saved money only over protracted and constant use. Geared hoists were intended to be inexpensive and meet the short-term needs of modestly capitalized mines. They were not as strong, fast, or fuel-efficient. The large size, high-quality steel, and the fine engines made the cost of first-motion hoists three to four times that of geared hoists, costing from approximately $1,000 to $3,000 for light to heavy models. First-motion hoists had speeds of 1,500’ to 3,000’ per minute, compared with 500’ to 700’ per minute for geared hoists. Geared hoists usually relied on old-fashioned but durable slide valve engines, while first-motion hoists usually were equipped with Corliss valves engines, which consumed half the fuel.[554]

While the costs of purchasing first-motion hoists were high, so were the installation expenses. Because geared hoists were self-contained on a common bedplate, the construction crew merely had to build a simple foundation with anchor bolts and drop the hoist into place. First-motion hoists, on the other hand, required raised masonry pylons for the steam cylinders and the cable drum bearings, a well for the drum, and anchor bolts for the brake posts. The hoist pieces then had to be maneuvered into place and simultaneously assembled.

Mining engineers chose specific hoists for the power they delivered, proportionally relative to the hoist’s overall size. Geared hoists smaller than 6’ x 6’ were for deep exploration and delivered less than 40 horsepower. Hoists between 7’ x 7’and 9’ x 9’ were for minor ore production and offered 75 to 100 horsepower. Hoists 10’ x 10’ to 11’ x 11’ were for moderate production and generated up to 150 horsepower, and larger units were exclusively for heavy production. Mining engineers rarely installed geared hoists larger than 12’ x 12’, because for a little more money, they could have obtained an efficient first-motion hoist.[555]

Regardless of the drive mechanism, single-drum hoists were restricted to shafts with single hoisting compartments, which had inherent inefficiencies. Double-drum hoists, on the other hand, offered greater performance because they increased production while saving energy costs. They achieved this through balanced hoisting as discussed above. However, double-drum hoists possessed several drawbacks that limited their appeal to particularly well-financed mining companies. The hoists were considerably more expensive than single-drum models, and sinking and timbering a shaft with two hoisting compartments constituted a great cost.

[554] Twitty, 2002: 199-201.
[555] Twitty, 2002: 320.

Like single-drum hoists, double-drum units came with geared or first-motion drives. Geared models, ranging in size from 7' x 12' to 12' x 17', were slower, less powerful, and noisier than their direct-drive brethren, but cost much less. The ultimate answer for raising the maximum quantity of ore in minimal time was the installation of a double-drum, first-motion hoist. This type of hoist ranged in size from approximately 18' x 25' to over 30' x 40' in area, and its visual impact mirrored its performance. The extreme difficulty and exorbitant costs of transporting and installing these massive machines relegated them to only the most heavily capitalized mining companies. Not only did these types of double-drum hoists permit mining companies to maximize production, but also they served as a statement of a company's financial status, levels of productivity, and quality of engineering.

As early as around 1895, San Juan County's well-capitalized mining companies, such as the Silver Lake Mines Company, embraced electric hoists for work underground. By 1900, electric hoists also saw greater use on the surface, as well. Like steam hoists, electric models came in four basic varieties: geared single and double-drum units, and direct-drive single and double-drum units. The geared electric hoists were much like their steam ancestors. The gearing permitted hoist manufacturers to install small and inexpensive motors ranging from 30 to 300 horsepower. Direct-drive electric hoists, on the other hand, had huge motors rated up to 2,000 horsepower attached to the same shaft as the cable drums.[556]

As with steam hoists, mining engineers classified single-drum electric hoists smaller than 6' x 6' in area as sinking-class in duty. Most production-class hoists featured motors rated to at least 60 horsepower for single-drum units and 100 horsepower for double-drum units. Even with large motors, these geared hoists had slow speeds of less than 600' per minute, a limited payload capacity, and were unable to work in the deepest shafts.[557]

During the capital-scarce Great Depression, many mining companies had to settle for small, slow, sinking-class hoists out of economic necessity. These companies used hoists with motors rated at only 15 horsepower, which in better times might have been used for light work underground. Some outfits cobbled together hoists from machinery that had been cast off during earlier decades. Miners exercised creativity in reusing obsolete machinery, and their solutions fell into several basic patterns. One common method involved obtaining an old, geared steam hoist, stripping the steam equipment, and adapting an electric motor. Another clever means was to leave the steam equipment intact and substituted compressed air for steam to power the hoist. The only drawback was that a costly, multistage compressor had to supply the air. In some cases, impoverished mining operations were able to contract with neighboring companies that possessed the necessary compressors for the air. A third practice was to assemble hoists from odd pieces of machinery. A favorite system involved coupling a small hoist, stripped of everything but the brake and clutch, to the power train of a salvaged automobile. Slow, noisy, and of questionable reliability, these contraptions allowed many mining operations to turn a

[556] Eaton, 1934: 86, 295; Lewis, 1946: 187; William Staley, *Mine Plant Design* (New York: McGraw-Hill Book Co., 1936) 137; Young, 1946: 203; E.N. Zurn, *Coal Miners' Pocketbook* (New York: McGraw-Hill Book Co., 1928): 760.
[557] Twitty, 1999: 341.

small profit. Lacking the money and knowledge of how to construct a proper foundation, miners simply bolted the hoist and salvaged automobile to a flimsy timber frame that had not necessarily been anchored in the ground.[558]

Some small and medium-sized mining outfits were able to afford factory-made gasoline hoists during the Great Depression. Mining companies continued to use the old single-cylinder gasoline hoists, and they also purchased factory-made donkey hoists offered by machinery suppliers such as Fairbanks-Morse and the Mine & Smelter Supply Company. The donkey hoist manufactured during the 1930s consisted of a small automobile engine that turned a cable drum through reduction gearing. The makers designed the little machines to be portable, and they affixed all of the components onto a steel frame.

Few shaft mines in the county today retain their hoists and instead feature the foundations, which are distinct. By examining the footprint of a foundation, the researcher can often determine the exact type of hoist that served a mine. Foundations for production-class *single-drum steam hoists* and *single-drum electric hoists* tend to be slightly rectangular and flat, feature at least six anchor bolts around the outside, and usually consist of concrete or masonry. Foundations greater than 8' x 8' in area may feature a depressed center that once accommodated a large cable drum. Foundations for *double-drum geared steam hoists* tend to possess an elongated rectangular footprint oriented 90 degrees to the shaft. They usually consist of concrete or masonry, feature a perimeter of anchor bolts, and include wells for the cable drums. Small anchor bolts on the edges of the drum wells often braced brake shoes.

Double-drum geared electric hoists were bolted to foundations similar to those for their steam-driven counterparts. The principal difference manifests as a separate mount for the electric motor, which is often rectangular, less than 4' x 5' in area, and features four anchor bolts.

Direct-drive hoists were usually bolted to complex foundations that anchored the machines' individual components. The foundation usually consists of two parallel masonry footers capped with dressed sandstone or granite blocks. The blocks toward the rear supported the steam cylinders and those toward the front supported the cable drum's bearings. Single-drum hoists required one depressed well between the footers for the cable drum, and double-drum hoists required two wells. In addition, a masonry pylon stood between the wells to support the drum axle. Foundations for single-drum hoists are rarely larger than 14' x 19' in area, and those for double-drum hoists are greater.[559]

Steam Boilers

Boilers were necessary components of steam-powered hoisting systems. While specific designs of boilers evolved and improved over time, the basic principle and function remained unchanged. Boilers were iron vessels in which intense heat converted large volumes of water

[558] Twitty, 1999: 341, 343.
[559] Twitty, 2002: 240.

into steam under great pressure. Such specialized devices had to be constructed of heavy boilerplate iron riveted to exacting specifications, and they had to arrive at the mine ready for neglect and abuse. The problem that boilers presented was that they were bulky, heavy, cumbersome, and required engineering to install.

During the 1870s, the *Pennsylvania boiler*, *locomotive boiler*, and *upright boiler*, also known as the *vertical boiler*, quickly gained popularity among the county's prospect operations. These boilers were well-suited to the county's difficult geographic and physical environment because they were self-contained and freestanding, ready to fire, and able to withstand mistreatment. Because the three types boilers were designed to be portable at the expense of efficiency, mining engineers declared them fit only for sinking duty.

In general, the above boilers consisted of a shell that contained water, flue tubes extending through the shell, a firebox inside the shell at one end, and a smoke manifold. When the fireman stoked a fire in the firebox, he adjusted the dampers to admit enough oxygen to bring the flames to a steady roar. The flue gases, which were superheated, flowed from the fire through the flue tubes, imparting their energy to the surrounding water, and they flowed out the smoke manifold and up the smokestack.

The boiler front featured a glass sight tube much like the level indicator on a coffee urn so the fireman could measure the water level. Boiler tenders usually kept the boiler three-quarters full, the empty space being necessary for steam to gather. When the fire grew low, the boiler tender opened the fire door, the upper of two cast- iron hatches, and threw in fuel. Mining engineers recognized that cord wood was the most appropriate fuel in remote and undeveloped mining districts because poor roads and great distances from railheads made importing coal too expensive. However, coal was the most energy-efficient, a half ton equaling the heat generated by a cord of wood, and as a result mining operations proximal to commercial centers preferred it.

During the 1880s, mining companies came to appreciate the utility and horsepower of the locomotive boiler, so named because railroad engine manufacturers favored it for building locomotives. The boiler consisted of a horizontal shell with a firebox built into one end and a smokestack projecting out of the other end. Nearly all models stood on wood skids and were easily portable, but some required a small masonry pad underneath the firebox and a masonry pillar supporting the other end. Locomotive boilers were usually 10' to 16' long, 3' in diameter, and stood up to around 6' high, not including the steam dome on top. These workhorses, the single most popular sinking-class source of steam into the 1910s, typically generated from to 30 to 50 horsepower, enough to run a hoist.[560]

Upright boilers were the least costly of all models. They tolerated abuse well and were the most portable, but they were highly inefficient and could not generate much horsepower. Upright boilers consisted of a vertical water shell that stood over a firebox and ash pit integral with a cast-iron base. The flue tubes extended upward through the shell and opened into a smoke chamber enclosed by a hood and smokestack, which appeared much like an inverted funnel. Upright boilers required little floor space and maintenance and were so durable that they almost

[560] Twitty, 1999: 204.

could have been rolled from site to site. Plenty of remote prospect operations saw great advantage in vertical boilers, and consequently these steam generators enjoyed substantial popularity into the 1910s.[561]

The third sinking-class boiler widely used was the Pennsylvania model. This unit combined the form and portability of the locomotive boiler with the function of the Scotch marine boiler, discussed below. Like the other portable boilers, the Pennsylvania boiler featured an enclosed firebox surrounded by a jacket of water. The flue gases traveled through tubes in the shell, rose into a small smoke chamber at the rear, reversed direction, traveled toward the front through more tubes, and escaped through a smokestack. The Pennsylvania boiler, which originated in the Keystone state's oil fields, proved to be remarkably efficient.[562]

Developed in Scotland for maritime purposes, the Scotch marine boiler was the least popular sinking-class steam generator. Scotch marine boilers consisted of a large-diameter shell enclosing the firebox, and the path for the flue gases was similar to that of the Pennsylvania boiler. While this type of boiler was one of the most efficient portable units, it never became popular because convention dictated the use of other types, and because it was heavy, large, and difficult to haul to remote locations.[563]

Engineers who designed production-class surface plants rarely relied on portable boilers because of their inefficiency. Rather, engineers predominantly used *return-tube boilers* in masonry settings, or they erected *water-tube boilers*, which offered the ultimate fuel economy. The concept and design behind the return-tube boiler was innovative. The boiler shell, part of a complex structure, was suspended from legs known as *buckstaves*, so named because they prevented the associated masonry walls from bucking outward. The masonry walls enclosed the area underneath the boiler shell, and a heavy iron façade shrouded the front. A firebox lay behind the façade underneath the boiler shell. Under the firebox lay an ash pit, and both were sealed off from the outside by heavy cast-iron doors. When a fire burned, the superheated flue gases traveled from the firebox along the belly of the boiler shell and rose up into a smoke chamber at the rear of the structure. They reversed direction and traveled toward the front through large flue tubes extending through the shell, and then exited through the smoke manifold. The path under and then back through the boiler shell offered the flue gases every opportunity to transfer energy to the water within and convert it into steam.

Return-tube boilers were workhorses that withstood the harsh treatment and neglect typical of the mining industry. However, boiler tenders had to attend to a few basic details to avoid accidental death, disastrous explosions or ruptures. First, they had to keep the boiler at least two-thirds full of water. Second, the fireman had to clean the ashes out of the ash pit regularly to ensure that the fire did not suffocate. Third, the fireman verified that the water and

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[561] Terrell Croft, *Steam Boilers* (New York: McGraw-Hill Book Co., 1921) 48; International Textbook Company, 1899: A18, 34; Frank B. Kleinhans, *Locomotive Boiler Construction* (New York: Norman W. Henley Publishing Co., 1915) 12; Rand Drill Company, *Illustrated Catalogue of the Rand Drill Company, New York, U.S.A.* (New York: Rand Drill Company, 1886) 47; W.H. Tinney, *Gold Mining Machinery: Its Selection, Arrangement, & Installation* (New York: D. Van Nostrand Company, 1906) 50.

[562] Twitty, 1999: 206.

[563] Colliery Engineer Company, 1893: 262; International Textbook Company, 1899: A18, 28; Peele, 1918: 2083; R.H. Thurston, *A Manual of Steam Boilers: Their Design, Construction, and Operation* (New York: John Wiley & Sons, 1901) 31.

steam valves were operational and that the pressure did not exceed the critical point. Last, the fireman had to feed the fire. Skilled firemen were able to add just enough fuel in an even distribution so that the fire kept a fairly constant glow. To ensure that firemen and boiler tenders had easy access to plenty of coal, the mining engineer usually had a coal bin built facing the firebox doors. In other circumstances cordwood may have been stacked in the bin's place.

Mining companies with plenty of capital installed additional devices to improve the energy efficiency and performance of their return-tube boilers. First, they may have arranged feed-water tanks to allow sediment and mineralization to settle out. Second, some companies installed feed-water heaters, which were small heat exchangers that used some of the boiler's hot water or steam to preheat the fresh feed water. These moderated the shock of temperature changes to the boiler, prolonging the vessel's life and increasing fuel efficiency. A few engineers working at the largest mines automated the input of coal with mechanical stokers. Engineers also fitted heavily stoked boilers with rocking or shaking grates that sifted the ashes downward, promoting better combustion of the fuel. Last, companies wrapped the heater, steam pipes, and exposed parts of the boiler with horsehair or asbestos plaster as insulation.[564]

At the time when boiler technology was nascent, in 1856 an American inventor named Wilcox devised a boiler radically different and more efficient than the best return-tube models. Wilcox's system consisted of a large brick vault capped with several horizontal, iron water tanks and an assemblage of fifty to sixty water-filled iron tubes. The vault contained a firebox, ash pit, and smoke chamber. The tubes drew water from one end of the tanks and sent the resultant steam to the other end. By 1870, the design, known as the *water-tube boiler*, had been commercialized and manufactured by the firm Babcock & Wilcox.[565]

After Babcock & Wilcox's water-tube boiler had proven itself in industrial applications, mining engineers began to take an interest. The fact that the water ran through the tubes and not around them greatly increased the liquid's heating area, which resulted in greater efficiency than return-tube boilers. In addition, the threat of a catastrophic explosion was almost nonexistent. By the 1890s, a number of mechanical engineers had devised other water-tube boilers, such as the Heine, Sterling, Wickes, Hazelton, and Harrisburg-Starr.

The problem with all of the above models, however, was that they required much more attention than the rugged return-tube boilers, were significantly more costly, and were beyond the understanding and field skills of average mining engineers. As a result, water-tube boilers saw use only at large, well capitalized mines under the supervision of professionally trained engineers. Both the Silver Lake and Iowa mines relied on such advanced boilers for most of their steam. As the prices of water-tube boilers fell during the 1900s and capital became abundant following the Silver Crash of 1893, their popularity grew, but the embrace of electricity in the 1910s prevented the widespread adoption of water-tube boilers.

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[564] Magnus Ihlseng, *A Manual of Mining* (New York: John Wiley & Sons, 1892): 581; International Textbook Company, 1924: A23, 53; *The Mining Catalog: 1925 Metal-Quarry Edition* (Keystone Consolidated Publishing Company Inc., 1925) 115; Peele, 1918: 2086.

[565] Croft, 1921: 18, 53; Horace Greeley, Leon Case, et. al.,"*Babcock and Wilcox Boiler," The Great Industries of the United States* (Hartford: J.B. Burr.; International Textbook Company, 1872, 1899) A18, 35; C.B. Linstrom and A.B. Clemens, *Steam Boilers and Equipment* (Scranton: International Textbook Co., 1928) 30; Peele, 1918: 2083; Thurston, 1901: 34; Tinney, 1906: 63.

Headframes

Nearly all the mechanical hoisting systems built in San Juan County included a headframe over the shaft. The purpose of the headframe was to support and guide the hoist cable and assist the transfer of rock from and supplies into the hoisting vehicle. Professionally educated engineers recognized six basic forms of headframes, including the tripod and tetrapod used with horse whims, as well as the two-post gallows, four and six-post derricks, and the A-frame.

The *two-post gallows* was one of the most common headframes, and engineers agreed that it was best for prospecting. The variety used by small operations usually consisted of two upright posts, cap timber, another cross-member several feet below, and diagonal back braces, all standing at most 25' high. The cap timber and lower cross-member held the sheave wheel in place. The gallows portion of the structure stood on one end of a timber foundation equal in length to the headframe's height. The diagonal backbraces extended from the posts down toward the hoist, where they were tied into the foundation footers. The foundation, made of parallel timbers held together with cross- members, rested on the surface of the ground and straddled the shaft collar. The four-post derrick erected for prospecting was similar in height, construction, and materials to two-post headframes; it featured four posts instead of two and stood on a timber foundation. The A-frame was based on the same design as the two-post gallows. The difference was that the A-frame featured fore and aft diagonal braces to buttress the structure in both directions. A-frames were not erected directly over inclined shafts and instead were placed between the hoist and shaft so that the angle of the cable extending upward from the hoist equaled that extending down the inclined shaft.

The common features shared by the above structures included small size, simplicity, minimization of materials, ease of erection, and portability. For comparison, a two-post gallows frame 20' high cost as little as $50 and a slightly larger structure $150, while a production-class A-frame cost $650 and a production-class, four-post derrick headframe up to $900.[566]

When designing sinking-class headframes, the mining engineer had to consider three basic stresses. The first was live load, created by the weight of a full hoist vehicle and cable. The second was braking load, a surge of force created when the hoistman quickly brought a vehicle to a halt in the shaft. The third was the horizontal pull of the hoist. To counter these forces, mining engineers often built their headframes with 8' x 8' timbers and installed diagonal back braces to counter the pull of the hoist. Usually, carpenters assembled the primary components with mortise-and-tenon joints, 1" diameter iron tie rods, and timber-bolts. Professionally trained mining engineers specified that diagonal back braces were most effective when they bisected a vertical angle and the diagonal pitch of the hoist cable. When a mining engineer attempted to find the mathematically perfect location for a hoist after erecting a headframe, he merely measured the distance from the shaft to the diagonal brace, doubled the length, and installed the

[566] Twitty, 1999: 215.

hoist. Many prospect operations followed this general guideline, but poorly educated engineers gave the diagonal braces either too much or too little angle.[567]

Unlike the simplicity of sinking-class headframes, production-class headframes were more complex, and designing them was rigorous. Mining engineers had to account for a wide variety of stresses, consider the structure's multiple functions, and coordinate the structure with other hoisting system components. They had to build a structure capable of withstanding vertical forces including an immense dead load, live load, and braking load. Engineers had to calculate horizontal forces including the powerful pull of the hoist and windshear, which could not be underestimated in San Juan County. Last, mining engineers had to plan for racking and swaying under loads and for vibration and shocks to the structure.[568]

Table E 2.2: Headframe Specifications: *Type, Material, Class*

Headframe Type	Material	Class	Capital Investment
Tripod	Hewn Logs	Sinking	Very Low
Tripod	Light Timber	Sinking	Very Low
Two Post (Gallows Frame): Small	Timber	Sinking	Low
Two Post (Gallows Frame): Large	Timber	Production	Low to Moderate
Two Post (Gallows Frame): Large	Steel	Production	Moderate to High
Four Post: Small	Light Timber	Sinking	Low
Four Post	Timber	Production	Moderate
Six Post	Timber	Production	Moderate to High
Four and Six Post	Steel	Production	High
A-Frame	Timber	Production	Moderate to High
A-Frame	Steel	Production	High

(Reproduced from Twitty, 1999: 281).

Building a headframe that could withstand the sum of the above forces was not enough at a producing mine. Mining engineers had to forecast how they thought the headframe would interact with the mine's production goals and how it would interface with the rest of the hoisting system. The depth of the shaft, the speed of the hoist, and the rail system at the mine directly influenced the height of the structure. Deep shafts served by fast hoists required tall headframes, usually higher than 50', to allow the hoistman room to stop the hoisting vehicle before slamming into the top. Highly productive mining operations often utilized vertical space and constructed multiple shaft landings. Some companies using skips built rock pockets into the headframe, which also required height.

Mining engineers found four basic headframe designs adequate for the needs of heavy ore production. These included the *four-post derrick*, the *six-post derrick*, an *A-frame* known also as the *California frame*, and a heavily braced, two-post structure known as the *Montana*

[567] Twitty, 1999: 215.

[568] Ihlseng, 1892: 91; International Textbook Company, 1899: A23, 105; International Textbook Company, 1906: A53, 31; Milo S. Ketchum, *The Design of Mine Structures* (New York: McGraw-Hill Book Co., 1912) 41; Peele, 1918: 926; Twitty, 1999: 274.

type. As the names suggest, engineers working in specific regions in the west favored certain headframe designs over others. While the above structures were intended to serve vertical shafts, two-post gallows headframes and a variety of A-frames up to 35' high were also erected to serve inclined shafts.[569]

Nearly all mining engineers built their headframes with heavy timbers assembled with mortise-and-tenon joints, timber-bolts, and iron tie rods. All four and six-post headframes featured stout backbracing anchored between the shaft and the hoist, and the entire structure stood on foundation footers straddling the shaft. The posts on A-frames were set at an exaggerated batter, meaning they splayed out to absorb all of the vertical and horizontal stresses, and as a result A-frames used in association with both vertical shafts and inclines rarely had backbraces.[570]

Production-class headframes, weighing dozens of tons, required sound and substantial foundations to remain stable. A preplanned and well-built foundation was one factor that set these structures apart from sinking-class headframes, and engineers used one of three basic designs. The first consisted of a squat timber cube featuring bottom sills, timber posts, and caps. The second type consisted of several log cribbing cells assembled with notches and forged iron spikes, and the third was a log or timber latticework consisting of open cubes between 4' and 6' high, capped with dimension timbers. The problem with the above foundations was that the perishable wood rotted when covered with waste rock, especially when the rock was highly mineralized. Well-financed companies substituted concrete or rock masonry to gain a lasting foundation.[571]

In the 1890s, the largest mining companies began experimenting with steel girders for headframes as an alternative to timber. According to many prominent mining engineers, steel was the ultimate building material because it did not decay, was strong, did not burn, and facilitated the erection of taller headframes. However, steel was significantly more expensive than timber, and as a result, few if any companies in the county put up such structures.

Mining operations that were active during and after the Great Depression had the same needs for headframes as their predecessors. Most Depression-era outfits attempted to reuse existing headframes to save capital, and in such cases, the outfit merely had to affect necessary repairs. If the mine lacked its original headframe, then the outfit had to erect another one, and the replacement structures differed according to the outfit's nature.

Large mining companies continued the practice of building four and six-post derricks and A-frames and still considered steel to be the ultimate material. But by the 1930s, a certain element of construction quality and craftsmanship had been lost. Workers no longer took the trouble to assemble the structure with mortise-and-tenon joints. Instead, they simply butted the timbers against each other or created shallow square notch joints and bolted the frame together.

Impoverished outfits with neither the funding nor the means to build substantial structures instead assembled small headframes designed to be functional while incorporating

[569] Twitty, 1999: 275.
[570] International Textbook Company, 1906: A53, 35; Ketchum, 1912: 7; Peele, 1918: 935.
[571] Twitty, 1999: 283.

little material. When possible, these mining companies relocated entire headframes. By nature, the headframes tended to be old sinking-class two-post gallows or four-post derrick structures because they were simple, easy to transport, and required no formal engineering.

One practice that many mining companies shared during the Great Depression was an extensive use of salvaged timbers. Stout timbers were a precious and costly commodity, and in hopes of saving capital, mining companies reused the heavy beams left by abandoned operations. As a result, headframes remaining from the 1930s and afterward may feature timbers differing in dimensions, weathering, and quality of wood. In addition, salvaged timbers frequently exhibit abandoned mortise-and-tenon joint sockets, and bolt and nail holes. The heavy use of such material for headframes, as well as for other structures, is typical of Depression-era structures.

Additional Surface Plant Components

The above descriptions of tunnel and shaft mines account for basic surface plant components. Productive mining companies often installed additional facilities that enhanced their ability to increase production and sustain work underground. The following components were characteristic of both tunnel and shaft mines.

Air Compressors

Blasting was of supreme importance to mining because it was the prime mover of rock underground. During much of the nineteenth century, miners traditionally drilled holes by hand, loaded them with explosives, and fired rounds. Hand-drilling proved slow, but no practical alternative existed to take its place until machinery manufacturers began selling mechanical rock drills during the 1870s. When drilling by hand, miners typically advanced tunnels and shafts only 1’ to 3’ per shift in hard rock. By contrast, the mechanical rock drills offered during the 1880s and 1890s permitted miners to bore greater numbers of deeper holes and advance a tunnel or shaft approximately 3’ to 7’ per shift. As drilling technology improved during the 1890s and 1900s, miners were able to make even greater progress, convincing engineers that the relatively high cost was justified. Some of the early drills were powered by steam plumbed to the point of work, but the majority were driven by compressed air, generated and distributed through an engineered system.[572]

The air compressor lay at the heart of the system, and while those manufactured between the 1880s and 1920s came in a variety of shapes and sizes, they all operated according to a basic premise. Compressors of this era consisted of at least one relatively large cylinder, much like a steam engine, which pushed air through valves into plumbing connected to an air receiving tank. The volume of air that a compressor delivered, measured as *cubic feet of air per minute* (cfm), depended on the cylinder’s diameter and stroke, and how fast the machine operated. The pressure capacity, measured as *pounds per square inch* (psi), depended on the above qualities,

[572] Halbert P. Gillette, *Rock Excavation: Methods and Cost* (New York: Myron C. Clark Publishing Company, 1907) 15; Hoover, 1909: 150; International Correspondence Schools, 1907: 13; Peele, 1918: 184, 213; Young, 1946: 87.

how stout the machine was, and on check-valves in the plumbing. Generally, high-pressure, high-volume compressors were large, strong, durable, complex, and therefore expensive.

The mechanical workings of the air compressors manufactured prior to around 1890 were relatively simple. The two most popular types were *steam-driven straight-line* and the *steam-driven duplex* models, and both were a basis for designs that served the mining industry well for over sixty years. The straight-line compressor, named after its physical configuration, was the least expensive, oldest, and most elemental of the two types of machines. Straight-line compressors were structurally based on the horizontal steam engine and featured a large compression cylinder at one end, a heavy cast-iron flywheel at the opposite end, and a steam cylinder situated in the middle, all bolted to a cast-iron bedplate. The steam cylinder powered the machine, and the flywheel provided momentum and smoothed the motion.

During the 1870s and early 1880s, mechanical engineers improved many of the inefficiencies attributed to early straight-line models. First, engineers modified the compression cylinder to make it double-acting, much like a butter churn. In this design, which became standard, the compression piston was at work in both directions of travel, being pushed one way by the steam piston and dragged back the other way by the spinning flywheel. In so doing the compression piston devoted 100 percent of its motion to compressing air.

During the early 1880s, mechanical engineers innovated several improvements. Engineers found that coupling the compression piston to the steam piston with a solid rod, so that both acted in tandem, proved highly inefficient. The steam piston was at its maximum pushing power when it was just beginning its stroke, and the compression piston, also beginning its stroke, offered the least resistance. When the steam piston had expended its energy and reached the end of its stroke, the compression piston offered the greatest resistance because the air in the cylinder had reached maximum compaction. Mechanical engineers recognized this wasteful imbalance and designed an intermediary crankshaft that reversed the relationship between the pistons. Despite the superior efficiency of this design, mining companies usually selected the simpler compressors with solid shafting because they cost less.

During the late 1880s and early 1890s, mining engineers fine-tuned compressed air technology used for mining. The most significant advance was a design that generated greater air pressure, which made drills run faster and improved the pressurization of the maze-like networks of plumbing. Machinery makers began offering straight-line and duplex compressors capable of achieving what the industry termed *multi-stage compression*. To increase pressure, mechanical engineers divided the compression between high and low-pressure cylinders in several stages, instead of in a single cylinder. They designed the low-pressure cylinder to be relatively large, forcing semi-compressed air into the small, high-pressure cylinder, which highly compressed the air and released it into a receiving tank.

Machinery makers designed multi-stage, straight-line compressors with two and even three compression cylinders coupled onto the steam-driven piston, and they produced duplex compressors with several multi-stage cylinder arrangements. The most common multistage duplex compressor was the *cross-compound* arrangement, in which one side of the machine featured the low-pressure cylinder, and the air passed from it through an intercooler to the high-

pressure cylinder on the other side. In general, companies with heavy air needs installed multi-stage compressors while operations with limited capital continued to rely on the less costly, conventional models.

Table E 2.3: Air Compressor Specifications: *Type, Timeframe, and Capital Investment*

Compressor Type	Age Range	Capital Investment
Upright: 2 Cylinders, Belt Driven	1900s-1940s	Low
Upright: 3 to 4 Cylinders, Integral Gasoline Piston	1930s-Present	Moderate
V Pattern	1930s-Present	Moderate to High
Straight-Line, Single Stage, Gasoline Engine Driven	1900s-1930s	Low
Straight-Line, Single Stage, Steam Driven	1880s-1920s	Moderate
Straight-Line, Two Stage, Steam Driven	1890s-1920s	High
Straight-Line, Triple Stage, Steam Driven	1890s-1920s	Very High
Straight-Line, Single Stage, Geared to Electric Motor	1900s-1920s	Moderate
Straight-Line, Various Stages, Geared to Electric Motor	1900s-1920s	High
Straight-Line, Single Stage, Belt Driven by Electric Motor	1900s-1940s	Low
Duplex, Single Stage, Steam Driven	1890s-1920s	Moderate
Duplex, Two Stage, Steam Driven	1890s-1920s	High
Duplex, Triple Stage, Steam Driven	1890s-1920s	Very High
Duplex, Two Stage, Belt Driven	1900s-1940s	Moderate
Duplex, Three Stage, Belt Driven	1900s-1940s	Moderate to High

(Adapted from Twitty, 2002: 306).

At the turn of the century, machinery makers began to offer air compressors that were smaller, more efficient, and provided better service than early models. They adapted several designs to be run by electric motors and gasoline engines, energy sources well-suited to remote mines. Gasoline and electric compressors underwent gradual acceptance, but proved their worth by the 1910s, and mining companies throughout San Juan County embraced them.

By the late 1890s, mining machinery makers offered three basic types of electric compressors, including a straight-line machine that was approximately the same size as traditional steam versions, a small straight-line unit, and a duplex compressor. Duplex models, conducive to multi-stage compression, were most popular among medium-sized and large mining companies, while moderately sized mining operations favored the small straight-line units. Due to limited air output compared with a relatively large floor space, the large, electric, straight-line compressors never became popular.

Compressor makers also developed economical gasoline units ideal for remote operations. The gasoline compressor, introduced in practical form in the late 1890s, consisted of a straight-line compression cylinder linked to a single-cylinder gas engine. Most mining

engineers considered gas compressors to be for sinking duty only. Large gasoline machines were capable of producing up to 300 cubic feet of air at 90 pounds per square inch, enough to run up to four small rock drills.[573]

The noisy gasoline machines had needs similar to their steam-driven cousins. Gasoline compressors required cooling, fuel, and a substantial foundation capable of withstanding intense vibration. They came from the factory either assembled or in large components for transportation into the backcountry. The cooling system often consisted of no more than a water tank, and the fuel system could have been simply a large sheet iron fuel tank connected to the engine by ¼" to ½" inch metal tubing. Motor-driven duplex and straight-line compressors dominated mining operations through the 1940s. Well-financed mining companies requiring high volumes of air at high pressures continued to favor belt-driven duplex compressors, while companies with slightly reduced air needs relied on relatively inexpensive, single-stage, belt-drive, straight-line compressors.

Despite common reliance on older designs, compressed air technology underwent dynamic changes after the 1910s. Mechanical engineers experimented with unconventional designs beginning in the 1900s, and during the 1910s several went commercial. The *upright two-cylinder compressor* was based on the automobile engine and featured similar valves and a crankshaft. Used on an experimental basis as early as the turn of the century, these units were inexpensive, adaptable to any form of power, and light. Further, machinery makers mounted them onto four-wheel trailers or simple wood frames for mobility. *V-cylinder compressors*, also known as *feather valve compressors*, adapted large-displacement truck engines and featured three to eight cylinders arranged in a "V" configuration. The new design relied on a grossly enlarged radiator for cooling and was powered by an electric motor directly coupled onto the crankshaft.

In most cases, when a mine was abandoned the compressor was removed, leaving only the foundation. However, as with hoists, based on that footprint, the researcher can often determine the exact type of compressor used. Following are descriptions of the foundations of common types of compressors. *Straight-line steam compressors* usually stood on foundations with a rectangular footprint and flat top studded with two rows of anchor bolts. In general, workers used masonry or concrete, although they bolted some machines less than 12' long to timbers. Foundations for large compressors often featured individual blocks for the steam and compression cylinders and a separate pedestal adjacent to one end for an outboard flywheel bearing.

Foundations for the large, early *duplex steam compressors* consisted of a pair of elongated rectangular pads spaced several feet apart. The pads were usually mirror opposites, and their anchor bolts were symmetrical in pattern. Workers almost always used masonry or concrete, but arranged individual stone blocks for the components of large versions. The steam and compression cylinders and flywheel were bolted to their own sets of blocks.

[573] Twitty, 1999: 126.

The foundations for the compact duplex compressors are easily identified today. The foundations are U-shaped, slightly rectangular, and several feet high. Units powered by a separate motor had a small pad for the motor at the open end of the U, while steam compressors lacked the additional pad.

Straight-line belt-driven compressors were bolted to foundations similar to those for their steam-driven counterparts. They also featured a separate pedestal at one end for the flywheel's outboard bearing, and a second, rectangular foundation for the drive motor.

Due to severe vibrations, *petroleum compressors* were usually bolted to stout, concrete foundations several feet high. The foundations are almost always rectangular, several feet wide, less than 9' long, with two rows of anchor bolts. *Upright compressors*, small in size, could have been bolted to either timber or concrete foundations rectangular in footprint. A pad for the engine or motor should be adjacent and aligned.

Foundations for *V-cylinder compressors* tend to be fairly distinct and often feature an adjacent mount for a motor or engine. Compressors that had several cylinders were bolted to rectangular foundations between 3' x 3' and 4' x 5' in area. Foundations for machines with numerous cylinders were several feet wide and up to 10' long. In construction, the foundations had a series of closely spaced timbers bolted to either an underlying concrete pad or buried timber footer.

Electricity

Mining engineers in the west began experimenting with electricity as early as 1881. At that time, electric technology was new and its practical application was limited primarily to lighting. During the 1880s, visionary inventors demonstrated that electricity was able to do mechanical work as well.[574]

During the late 1880s and early 1890s, well-capitalized companies in technologically advanced areas, the San Juan Mountains in particular, began to harness electricity for practical use. They made their first attempts in locations that featured a combination of water and topography that could generate hydro-power. In 1888, the Tomboy and Virginius mines at Telluride used electricity to run custom-made electric hoists and lighting. In 1890, power plants were built at Ames in San Miguel County and at Silverton. In 1891, Edward Stoiber erected a small plant for his Silver Lake Mine. Colorado, and especially the San Juan Mountains, acted as a proving ground for the application of electricity through the rest of the decade. Engineers foresaw electricity as an alternative to steam. Generating electricity at a central point and transmitting to remote mines eliminated the need to haul coal and steam equipment at great cost. Inherent limitations in electrical technology, however, slowed its initial use.

The earliest electrical circuits were energized with direct current (DC) with a unidirectional flow, although mining engineers also experimented with alternating, or oscillating, current (AC). Neither power source as they existed during early the 1890s was particularly well

[574] Eric Twitty, *"From Steam Engines to Electric Motors: Electrification in the Cripple Creek Mining District,"* The Mining History Journal (1998): 103.

suited for mining. AC current could be transmitted for miles with little energy loss, but AC motors were incapable of starting or stopping under load. Therefore, AC was unsuitable for running hoists, large shop appliances, or other machines that experienced sudden drag or required variable speed. AC electricity was effective, however, for running small air compressors, ventilation fans, and other constant-rotation machines that offered little resistance. DC electricity, on the other hand, had the capacity to start and stop machinery under load, but the electric current could not be transmitted at distance without suffering debilitating power loss. Therefore DC current had to be used adjacent to its point of generation. In addition, DC motors were incapable of running the massive production-class machines that mining companies had come to rely on for profitable ore extraction.[575]

Based on the above, contemporary electrical technology offered mining companies little incentive to retire their steam equipment. However, progressive engineers such as Edward Stoiber conducted extensive experimentation during the early 1890s to harness both DC and AC currents. Around 1900, electrical appliance manufacturers made several breakthroughs that rendered the power source useful for mining. Electricians developed the three-phase AC motor, which could start and stop under load while using current that could be transmitted long distances. They also invented DC/AC converters, which permitted the use of DC motors on the distribution end of an AC electric line. The net result was that electricity became an attractive power source to a broad range of consumers. Still, many mining companies were not yet willing to relinquish traditional steam technology completely. Voltage, amperage, and current had not yet been standardized among machinery manufacturers or various power generators. As such, the prevailing attitude was cautious.[576]

The rigors of mine hoisting proved to be a major obstacle, but by the turn of the century machinery manufacturers developed a variety of small AC and DC hoists that were reasonably reliable. The early electric models were similar in design to sinking-class geared steam hoists and were manufactured with motors wholesaled from electric appliance companies such as General Electric. Even though the electric hoists were able to start and stop under load, they remained slow with limited payload capacity.[577]

By the 1910s, engineering progressed to the point where mining companies could not deny that electric equipment performed as well as steam. When steam machines became worn, mining companies replaced them with electric models. One engineer asserted that where power was readily available, a steam-driven compressor cost up to $100 per horsepower per year to run while an electric model cost only $50. During the 1910s, engineers and manufacturers improved performance and reliability, and introduced double-drum units for balanced hoisting. By 1920, except for remote and poorly capitalized operations, most companies adopted electric power.[578]

Architecture

[575] International Textbook Company, 1899: A23, 5; Peele, 1918: 1126; Twitty, 1998.
[576] Twitty, 1999: 269.
[577] Twitty, 1999:270.
[578] Twitty, 1999:270.

Once a mining company had proven the existence of ore, investors expected the operation to perform throughout the year, until the ore had been exhausted. Complying with company wishes, engineers erected buildings to shelter surface plant components against the weather. They sheltered not only the mine crew, but machinery components from exposure to adverse weather. The engineer also had a tacit understanding that mine buildings possessed the ability to inspire investors. Large, well-built buildings such as those in Silver Lake Basin conveyed permanence, wealth, and industrial might.

Functional layout, design, and construction materials for mine buildings in San Juan County evolved between the 1870s and the 1920s. Most were vernacular expressions unique to each mining operation. Professional architects rarely designed these buildings, although professional and self-actualized engineers often proved capable builders despite formal training in architecture. They successfully adapted construction methods to the terrain, climate, transportation limitations, financial resources, and available materials of San Juan County. In many cases, engineers imitated mining industry architecture elsewhere and molded it to fulfill a particular need in a localized context.

Mining engineers considered four basic expenditures that influenced the type, size, and composition construction. These included the time necessary to design the building and the cost to purchase or fabricate basic construction materials. Third, materials had to be hauled to the site, and fourth, the cost of construction itself. Between the 1870s and the turn of the century, well-capitalized companies met the above considerations by erecting frame buildings sided with lumber, sometimes with some degree of pre-assembly or numbering of parts. Smaller or poorly funded operations substituted locally-available logs. Buildings erected by well-financed companies tended to be substantial and well-built, while those of operations with poor capitalization were crude, small, and rough.

The introduction of steel and iron materials to the mining industry in the 1890s changed some buildings. Steel makers began selling corrugated siding for commercial construction in the 1890s. While much siding was decorative, some varieties were designed with industrial applications in mind. Corrugated sheet metal particularly found favor with the mining industry and its use spread rapidly. Engineers increasingly utilized the material such that by the 1910s it had become ubiquitous siding for siding. The advantages of corrugated sheet metal were its affordability, light weight (and thus ease of shipping), ability to cover a substantial area, and rigidity. These qualities made corrugated sheet metal ideal where remoteness rendered lumber too costly.[579]

The other significant use of metal in mine buildings occurred during the 1900s when a few prominent companies began experimenting with girders for framing large buildings such as mills. The Gold Prince Mill, erected at Animas Forks in 1903, exemplified the practice. Architects began using steel framing to support commercial and industrial brick and stone masonry buildings as early as the 1880s, but mining companies in general found that wood

[579] Twitty, 1999: 304.

framing met their needs for less money. By the 1890s, architectural steelwork had improved and steel makers offered lightweight beams, which mining engineers adapted to the framing of large buildings. Further, engineers found that steel offered a sound structure resistant to high winds, but also often cost less than the thousands of board-feet of lumber required to erect the massive buildings.

The general types, forms, and designs of mine buildings followed a few patterns, regardless of the materials. Between the 1870s and 1910s, most engineers enclosed the primary surface plant components clustered around the shaft in a multi-purpose *shaft house*, and the plant components associated with a tunnel in a *tunnel house*. These buildings contained machinery, the shop, mine entrance, and workspace. Smaller shaft houses in San Juan County were often constructed of post-and-girt framing, gabled rafter roofs, and unsubstantial foundations. Larger shaft houses were based on custom-designed frames of heavy timbers capable of supporting the roof independent of the walls. Regardless of frame design, carpenters clad the walls with board-and-batten siding, several layers of boards, and, by the 1900s, corrugated metal siding. Even after electric lighting was available, engineers continued to design large multi-pane windows at regular intervals for daylight.

Most shaft houses conformed to a few standard footprints influenced by the arrangement of machinery. Overall, the buildings tended to be rectilinear to encompass the hoist, anchored some distance from the shaft, with lateral extensions for the shop, water tank, boilers, and either coal or cord wood storage. Professional engineers recommended that at least the boiler, and ideally the shop as well, be partitioned in separate rooms because they generated unpleasant soot and dust which took a toll on lubricated machinery.[580]

The roof profile of most shaft houses featured a louvered cupola enclosing the headframe's crown and a sloped extension descending toward the hoist to accommodate the hoist cable and headframe backbraces. Tall iron boiler smokestacks pierced the roof proximal to the hoist. The forge stovepipe extended through the roof near the shaft collar. The shaft house also sometimes featured other stove pipes at the hoistman's platform and carpentry shop. The tall smokestacks were usually guyed with baling wire against strong winds. The shaft houses at high elevations often had plank flooring to improve insulation. In some cases the shop and boiler areas, where workers dropped smoldering embers, hot pieces of metal, and nodules of fresh clinker were also floored with planking, despite fire hazard. Customarily the mining engineer designed the flooring flush with the top surfaces of the machine foundations, permitting steam and other pipes to be routed underneath.

By the late 1910s, the U.S. Bureau of Mines outlawed shaft houses made of flammable materials. The surface plants then changed to consist of a cluster of smaller buildings surrounding an exposed headframe. Instead of a shaft house, mines featured a *hoist house* for the hoist, boilers, and shop. At large operations, individual buildings housed some surface plant components separately. The shop had its own building, as with the *compressor house* and

[580] Twitty, 1999: 306.

electrical substation *transformer house*. The mine plant may have also featured a miner's *change house,* also known as a *dry*, a storage building, stable, and carpentry shop.

The difficult economic climate of the Great Depression changed general construction methods for mining architecture to some degree. Overall, the buildings became smaller, incorporated more salvaged materials, and were less well built than in previous decades. These trends continued through mining's decline in the 1960s. Mining companies with capital erected buildings that were spacious with lofty, gabled roofs when possible. Engineers continued to take advantage of natural light and provided broad, custom-made doors at key functional points. Engineers either floored principal structures with poured Portland cement, inexpensive due in part to the proliferation of trucking, or used wood planking. Preferred materials included lumber, sheet iron, and factory-made hardware. In most cases, mining engineers emphasized function and economy in their designs with no superfluous ornamentation. Poorly funded outfits could not afford quality materials or tools, experienced engineers, or skilled workers. Many favored single-slope shed roofing with salvaged irregular doors and windows. Overall, these buildings assumed an ad-hoc quality, but were ultimately well-built and offered shelter. Some buildings lacked formal framing or were simple balloon-frame construction. Builders used a patchwork of planks and sheet metal for siding, often layered to prevent wind damage.

Ore Storage

Although capitalists, engineers, and miners often held differing opinions in running a mine, all were in agreement that the primary goal was the production of ore. Those mines with any measurable output usually featured an ore storage facility to accommodate production, and two basic types of facilities typical of San Juan County's hardrock mines. *Ore bins* were functionally different from *ore sorting houses*, and mining companies based choice of structure on the type of ore being mined. Some ores were fairly consistent in quality and rock type and warranted storage in an ore bin. Low-grade and complex ore required sorting, separation from waste rock, and rudimentary concentration in an ore sorting house. Both types of structures required a means of inputting ore from the mine and a means of extracting it for shipment to a mill for finer concentration.

Mining engineers recognized three basic types of ore bins: the *flat-bottom bin*, *sloped-floor bin*, and hybrid *compromise bin*. Mining companies with regular ore production often erected large sloped-floor ore bins. The solidity of these structures inspired confidence. Well-built sloped-floor bins, which cost more than twice to build than flat-bottomed bins, typically consisted of a heavy post-and-girt frame sided on the interior with planking. The structures generally stood on foundations of heavy timber footers on terraces of waste rock. To ensure the structure's durability against the onslaught of sharp rock, laborers often armored bin floors with salvaged plate iron. Small mines used sloped-floor bins consisting of a single cell, while large mines erected structures with numerous cells to hold either different grades of ore, or batches of payrock produced by multiple companies of lessees working within the same mine.

Mining companies with limited financing and ore production erected flat-bottom bins because such structures were inexpensive. Rarely did these structures attain the proportions of their large sloped-floor cousins because the walls were not able to withstand the immense lateral pressures exerted by the ore. Flat-bottomed bins contended with pressure on all four walls, while sloped-floor bins directed the pressure against the front wall and diagonal floor. Flat-bottom bins also were seasonal because they could not be roofed.

Ore sorting houses were generally more complex and required greater capital and engineering to erect than ore bins. The primary functions of ore sorting houses were concentration and storage. In keeping with the gravity-flow engineering typical of mining, engineers usually designed sorting houses with multiple levels for input, processing, and storage. These structures usually featured a row of receiving bins or chutes on the top level, a sorting floor under the receiving bins, and a row of holding bins underneath the sorting floor. Receiving bins usually had sloped floors, and in most cases the holding bins did too. A cupola sheltered the top level, and the sorting floor was fully enclosed and heated with a wood stove. The holding bins at bottom were sloped, and the structure usually stood on a foundation of heavy timber pilings or log cribbing walls.[581]

The general path the ore followed began when miners underground characterized the nature of the ore they were extracting. They communicated their assessment via a labeled stake, a message on a discarded dynamite box panel, or a tag placed in the ore car. A trammer then hauled the loaded car out of the mine and pushed it into the sorting house. He emptied the contents into one of several bins, depending on how impure the ore was. High-grade ore went into a small special bin at one end of the structure. Run-of-mine ore, which was not particularly rich but required no sorting, went into another bin at the opposite end. Low-grade payrock combined with waste rock, known as mixed ore, went into one of several bins located in the center of the ore sorting house. When released from the car, the mixed ore slid onto a heavy grate known as a *grizzly*. The rich portions of the ore fractured into fines, while the large cobbles that remained intact after blasting and shoveling contained waste rock that needed to be cobbed, or knocked off by surface laborers. The valuable fines dropped through the grizzly directly into the holding bins at the bottom of the structure, while the cobbles rolled off the grizzlies and into chutes that fed onto sorting tables. There, laborers worked to separate the ore from waste.

Explosives Magazines

Explosives were fundamental to mining as the prime mover of rock. Mining companies had to store enough dynamite and blasting powder to carry them through the weeks spanning freight deliveries, and they often informally stacked 50 pound boxes, the standard shipping container, in heavily used mine buildings or underground workings. Worse, during cold months, much of the year at high altitude, miners stored boxes of dynamite near boilers, in blacksmith shops, and near hoists where it remained in a thawed and ready state. Such storage practices

[581] Twitty, 1999: 153.

were dangerous, and in response, some engineers instituted explosives magazines where storage could be carried out in a more controlled and orderly manner.

Well-built magazines came in a variety of forms and sizes, but all shared the common goal of concentrating and sheltering the mine's supply of explosives away from the main surface plant. Trained engineers felt that magazines should be bulletproof, fireproof, dry, and well-ventilated. Magazines should be constructed of brick or concrete, or if frame construction, the walls needed to be sand-filled and sheathed with metal. These features not only could protect explosives from physical threats, but regulate the interior environment. Extreme temperature fluctuations and pervasive moisture damaged fuse, blasting caps, blasting powder, and most forms of dynamite. This in turn directly impacted the miners' work environment, because degraded explosives created foul and poisonous gas byproducts that vitiated mine atmospheres. Mining engineers recognized proper magazine construction as comprised of stout masonry or concrete with a heavy arched roof and metal doors in steel jambs. Other magazines were similar to root cellars, consisting of a plank-lined chamber excavated out of a hillside, often 8' x 10' in area, and roofed with earth and rubble. Usually magazines were located away from the mine's surface plant. Regardless of degradation and obvious safety hazards, many small and medium-sized mining companies stored explosives in crude and even dangerous structures. Miners erected sheds sided only with corrugated sheet metal. In other cases, capital-poor operations took even less precaution and stored explosives in sheet metal boxes similar to doghouses, in earthen pits roofed with corrugated metal, or in abandoned prospect adits.

Aerial Tramways

San Juan County possesses extremely hostile terrain. Some of the county's most promising mines were also some of its most inaccessible. Sheer cliffs, excessively steep slopes, heavy snowpack, and ragged bedrock confounded numerous attempts to establish roads negotiable by wagon. Some locations were so difficult to reach that pack trains were the only viable means of transporting in materials and hauling out ore. Inadequate transportation had the potential to ruin otherwise profitable operations. Pack trains were costly, and approximately eleven burros or donkeys were required to carry out one ton of ore. The aerial tramway, for which San Juan County became known, was a productive solution to the transportation problem.[582]

Andrew S. Hallidie, a San Francisco engineer and mining machinery maker, was the first to develop a continuously operating tramway with a significant carrying capacity. In the late 1860s, he devised a system that consisted of a series of wooden towers, a continuous loop of wire rope, and loading and unloading terminals at both ends. A procession of ore buckets was fastened to the wire rope and traveled a circuit between the stations. The system operated under gravity, and as the loaded buckets gently descended downslope, they pulled the light empty ones back up to the mine. The wire rope passed around large sheave wheels in the terminals, and in

[582] Ihlseng, 1892: 137.

between coasted over idler wheels on timber cross-members, which were bolted to the towers. When empty buckets entered the top terminal, workers loaded them with payrock while the buckets were in motion. The buckets then passed around the sheave wheel and traveled down to the bottom terminal. When the buckets entered the bottom terminal, a guide rail upset them such that they dumped their contents into a receiving bin, and then returned to the top terminal. Hallidie's design changed little from the 1870s, when mining companies began experimenting with it, until the 1890s when other designs came to dominate.

Although the Hallidie design was the best contemporary tram design for moving large volumes of ore, it had limitations. Theodore Otto and Adolph Bleichert, two German engineers, developed an alternative system introduced to Europe in 1874. The *Bleichert Double Rope* tramway utilized a *track rope* spanning from tower to tower, and a separate *traction rope* that tugged the ore buckets around the circuit. The track rope was fixed in place and served as a flexible rail, which the buckets coasted over on special hangers fitted with guide wheels. The traction rope attached to the bucket hanger via a mechanical clamp known as a *grip*. Like Hallidie Single Rope tramways, Bleichert Double Rope tramways incorporated top and bottom terminals where the buckets were filled and emptied, usually aided by gravity.[583]

The principal difference lay with the grip, which was releasable and allowed workers to detach the buckets from the traction rope and stop their motion. The workers could thus manually push the buckets around the interior of the terminal on suspended rails and fill them at leisure without spillage. The double-rope system also permitted the entire tramway circuit to be extended up to four miles in length and at almost any pitch. Given this, even though Bleichert systems were up to fifty percent more expensive than Hallidie tramways, they proved better for heavy production because they had greater carrying capacities.

Mining companies began experimenting with Bleichert Double Rope systems in the 1880s, and due to superior performance, Bleichert systems eclipsed the less expensive Hallidie tramways by the 1890s. Still, some companies with limited production and moderate amounts of capital continued to install Hallidie systems after the turn of the century. Designing and building aerial tramways were beyond the skills of most engineers because the systems were complex and required advanced economic and engineering calculations. Installation usually required at least some direction from technicians dispatched by the tramway maker. Although mining companies purchased standardized tramway equipment from manufacturers, rarely were two systems alike in the county, in part because the physical and economic conditions of each mine were different.

Tramway systems were materials-intensive and required substantial structures. The basic components included a top terminal near the tunnel or shaft, a bottom terminal located adjacent to a road, railroad, or ore concentration mill, and a series of towers for the bucket line. Engineers developed four basic types of towers for both Bleichert and Hallidie systems. These included the *pyramid* tower, *braced hill tower*, *through tower*, and *composite tower*. The pyramid tower consisted of four upright legs that joined at the structure's crest. The through tower resembled an A-shaped headframe consisting of a wide, rectangular structure stabilized by fore and back

[583] Ihlseng, 1892: 138; International Textbook Company, 1905: 122; Lewis, 1946: 372; Peele, 1918: 1563; Robert A. Trennert, *"From Gold Ore to Bat Guano: Aerial Tramways in the West,"* The Mining History Journal (1997): 6.

braces, the tram buckets passing through the framing. Composite towers usually had a truncated pyramid base topped with a smaller frame supporting a cross-member. The braced hill tower was similar to the through tower, except it had exaggerated diagonal braces tying it into the hill slope. Towers for both Bleichert and Hallidie systems required stout cross-members that supported the wire ropes. Towers had to be far away enough so the buckets could swing in the wind and not strike the towers. Hallidie systems, with their single-wire rope and fixed buckets, needed only one cross-member with several idler wheels or rollers. Because the buckets suspended from a long hanger fixed onto the cable, the cross-member was bolted to the top of the tower. Bleichert systems, on the other hand, required a stout cross-member at the tower top to support the stationary track cable, and a second cross-member 3' to 7' below to accommodate the moving traction rope. The second cross-member almost always featured either idler wheels or a broad, steel roller.

Tramway terminal design challenged engineers with integrating the system with ore production. Terminals had to be physically arranged to permit the input and storage of tons of ore, facilitate the transfer of payrock into or out of the tram buckets, and resist the tremendous pull on the sheave wheel by the traction rope. In the case of Bleichert systems, terminals also anchored the track cables. Mining engineers designing small-capacity tramways attempted to solve all of the above problems within a single structure, while the terminals for large-capacity tramways required complex buildings.

Regardless of the type of tramway, the engineer had to design timber framing for the sheave wheel capable of resisting the tremendous horizontal forces of keeping the traction rope taut. The sheave in the top terminal usually fixed to a heavy timber framework anchored to bedrock and partially buried with waste rock ballast. In some designs, the wheel canted at the same angle as the pitch of the bucket line, so the cable did not derail, causing a potentially costly and fatal catastrophe. With Bleichert systems, framing usually surrounded the sheave for maximum strength, unlike Hallidie systems. Because the buckets were fixed to the traction cable, they had to pass around the wheel, which meant the wheel had to be exposed on all but the front side. Typical sheave wheels, 6' in diameter for small systems and 12' for large systems, featured a deep, toothed groove for the rope, fixed onto a heavy steel axle set in cast-iron bearings bolted to the timbers. Brake levers, usually installed in both terminals, were typically very long to provide leverage, located adjacent to or on a catwalk immediately over the wheel. The lever controlled heavy wooden shoes that pressed against a special flange fastened to the sheave wheel. At the bottom terminal, the sheave had to be moveable to take up slack in the bucket-line. In many cases, the wheel was fastened onto a heavy timber frame pulled backward by adjustable anchor cables or threaded steel rods.

Both Hallidie and Bleichert tramways were typically too large and expensive for smaller operations. Yet, rugged terrain and locations high on the sides of mountains presented no less of an access problem for these limited operations. In response, smaller companies erected *single-rope reversible* and *double-rope reversible* trams. Well-engineered single-rope trams consisted of simple components. A fixed line extended from an ore bin located high up at the mine down to another ore bin below. A hoist at the mine wound a second cable that pulled a bucket up, and

when the bucket was full, a worker lowered it via hand brake. Double-rope tramways, also known as *jig backs*, featured two fixed lines and two buckets that counter balanced. A worker lowered a full bucket down to the bottom terminal with a hand brake, and it pulled the lighter, empty one up to the top terminal. Lengthy double-rope tramways often featured a series of towers similar to those for Bleichert systems.

Ore Beneficiation: Smelting, Ore Concentration, and Amalgamation

Mining was the first stage in a long process to convert ore into refined metals for consumption. When extracted from the ground crude ore required treatment to separate the metal content from waste. The industry referred to the entire process as beneficiation, with numerous steps involved. The process was not straightforward because in San Juan County nearly all forms of ore were highly complex blends of silver, zinc, lead, copper, and gold, which strongly resisted treatment. This forced metallurgists to develop advanced chemical and mechanical processes. Simple pure ores, and some did exist, required few steps, while complex ore required time-intensive treatment. In overview, the process began with crushing and grinding the ore, followed by separating metalliferous material from waste through *concentration*. The resultant *concentrates* roasted and smelted in a furnace, which furthered separation and yielded a blend of metals known as *matte*. Advanced smelters located in Durango, Denver, Golden, Colorado Springs, and the Midwest refined matte into pure metals or *bullion*.

In San Juan County, a variety of facilities carried out one or all of the steps necessary to process crude ore. They operated either as independent mills or in conjunction with specific mines. *Smelters* were turnkey facilities that reduced crude ore to metals and matte. The Greene, Martha Rose, Walsh, and Kendrick-Gelder smelters operated sequentially in the county between 1874 and 1909. The Durango and Standard smelters operated in Durango between 1882 and 1931. Unlike smelters, *concentration mills* did not reduce ore to matte, but instead, merely separated waste from ore metal content. *Amalgamation mills*, rare in the county, crushed gold ore and relied on mercury to amalgamate with the gold.

Smelters

To produce metals, smelters incorporated mechanical, chemical, and roasting processes that a metallurgist tailored to the general character of the county's ore. Basic smelting began when wagons delivered crude ore to the facility, where workers dumped it into receiving bins at the smelter's head. The ore had to be broken into consistently sized cobbles either by hand or with a mechanical crusher before loading into the smelting furnace. If the ore contained high proportions of waste, then it was concentrated with mechanical methods prior to smelting.

The furnace was at the heart of a smelter facility, and two general types saw use in the county. The earliest, employed by the Rough and Ready and Little Dutch smelters, was a masonry structure with a chamber for ore, ducts to direct blasts of hot gases against the ore, and fireboxes with special ventilation to enhance fuel combustion. Troughs were supposed to collect

molten liquid as it ran off the ore and segregate the metal content from slag according to gravity. The exact design of these early smelters is unknown, because they largely failed.

The most successful furnaces, employed at the Martha Rose smelter, were cylindrical steel vessels 4' to 12' in diameter and lined with fire bricks. They stood on stout rock or brick masonry foundations and featured tap spouts and tuyeres, ports that admitted air blasts at graduated intervals. At center was a columnar charge of fuel, where workers dumped crude ore until the ore chamber was full. They usually admitted lead bullion, or lead or iron ore, first because the soft metal served as a flux, which, when molten, helped the rest of the ore to liquefy. After workers arranged layers of ore, sealed the spouts, and added more fuel, they started a blower that fed air to the smoldering fuel, bringing it to a great heat.[584]

As the lead or iron ore melted and the temperature increased, these liquid metals came in contact with harder metals and minerals, causing them to soften, melt, and trickle down into the base of the furnace. Over time, the lot of ore became molten and the heaviest material, usually the metals, settled to the bottom while the lighter waste floated on top. At this point, workers opened the upper slag spouts and tapped the liquid waste into slag carts, then did likewise for intermediate slag spouts. After they drew the waste off, the workers added more ore and fuel until the pool of liquid metal rose to the height of the lower slag spout. At this time, workers opened the lowest spout at the furnace base and tapped the molten metal into pots or molds until liquid slag appeared, indicating an end to the metal. Workers repeated the process, keeping the furnace in continuous operation for days or weeks.[585]

Because metallurgists used gravity to draw ore through the processing stages when possible, they usually sited smelters at the base of a slope. Smelting facilities usually required flat space, a source of abundant water, and well-graded roads. In addition to the furnace, smelters often featured ore bins, large fuel bins, water tanks, storage, assay office, and vault. Each smelter usually had more than one furnace to process batches of ore simultaneously if the material was simple, or in stages if the ore was complex. Some smelters also featured roasters and mechanized concentration mills to prepare the ore and enhance separation prior to smelting.

Concentration Mills

Only a few companies in San Juan County possessed enough capital and ore to warrant the erection of a dedicated smelter. Most companies shipped their ores to custom smelters, which extracted the metals for a fee. The shipping charges and smelting fees often constituted considerable overhead, and in response, well-capitalized mining companies attempted to save money by building concentration mills near their workings. Concentration mills relied on mechanical and chemical processes to reduce ore, separate the metalliferous materials, and prepare the resultant concentrates for shipment to a smelter for final treatment. In so doing, mining companies accomplished many intermediate steps that smelters charged for and did not

[584] Lynn Bailey, *Supplying the Mining World: the Mining Equipment Manufacturers of San Francisco 1850-1900* (Tucson: Western Lore Press, 1996) 80; Will Meyerriecks, *Drills and Mills: Precious Metal Mining and Milling Methods of the Frontier West* (Tampa: 2001) 173.
[585] Bailey, 2002: 82-3; Meyerriecks, 2001: 174.

have to ship heavy crude ore. Concentration mills were not equipped, however, to produce finished bullion.

Concentration mills were usually built over a series of terraces incised into a hillslope so gravity could draw the ore through the various processing stages. Mills existed in a variety of sizes, and large facilities usually required stone masonry or concrete terraces, while earthen terraces and substantial beamwork were sufficient for small facilities. Large mills were heavily equipped to process both high volumes of ore and complex ore that resisted simple treatment. To do so, they often provided primary, secondary, and even tertiary stages of crushing, screening, and concentration. The Silver Lake Mill even featured several parallel sequences of these processes. Small mills, by contrast, usually provided crushing and concentration in a single linear path.

Engineers and metallurgists tended to follow a general pattern when designing concentration mills. An ore bin stood at the mill's head and fed crude ore into a *primary crusher*, usually located on the mill's top platform. The crusher reduced the material to gravel and cobbles ranging from 1" to 4" in diameter, which descended to a *secondary crusher* located on the platform below. The secondary crusher pulverized the ore to sand and slurry, to pass through a screening system. Oversized material returned for secondary crushing while the remainder passed on to concentration at smaller mills, or tertiary crushing followed by concentration at larger mills. By 1900, engineers favored *trommel screens* or *shaking screens* to sort the sand. A trommel consisted of a concentric series of cylindrical screens that rotated, allowing fine material to drop through while oversized cobbles rolled out of an open end. A shaking screen was a stack of rectangular pans with screen floors.[586]

Machinery manufacturers offered a wide array of crushers and grinders, which metallurgists selected according to the ore's characteristics. Because no two mines featured the same ore and no two metallurgical assessments were alike, each mill was custom. However, engineers followed certain trends regarding the application of crushing machinery. Jaw crushers, also known as Blake crushers, provided primary crushing, while a few large operations employed gyratory crushers. Batteries of stamps were commonly employed for secondary crushing. A stamp battery consisted of a timber gallows frame with guides for heavy iron rods featuring cylindrical iron shoes. A cam lifted the rods in sequence and let them drop on the gravel being crushed. Crushing rolls often carried out secondary and tertiary crushing, and they consisted of a pair of heavy iron rollers similar to wheels in a stout timber frame. A narrow gap between the rollers drew in clasts of sand and gravel and fragmented them. Grinding pans and Huntington mills were used for tertiary crushing, and both featured a heavy cast-iron pan and iron shoes or rollers that dragged across the floor grinding the ore. When the ore was free-milling gold or silver, the metallurgist introduced mercury into the pan to amalgamate with the metals. *Tube mills* and *ball mills* offered the finest grinding. Each appliance consisted of a large cylinder that mill workers partially filled with sand, gravel, and water. The cylinder slowly rotated, and the iron rods in tube mills or iron balls in ball mills tumbled in the chamber,

[586] Peele, 1918: 1623, 1627; Tinney, 1906: 191.

reducing the material to slurry. Both grinding appliances rose to popularity around 1900 and by the 1930s were used in place of crushing rolls and stamp batteries. The end product of crushing and grinding were *fines* and *slurry*.[587]

Following another screening, ore descended to subsequent mill platforms for concentration Several devices proved efficient at separating out metals, and most metallurgists assembled a concentration sequence involving more than one appliance. The *jig* relied on water currents and agitation to separate heavy metalliferous material and classify particles by size and weight. The jig consisted of a wooden trough, often 4' x 9' in area and 4' high, divided into cells that opened onto a V-shaped floor featuring valves and drains. Plungers agitated the slurry of ground ore in the cells, causing the heavy or large fines to settle while a gentle current of water washed the waste away. Jigs were highly popular in the county from the late 1870s into the 1930s.

Vanners were a popular concentration appliance for silver ores between the 1880s and 1900s, until they were replaced by vibrating tables. A vanner featured a broad rubber belt on rollers mounted to an iron frame that vibrated. The belt assembly, around 5' x 15' in area, was suspended by an oscillating mechanism from a chassis bolted to a timber foundation. The belt moistened and as the machine vibrated, heavy metalliferous material settled against and stuck to the rubber while a jet of water washed off waste. As the belt wrapped down around one of the rollers, the metalliferous material dropped into a flume and proceeded for further concentration.[588]

Vibrating tables were one of the most effective classes of concentration appliances and rose to prominence around 1900. Arthur Wilfley designed the first model for his mill in Robinson, Colorado, in 1896. By the 1910s, metallurgists adapted the concept for nearly all types of metal ores. A vibrating table featured a tabletop, often 5' x 15' in area, clad with rubber or linoleum held down with fine riffles. The tabletop slanted on a mobile iron frame that rapidly oscillated, and the vigorous action caused heavy metalliferous material to settle against the higher riffles while the waste worked its way downward. Water playing across the tabletop washed the waste away. Edward Stoiber and his metallurgist Robert J. McCartney designed the Stoiber-McCartney table specifically for San Juan County ore.[589]

By the mid-1910s, *flotation cells* proved their worth operating according to principles that seemed to defy traditional concentration technology. The technology pioneered in the county in 1914 and concurrently elsewhere in the state, became rapidly common. Local metallurgist Louis Bastian designed his own version. Flotation cells consisted of a large rectangular tank divided into compartments filled with water and slurry. Oils or detergent compressed air while agitators worked the mixture into froth. In contrast to other devices, the froth carried metalliferous material upward while wastes settled to the bottom of the cells. Revolving paddles then swept the metalliferous material into troughs.

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[587] Peele, 1918: 1630.

[588] Lynn Bailey, *Shaft Furnaces and Beehive Kilns: A History of Smelting in the Far West, 1863-1900* (Tucson: Westernlore Press, 2002) 64, 112; Tinney, 1906: 204.

[589] Peele, 1918: 1680; Tinney, 1906: 204.

While vibrating tables and flotation cells proved effective for silver and industrial metal ores, they provided limited success for complex gold ores, including telluride. At the turn of the century, mining companies first in Cripple Creek and then in Boulder County began experimenting with *cyanidation*, pioneered in New Zealand. Cyanidation crushed and ground ore as above, concentrating it into slurry. A worker transferred the metalliferous material into *cyanide tanks*, large wooden vats that agitated the slurry in a dilute cyanide solution. The cyanide bonded with gold, the waste flumed out, and a worker tapped the solution into *precipitating boxes* where he introduced zinc, to which cyanide attracted over gold. The chemical reaction caused the precious metal to precipitate out. Cyanide mills featured one or a series of cyanide tanks, depending on the purity and volume of ore.

Most mill processes liquefied slurry with water to mobilize the material and allay dust. However, at the end of the process, concentrates had to dry for shipment. Engineers installed various dewatering devices ranging from conical and pyramidal settling boxes to Dorr thickeners. Mill workers introduced slurries into settling boxes where the fines accumulated and exited through spigots in the bottom. The Dorr thickener, devised for high volumes of material, featured a tank at least 20' in diameter with a conical floor. Radial arms rotated slowly within the slurry and forced the fines toward the tank's center, where the material passed through a large spigot.[590]

Gravity drew the metalliferous fines from one crushing and concentration stage to the next. However, each step also facilitated returning inferior material back for reprocessing, which often meant sending the material uphill. To accomplish this, metallurgists used either bucket-lines or spiral feeds. Bucket lines were a series of closely spaced sheet iron pans stitched to an endless canvas belt, via which buckets emptied into one another. Spiral feeds, effective for moving fines short distances, typically featured an auger that rotated in a sheet iron shroud. As the auger turned, it moved material upward and deposited it into a bin.

Concentration mills relied on the same sources of power as mine surface plants, although the transition from steam to electricity at mills occurred slightly earlier. Most mills relied on a single, large steam engine that drove various appliances through a system of overhead driveshafts and belts. The horizontal steam engine was most common, and small upright units powered additional appliances at large mills. By around 1900, with electricity commonly available in the county, engineers began using motors.

Amalgamation Stamp Mills

Two definitions apply to the term *stamp mill*. As noted above, concentration mills employed batteries of stamps to crush ore prior to other processing steps. In this case the term stamp mill refers to the stamp battery, a component of a concentration mill. Under the right mineralogical conditions, companies based an entire facility around a stamp battery to recover metals without smelting or advanced concentration. The ore had to feature relatively simple gold

[590] Peele, 1918: 1669.

or silver compounds and be easily crushed. A jaw crusher usually provided primary crushing, while stamps further reduced the ore. Amalgamating tables at the battery's toe, coated with mercury, recovered the gold or silver. Workers periodically scraped off the amalgam and heated the mass in a retort, which volatized the mercury and left the gold or silver.

Because stamp mills only required a fraction of the equipment installed at more complex concentration mills, they were smaller and simpler. Regardless, stamp mills shared a few fundamental aspects. First, due to the various stages of crushing and metals recovery, these facilities were also arranged on a series of platforms to use gravity to advantage. Second, stamp mills usually featured a receiving bin above the primary crusher to hold crude ore destined for processing. Third, the mid or lower platform housed the power source, often a horizontal steam engine and boiler. Last, the mill required a water source. Metallurgists often also installed tertiary crushing and a concentration appliance in some stamp mills to better prepare the ore for amalgamation. In such cases, the mill became an *amalgamation stamp mill*, such as the Intersection Mine in the Eureka district.

Arrastras

An arrastra was a simple and inexpensive, yet labor-intensive and inefficient means of recovering metals from ore. Arrastras primarily functioned during the first years of hardrock mining in San Juan County to treat simple gold ore. The county's first mine, the Little Giant, relied on an arrastra. While a few capital-starved outfits continued to employ the technology through the 1910s, the quick exhaustion of simple gold ore rendered these primitive treatment facilities obsolete by around 1875.

A typical arrastra featured a circular floor of carefully fitted stones, low sidewalls, and a capstan at center. They ranged in size from around 6' to 20' in diameter. A beam attached to the capstan's top, and as it rotated, the beam dragged between one and twelve muller stones across the floor, depending on the arrastra's size. Usually the stones, chained to the beam, were staggered so they covered the floor's entire surface area. The floor stones had to possess flat faces and tight joints, while the mullers featured convex bottoms and iron hooks hammered tight into drill holes. The traditional Spanish arrastra relied on slave labor as motive power, which draft animals replaced. With the improvement of technology, scarcity of labor, and desire for increased production, in a few cases engineers harnessed waterpower and steam engines. The simplest form of arrastra cost around $150 to build, much of which went to the labor for dressing and assembling the rockwork.[591]

To build an arrastra, a worker leveled a platform, excavated a pit at center, and installed the capstan, which had to be stout enough to resist great horizontal force. The worker paved the platform with a layer of fine clay and carefully fitted the floor stones together using more clay as mortar. With the floor complete, he erected the sidewall, which consisted either of more

[591] Meyerreicks, 2001: 194.

stonework or planks. During the twentieth century, concrete became a substitute for masonry. Once the beam and mullers were in place, the arrastra was ready for operation.[592]

Running an arrastra required more skill and experience with local ores than engineering or formal metallurgy. First, a worker scattered a *charge* of ore across the arrastra's floor, completely covering the stones, and then introduced a little water. Then, the motive power began rotating the beam, dragging the mullers over the fragmented ore, slowly grinding it into sand. The worker periodically added more water to convert the material into a slurry, and sprinkled mercury into the mixture. The mullers continued to reduce the ore into a combination of sand and fine particles known as *slimes*. The purpose of adding mercury was to create an amalgam with the metals as they became exposed by the continued fracturing of the ore. Fine particles offered a greater surface area, facilitating amalgamation. Here, experience with local ores came into play, as the arrastra operator added enough mercury to form an amalgam paste, but not in excess, at peril of creating a liquid difficult to recover. Generally, one ounce of mercury recovered an equal amount of gold, or one pound of silver. In some cases, the operator added lye to bind with oils and grease, which interfered with amalgamation.[593]

The next stage of arrastra ore processing was *cleanup*, where worthless *gangue* was removed and the amalgam recovered from the arrastra's interior. First, the operator drained the interior either by bailing, breaching the sidewall, or opening a port near the wall's base. The operator then shoveled the sand and slime out, leaving a mud and sand layer on the flooring stones. The operator carefully washed additional material out of the arrastra's interior, exposing as much of the amalgam smeared on the floor stones and deposited between the joints as possible. The operator next disassembled the floor stones, if small, and washed and scraped off the amalgam. Last, he filled a retort with the precious material and heated the vessel to volatize the mercury, leaving a sponge-like mass of metal. The retort vapors were usually routed through cool pipes to condense the mercury for reuse. Finally, the operator rebuilt the arrastra and repeated the process with another load of ore.[594]

[592] Young, 1987: 69-71.
[593] Meyerreicks, 2001: 143, 195; Young, 1987: 71.
[594] Ibid.

Section F: Property Types and Registration Requirements

INTRODUCTION

Section F describes the property types common to San Juan County's historic mining industry. The types are categorized by function: prospecting, mining, beneficiation of ores, and associated settlement. The objective is to standardize cultural resource management and historic preservation, and to contextualize information for education and interpretation. A list of common archaeological, engineering, and architectural features follows the property types. These descriptions were reproduced from the statewide Multiple Property Documentation Form, *The Mining Industry in Colorado* with author permission and as adapted to the resources of San Juan County. Registration requirements have been tailored to conditions specific to the county. The researcher should review the mining methods and equipment in Section E for additional background and terminology. The Periods of Significance and relevant National Register of Historic Places (NRHP) Areas of Significance are summarized below. A Period of Significance is defined as a discrete timeframe during which formative trends and events occurred. Although this discussion highlights general significance for some areas, individual nomination would in turn further compare and elaborate on the appropriate level of significance.

The following Property Types and Subtypes are developed in this section:

Placer Mine	Hardrock Prospect	Hardrock Mine	Aerial Tramway
Stream Placer	Prospect Complex	Shaft Mine	Single-Rope Reversible
Gulch Placer	Prospect Shaft	Tunnel Mine	Double-Rope Reversible
Hydraulic Placer	Prospect Adit		Hallidie Single-Rope
			Bleichert Double-Rope

Ore Concentration Facility	Smelter	Settlement and Residence	Rural Historic Mining Landscape
Concentration Mill		Prospector's Camp	
Amalgamation Stamp Mill		Workers' Housing	
Arrastra		Isolated Residence	
		Unincorporated Settlement	
		Townsite	

Regarding any nomination of any property type or subtype, the researcher should refer for additional information to the suite of publications published by the National Park Service's National Register of Historic Places program. Of particular interest may be the following National Register bulletins: *How to Apply the National Register of Criteria for Evaluation*; *How to Complete the National Register Registration Form*; *Guidelines for Evaluating and Registering Archeological Properties*; *Guidelines for Identifying, Evaluating and Registering Historic Mining Properties*; *Guidelines for Evaluating and Documenting Rural Historic Landscapes*;

Guidelines for Evaluating and Documenting Properties Associated with Significant Persons; and *Defining Boundaries for National Register Properties.*

OVERVIEW OF PERIODS AND AREAS OF SIGNIFICANCE

The Gold Rush, 1860 – 1861

The first Period of Significance began in 1860, when Charles Baker and party discovered gold in Baker's Park, and ended the following year with the dissolution of the ensuing rush. Exploration/Settlement is the most relevant Area of Significance and possesses aspects of statewide significance. The so-called San Juan Humbug was the earliest rush and resulted in a large incursion of new settlers into southwestern Colorado. While gold was the initial premise, the actual product was initial exploration and quantification of the San Juan mountain region. Later, this knowledge played a key role in permanent settlement, establishment of San Juan and adjoining counties, and growth of a nationally celebrated mining industry. Few historic resources clearly attributable to the Baker's Park rush survive. The dominant activities were simple placer mining and temporary settlement, thus the only resources that may remain are hand placers, prospectors' camps, and cabin sites. Much has been lost to natural decay and land use associated with 110 years of mining and settlement.

Return to the San Juans, 1870 – 1874

The second Period of Significance began in 1870, when the next wave of prospectors arrived to engage in exploration through 1874, by which date the foundation for the mining industry was firmly established. The relevant Areas of Significance are Exploration/Settlement, Industry, and Politics/Government. Dominant activities were prospecting, settlement, and initial development of mines. Associated resources include prospects, small mines, prospectors' camps, and cabin sites. Few historic resources survive, however.

Area of Significance: Exploration/Settlement

In terms of Exploration/Settlement, the county underwent an initial period of exploration, quantification, and development. The first prospectors arrived in the drainage in 1870, developing the Little Giant, the earliest mine, the following year. Its success stimulated further exploration for gold as well as silver after 1872, when it became increasingly apparent that the region possessed abundant silver veins, but fewer gold deposits. By 1874, prospectors established baseline knowledge regarding regional geography and natural resources and in turn a template for the county's pattern of settlement. In 1874, prospectors established camps in the northeast and at the mouths of California and Eureka gulches. These camps later became the towns of Mineral Point, Animas Forks, and Eureka. At the same time, community organizers formally platted Howardsville and Silverton, which grew into the county's population centers. Trends related to exploration and settlement are significant at the local level.

Area of Significance: Industry

In terms of Industry, basic requirements for a viable mining industry were established. First, outside investors began to take an interest in the San Juans, thus introducing capital. By funding the Little Giant Mine, the Greene Smelter, and other operations, the investors established an important precedent. Second, prospectors located and began developing veins, many of which became major producers in future years. In so doing, the prospectors formed a foundation for a mining industry. Finally, three smelters were erected during the Period, and mining in the San Juans was economically dependent on local ore treatment. While the smelters were failures at first, they pioneered the ore treatment industry. The historical trends related to industry were significant mostly on a local level.

Area of Significance: Politics/Government

In terms of the Politics/Government Area of Significance, the Animas River drainage hosted several forms of frontier government during the Period. In particular, prospectors organized the region's first mining districts, and a body of elected representatives drafted laws that regulated behavior. In the absence of formal recognition by the Territorial Legislature, and the unresolved issue of who owned the San Juans, the districts were the only form of government until 1874. At that time, the Territorial Legislature officially took possession of the Animas River drainage, created La Plata County, and designated Howardsville, and then Silverton, as county seat. The historical trends related to politics were significant largely on a local level.

Settlement and Establishment of Industry, 1875 – 1881

The third Period of Significance began in 1875 and ended in 1881, marking a major transition when the factors for a successful mining industry coalesced and fostered a major wave of prospecting and ore production in meaningful volumes. This period initiated enough momentum to secure the industry's future. The Greene Smelter, which began successful operations in 1875, contributed heavily as it provided needed local ore treatment capacity. Between 1875 and 1879, individuals and small outfits developed at least 345 prospects, forty-eight small mines, three medium-sized mines, one large mine, and two placer operations. The large number of prospects and high proportion of small mines highlights that the mining industry was nascent and growing. Prior to 1875, the number of prospects and mines was much smaller. A small mine is defined as an operation with shallow underground workings, a handful of workers, basic surface facilities, and limited output. A medium-sized mine was usually a company endeavor with between five and thirty workers, fairly extensive workings, and a surface plant with at least several buildings. A large mine had extensive workings, a surface plant with multiple components and some machinery, a workforce greater than fifty, and significant output. The period ended in 1881, a year before the Denver & Rio Grande Extension Railroad ushered in another major transition.

The dominant activities during the latter half of the 1870s were prospecting, settlement, and initial development of mines. The most relevant Areas of Significance are Exploration/Settlement, Industry, Commerce, Communication, Transportation, and Politics/Government. Associated resources are prospects, small mines, prospectors' camps, and cabin sites.

Area of Significance: Exploration/Settlement

In terms of Exploration/Settlement, the county's geography was still relatively unexplored when the period began. The areas around Animas Forks, Eureka, Howardsville, Mineral Point, and Silverton had been explored, but not the county's remote recesses and perimeter. During this period, prospectors finally penetrated most of the county and quantified its general geography, although it would be another ten years before the territory was thoroughly explored. Through examination, sampling, and claim development, prospectors defined the areas with the highest concentrations of veins and most of the principal ore bodies in those areas. This information guided investors willing to risk their capital.

Prospectors and community organizers also completed the template for the county's pattern of settlement. Howardsville and Silverton cemented their roles as the county's most important towns, with Silverton assuming the role of administrative, financial, and transportation center. Other towns took shape from prospectors' camps. Mineral Point was the northernmost commercial outpost for the Mineral Point district. Animas Forks and Eureka were the commercial centers for the Eureka district, and Animas Forks was also the eastern gateway into the county. Gladstone was the commercial and, for a brief time, ore treatment center for the Cement Creek drainage. Trends related to exploration and settlement were important on local and statewide levels of significance.

Area of Significance: Industry

A true mining industry finally took hold in the county. Coupled with the Greene Smelter, general investment and infrastructure improvement fostered transition from prospecting to mining, as measured by ore production. Capitalists organized companies that developed nascent prospects into substantial operations, in turn inspiring confidence among other investors. Collectively, the companies, regardless of size or productivity, improved the transportation system, reinforced the settlement pattern, contributed to the local economy, and increased the county's prominence statewide. The industry attracted the Denver & Rio Grande Railroad, whose directors established the town of Durango and financed a large smelter. These two factors increased the upward momentum of the mining industry and allowed it to blossom into a full boom. Trends related to industry were important on local and statewide levels of significance.

Area of Significance: Politics/Government

In terms of Politics/Government, the increase in population and growing prominence of the mining industry altered the political map of southwestern Colorado. The Territorial Legislature carved San Juan County out of northern La Plata County and designated Silverton as county seat. Community organizers established primitive municipal governments to administer to matters for the principal settlements. In the large towns, municipal governments were elected, while in the camps, these consisted of founding members or townsite company officials by default. Local governments conducted improvements, established guidelines for development, and promoted

communities. In general, these systems have persisted throughout the county's subsequent history.

Area of Significance: Communications

Commerce, related investment, and politics fostered a need for a communication system superior to word-of-mouth and out-of-date newspapers. As a result, entrepreneurs and the Postal Service established three modes of formal communication. The Postal Service subsidized post offices in Animas Forks, Eureka, Highland Mary, Howardsville, Mineral Point, Niegoldstown, Poughkeepsie, and Silverton. The agency also contracted with carriers who brought mail in all seasons, first from Del Norte and from Durango when the Denver & Rio Grande established its terminus there in 1880. Journalists began regularly printing newspapers in Silverton, and for brief periods in Animas Forks, Howardsville, and Poughkeepsie. Around the same time that Denver received its first telephone, so did Silverton. In 1881, the Colorado Telephone Company established a central office in Silverton and wired a line over Engineer Pass to Lake City. These two offices became nodes of a regional system built over the following several years. These three means of communication contributed to the growth of the mining industry, connected it with the outside world, and improved quality of life in the county.[1]

Area of Significance: Commerce

Regarding Commerce, San Juan County's mining industry and population grew large enough during this period to constitute an economic web with a local, statewide, and national role. In terms of investment, most individuals who developed prospects and small mines were of regional importance, some larger operations on a statewide scale, and a few based outside of Colorado. Their capital supported growth of the county, development of its mining industry, and associated communication, banking, and commercial systems. Prospecting and mining in the county's districts further contributed to regional, statewide, and national consumer markets. Mining companies diverted money into the local economy by paying wages to their workers, hiring consultants for various services, and purchasing small items from businesses in the major towns. Such expenditures directly fostered growth of the local economy. Companies acquired large machinery and other industrial goods from manufacturers in Denver and to a lesser degree outside of Colorado. The manufacturers in Denver in turn purchased their materials from sources within and outside of Colorado. The mining companies and prospectors in the county thus supported Colorado and other industrial economies. Miners and prospectors consumed food and other domestic goods purchased. Packing companies shipped preserved food from the Midwest and on west coast, while fresh food came from Colorado farms and ranches. Domestic goods came from manufacturing centers nationwide, primarily in the east.

Area of Significance: Transportation

[1] Nossaman, 1998: 38, 68.

An efficient transportation system was as important for mining and local ore treatment. At first, mining interests relied on burros and pack trails to import needed materials and export ore. Because this system limited the movement of freight, development was slow and productive mines were able to produce only the highest grades of ore, which were in short supply. Between 1875 and 1881, the San Juan County commission and local investors developed basic regional network of wagon roads. A network of feeder roads directed wagon traffic from all major drainages to transportation, milling, and commercial centers in the Animas River valley. Trunk lines connected the valley with Otto Mears' toll road system to the east at Lake City and all-season roads in the lowlands to the south. Wagons decreased the cost of freight and increased the tonnages of ore that could be shipped, thus allowing mining companies to increase production. The increased production in turn encouraged activity and investment and fostered further industry expansion.

The Early 1880s Boom, 1882 – 1885

The fourth Period of Significance began in 1882 and ended in 1886, during which time the mining industry reached a boom state and boosted San Juan County as one of Colorado's most important industrial regions. The transportation and smelting network that the Denver & Rio Grande Railroad established in 1882 created the conditions for the boom. In particular, decreased freight costs, local smelting and ore concentration at reasonable rates, and an increase in the amount and variety of goods available in the county were key contributing factors. The net result was that the cost of production fell for mining companies with the shipment of higher tonnages of ore, medium-grade payrock now rendered profitable to produce, and quality of life improved. The number of mines that produced ore between 1882 and 1885 nearly doubled from the previous peak of the late 1870s. Similarly, population rose from around 1,100 people in 1880 to 2,000 in 1885. Ore production increased exponentially from a total of $40,000 for silver, gold, and lead in 1880 to almost $1 million in 1885. However, countywide problems began to materialize in 1885 and reflected in 1887 production figures, a total of $607,000 for all metals. The downward trend indicated that the mining industry was passing into a slump.[2]

During this period, San Juan County hosted events and trends significant on local, state, and national levels. Mine development, ore production, and community organization dominated, with relevant Areas of Significance including Industry, Engineering, Commerce, Communication, Community Planning and Development, Transportation, and Politics/Government.

Area of Significance: Industry

Mining reached one of its greatest production peaks between 1875 and 1881, a key indicator of a discrete Period of Significance. While mining comprised the underpinning of Euro-American settlement in San Juan County, the industry's ability to attract the railroad and Durango Smelter changed the entire region. Denver & Rio Grande officials graded the railroad and built the

[2] Henderson, 1926: 216; Schulze, 1977: 1880-3; Schulze, 1977: 1885-1891.

smelter due to the business potential offered by the mining industry, which conversely caused the mining industry to boom. As during the late 1870s, companies continued to improve the transportation system, reinforce the existing settlement pattern, contribute to the local economy, and increase the county's prominence. Productive mines generated so much ore that they fostered a wave of local ore buying and treatment facilities, which complimented the final processing offered by the Durango Smelter. By providing a market for ore from small mines, the facilities fostered an overall increase in production.

Area of Significance: Engineering
The mining industry depended on effective milling methods for treating ore and separating metals content from waste. Determining effective methods was complicated by the complexity of the ore, which also differed in character from mine to mine. During the 1870s and early 1880s, a number of firms built smelters and concentration mills. Nearly all failed, eroding confidence in the county's mining industry. This period eventually saw expert metallurgists puzzle out the problems and devise successful methods for specific areas in the county. While many failures still followed, successful mills set a lasting precedent that ultimately saved the industry.

Area of Significance: Communications
Communications remained important during this period, and their function and role as outlined previously continued. The mining industry, population, and business sector all supported the communication systems developed previously, as well as expansion of the telephone network and construction of a telegraph line to Durango.

Area of Significance: Commerce
Commerce increased and became more influential as the county's economy grew in wealth and complexity.

Area of Significance: Community Planning and Development
During the late 1870s, the county's pattern of settlement materialized as a function of exploration and prospecting, thus partially in flux. The arrival of the railroad, resultant boom, and development of the Red Mountain district (Ouray County) cemented nascent patterns, which changed little for the next twenty-five years. The county's most important towns thrived in the Animas River valley, including, west to east: Silverton, Howardsville, Middleton, Eureka, and Animas Forks. Secondary towns appeared in minor drainages and included Chattanooga at the head of Mineral Creek and Gladstone in Cement Creek. The hamlets of Poughkeepsie and Mineral Point occupied the county's northeastern reaches.

These settlements assumed particular roles in response to conditions created by the boom. Silverton fulfilled many functions, broadly as the principal point of entry into the county and gateway into the Red Mountain district. The town was also the exchange point where people and goods flowed into the county and ore flowed out. Given this, Silverton was the county's commercial, communications, financial, transportation, social, and administrative hub.

Howardsville served a similar function for the Las Animas and southern Eureka districts, in addition to serving as source for most of the county's meat and dairy products. Middleton was a working community for the mines around Minnie and Maggie gulches. Eureka served the commercial needs of the central Eureka district. Animas Forks was larger than Eureka because it was the eastern gateway into the county, a commercial center for the northern Eureka district, and a base for local miners. Chattanooga was the commercial point for the upper Mineral Creek drainage and entry into the Red Mountain district. Gladstone was center to a tiny mining industry, and Poughkeepsie and Mineral Point were primarily prospectors' camps that offered a few services.

All the county's settlements experienced significant growth during the boom. The degree to which a municipal planning process, or divisions among class and ethnicity, guided growth remains unknown. Animas Forks, Chattanooga, Gladstone, Mineral Point, and Poughkeepsie followed growth patterns typical of mining camps. Specifically, collections of prospectors' cabins served as nuclei, a few businesses followed, and additional residents congregated around the businesses. The only constant was an attempt to develop some semblance of a "main street. By contrast, Eureka, Howardsville, and Silverton were formally platted with lots, blocks, and streets on a defined grid. While these towns were the most prominent communities, other settlement subsisted. Most mines and prospects were too far for a reasonable commute by foot, so miners and prospectors lived at their points of work. The residences at large mines often were boardinghouses, while cabins sufficed at smaller operations. Broadly speaking, worker residences scattered amid mines was a settlement pattern typical of the entire Rocky Mountain region. The location of the mine and the suitability of adjacent sites were the primary governing factors.

Area of Significance: Transportation

Investors, in conjunction with the county commission, improved the road network essential for mining. In addition, the county paid to build a road from Chattanooga over Red Mountain Pass and into the Red Mountain Mining District. The purpose was to increase the county's relationship with the district and secure a role as gateway community over rival Ouray. The arrival of the railroad was a critical transportation event during this period, dramatically lowering the costs of mining and living, increasing tonnages of ore that companies could ship, providing a direct link with the Durango Smelter, making a wider variety of goods available at lower prices, and improving the overall quality of life. The railroad was a principal agent that allowed the mining industry to boom.

Area of Significance: Politics/Government

Regarding Politics/Government, trends in county and local government continued. In addition, the success of industry increased the political standing and power of investors and government representatives, which they used to influence state and federal policy. For example, because the county's mining industry depended on silver, legislators and politically connected investors fought change to the federal policy on silver acquisition.

The Value of Silver is Restored, 1890 – 1893

This period began in 1890 and ended in 1893. An increase in the value of silver in 1890 brought the mining industry out of the major recession of the latter half of the 1880s caused by a variety of factors. First, miners exhausted most of the county's shallow ore veins, forcing mines to close because veins had little left to offer. Second, substantial veins contained large ore reserves, but the character of the ore became complex, low in grade, and difficult to treat with depth. Most of this ore was thus unprofitable with existing technology. Third, the price of silver and industrial metals declined during the latter half of the 1880s. As prices fell, mining companies found that the cost of extracting available ore exceeded returns and suspended operations. The lack of production and troublesome ore in turn impacted the milling sector, spread throughout the local economy, and affected business and population. The federal government increased the price of silver by means of the 1890 Sherman Silver Purchase Act, stimulating a countywide revival and reversing some of the problems created by the recession. However, the revival was not immediate and required a year to fully take hold. The value of silver began to ebb again and the Sherman act was repealed in 1893.

During this period, San Juan County hosted events and trends significant on local, state, and national levels. The relevant Areas of Significance include Industry, Engineering, Commerce, Communication, Community Planning and Development, Transportation, and Politics/Government. The dominant activities were mining, ore treatment, ongoing residence, community building, and construction of infrastructure.

Area of Significance: Industry

The mining industry continued as the main stimulus for Euro-American presence in San Juan County, as well as the foundation for the economy and institutions on which business and population depended. San Juan County's industry was also the principal supporter of the railroad and Durango Smelter. By providing these entities income, the county's mining industry contributed to the success of mining elsewhere in the San Juans. The railroad and Durango Smelter provided needed transportation and cost-effective ore treatment.

Area of Significance: Engineering

Engineering was critical on a local level during this period, with several sub-areas worthy of consideration. Regarding milling and ore treatment, the mining industry depended increasingly on effective methods for treating complex, low-grade ore. Finding effective methods required calculation, knowledge of metallurgy, and trial and error. Successful mills served as templates. Failed mills exemplified conventional practices and types of appliances that not applicable to regional ore.

The second sub-area is electricity. The mining industry relied primarily on steam and draft animals for power due to the cost of hauling in steam equipment and fuel, except for those extremely well-funded operations. This limited remote outfits to only small tonnages of high-grade ore. However, electricity had the potential to revolutionize mining. In theory, mining

companies merely had to haul motors into the backcountry and transmit power over wires from a convenient generation point. During the early 1890s through the turn of the century, electrical technology was in an experimental state not yet fully adaptable to the needs of mining. Direct current (DC) motors could start and stop under load, as required for many mining applications, but could not be transmitted far without suffering significant power losses. Current thus had to be used close to the point of generation. For remote mines, hauling in a generator, its power source, and motors provided little advantage over steam equipment. Alternating current (AC), by contrast, could be transmitted far, but AC motors were unable to start and stop under load and were therefore impractical for machinery such as hoists and large air compressors. Despite these drawbacks, a few highly progressive mining experts in the county harnessed electricity in an attempt to lower operating costs. Stoiber built one of the earliest AC systems in the mining industry to run mill machinery at Silver Lake Mine. John Terry installed a DC system at the Sunnyside Midway Mill in Eureka Gulch, and in so doing minimized the amount of fuel coal that had to be regularly carried up. Edward M. Brown did likewise at the San Juan Chief near Mineral Point. These successful applications contributed to the development of electrical technology and its application to mining, rendering the San Juans a center of electrical technology.

The third sub-area is aerial tramways. In the San Juans, where topography is extreme, transporting ore from mine to mill was slow and costly. As illustrated by the Little Giant Mine in Arrastra Gulch, aerial tramways offered a solution because ore could be lowered down to a mill or shipping point, regardless of terrain or weather. In general, the greater mining industry adopted the technology gradually because of its high initial cost and exacting engineering. By the early 1890s, companies realized that the expense would quickly be offset by reduced shipping costs and increased production. During this period four companies successfully experimented with the technology. Thomas Trippe operated a tramway at the Titusville in 1889, the San Bernardino company in 1890, Rasmus Hanson in 1891, and the Victoria company in 1893. These tramways exemplified the efficiency of this transportation solution. Within a few years, many companies followed, and the San Juans became a center of tramway engineering.

Areas of Significance: Communications, Commerce, and Politics/Government

Communications, commerce, and politics/government remained significant as the types of systems and their roles defined above continued.

Area of Significance: Community Planning and Development

Community Planning and Development remained significant for specific settlements. During the first half of the 1880s, the county's general pattern of settlement matured. The pattern then contracted as a result of the late 1880s recession, and all settlements shrank while a few neared abandonment. By the early 1890s, the pattern stabilized and principal towns thrived. However, because the towns did not grow much, there was little additional municipal planning. Of note, Animas Forks, the commercial center of the northern Eureka district, declined. When the town

burned in 1891, most remaining residents and businesses left. Chattanooga and Gladstone revived on minor scales, while Poughkeepsie was abandoned.

Area of Significance: Transportation
Regarding transportation, mining companies and the county commission continued to improve the road network requisite for mining. The railroad remained a principal agent allowing the mining industry to revive.

The Silver Crash, 1894 – 1897
The sixth Period of Significance began in 1894 and ended in 1897. The Silver Crash of 1893 caused the value of silver to topple to its lowest point since Colorado achieved statehood. The price collapse at first wrecked mining in the west and in turn contributed to one of the worst economic depressions to strike the nation. Colorado and San Juan County suffered deeply and underwent major transitions. Colorado entered a depression, but the county adjusted and ultimately faired better than most of the state's other mining regions. Although fewer mines were active than during the early 1890s, the production of gold, silver, and lead increased.

First, the owners of several of the county's largest mines pursued the strategy of producing and milling ore in economies of scale. Through heavy capital investment, advanced technology, and carefully designed mills, the companies lowered operating costs enough to render low-grade ore profitable to produce. This type of ore was the most abundant resource in the county but had been ignored in favor of higher grades of material. When economic conditions forced the matter, well-financed outfits realized they either had to cease operating or find a way to profit from the low-grade ore. They succeeded, and their significant yield made up the bulk of the county's overall production.

Secondly, some investors used the poor economic climate to purchase proven mines offered for sale. At the same time, a few owners unwilling to allow their properties to remain idle attempted to reopen. Both groups invested capital in development and machinery to lower operating costs and increase output, which also contributed to the county's production figures. Nearly all county mining districts saw several such ventures, although while county production figures were substantial, this did not reflect a vibrant mining industry. Most mines remained idle or operated at reduced capacity.

The last factor was a strong interest in gold. With the price of silver at an all-time low, mining outfits focused on ore with high gold content because that metal held a constant value. Most mines that generated substantial tonnages of ore prioritized gold and considered silver to be secondary profit. Because nearly all ore in the county featured gold and silver in combination, the pursuit of gold resulted in the production of silver as well. The interest in gold fostered the first true rush that the county witnessed in years. When gold ore was discovered in the Bear Creek drainage in 1893, it created a considerable excitement. The town of Sylvanite, also known as Bear Creek, and a handful of profitable mines resulted, but were short-lived. The period ended in 1897, when economic recovery drew the mining industry into one of its most important eras.

During the sixth Period, San Juan County hosted events and trends that were important on local, state, and national levels. The applicable Areas of Significance include Industry, Engineering, Commerce, Communication, Community Planning and Development, Transportation, and Politics/Government. The dominant activities were mining, ore treatment, ongoing residence, community building, and construction of infrastructure. .

Area of Significance: Industry

The mining industry continued as foundational for the population, economy, and other institutions, largely as a function of large productive mines since most small operations were idle. The railroad and Durango Smelter also remained central to the central San Juans during the post-Silver Crash depression because they provided the only cost-effective transportation and ore treatment. Without them, the regional mining industry might not have survived. Owners of the large mines pioneered and demonstrated how production and milling in economies of scale could offset the low value of silver and render low-grade ore profitable. This required major capital investment to employ mechanization and automation to lower operating costs and maximize output. Few companies were able to employ this strategy because capital was scarce, but by the late 1890s,the practice swept Colorado's mining industry and helped it to restore the economy. According to some industry experts, San Juan County was the birthplace of the economies-of-scale strategy.[3]

Area of Significance: Engineering

Engineering was significant on local and national levels during this period. The sub-areas of milling, electricity, and tramways, were vital to production in economies of scale, the strategy for which hinged on exploiting low-grade ore as a commodity, only possible through efficient ore treatment. Successful companies overcame problems that had vexed mill operators for nearly two decades, devising effective concentration methods through calculation, knowledge of metallurgy, invention, and an understanding of how to adapt existing equipment. Electricity facilitated savings on energy costs. These companies improved generation and transmission technology in addition to electrical application to mining. Similar evolutions impacted aerial tramway engineering, which large companies increasingly relied on to reduce the costs of transporting ore to their mills and supplies up to the mines. Some of Colorado's longest systems included those built for the Iowa, Siler Lake, and other local operations. Application of engineering technologies and machinery on a massive scale enabled production, transportation, and concentration of ore in unprecedented volumes. In turn, machinery was refined and applied to increasingly specific functions and integrated into complex systems through engineering, coordination, planning, and management.

Areas of Significance: Communications, Commerce, and Politics/Government

[3] Burbank and Luedke, 1969: 4; Ransome, 1901: 23; *Silverton Standard* (11 Jan 1902).

Communications, Commerce, and Politics/Government remained significant during this period in roles defined above.

Area of Significance: Community Planning and Development
The trends discussed continued to apply, although the southeastern county received its first and only settlement in response to the minor gold rush at the end of 1893. Bear Creek, formally known as Sylvanite, remained viable into the mid-1890s.

Area of Significance: Transportation
Regarding transportation, mining companies and the county commission continued to improve the road network, as Otto Mears built the Silverton Northern Railroad from Silverton to Eureka, lowering the cost of transportation for companies in the eastern portion of the county. Aerial tramways began their ascent to prominence during the period. The Silver Lake Mines Company and other large organizations erected tramways as a solution to transportation problems posed by remote locations and difficult terrain. Tramways provided an effective alternative to labor and pack animals, moving materials and ore over hostile terrain in all weather. Although the initial cost was high, tramways allowed many companies to develop advanced mines, achieve high volumes of production, and become profitable.

The Great Mining Revival, 1898 – 1910
The seventh Period of Significance began in 1898, when conditions fostered a revival of mining on a scale not yet seen in the county. Production peaked quickly, tapered toward 1906, and dropped off at the end 1907 due to a national recession and collapse of metals prices. The revival, however, lasted through 1910 when activity and production declined significantly.

Although popular histories romanticize the county's early 1880s boom, the 1898 revival was also critical to shaping county and statewide trends. During the revival, nearly all quantifiable indictors for mining in the county reached an apex. The population increased from 1,600 in 1890 to 2,300 in 1900, further ascending to 3,000 in 1910. The county featured more medium-sized and large mines than any time before or after the revival, as well as a spike in prospecting. In total, the mines produced around $700,000 in silver, as much in lead, and over $1 million in gold annually during the first years of the revival, although less afterward. The county also saw its first meaningful zinc recovery in 1904, and thereafter the metal became an important resource.[4] Production figures must be considered in the context of low metals values. Silver fetched around $.60 per ounce, 30 to 35 percent less than during the peak years, and yet the dollar amount exported remained high. The mining industry thus arguably produced greater tonnages of ore and waste rock than at any other time in its history. Ore production and milling in economies of scale, major development both above and below ground, heavy mechanization, and widespread investment were hallmarks of the revival.

[4] Schulze, 1977: 1890-7; Schulze, 1977: 1900-10; Schulze, 1977: 1910-18; Henderson, 1926: 216 for production figures.

During this period, San Juan County hosted events and trends significant on local, state, and national levels. The most relevant Areas of Significance include Industry, Engineering, Transportation, Commerce, Communication, Community Planning and Development, Social History, and Politics/Government. A large proportion of historic resources date to this period, during which the dominant activities were mining, ore treatment, ongoing residence, community building, and construction of infrastructure.

Area of Significance: Industry

The mining industry continued to provide the Durango Smelter and railroad with the majority of their income as they were instrumental in facilitating the revival. A greater number of large mines contributed to innovation in production and milling in economies of scale. With capital available again during the late 1890s, companies invested in infrastructure, development, and workforce. Although the economies-of-scale strategy was a statewide movement, the large companies in the San Juans participated to a greater proportionate degree. Extreme topography, harsh environment, and complex ore required adaptation of mechanization and methods to the region. The county's mining industry contributed heavily to Colorado's economy during the revival. Contributions to total state metals output ranged from 3 percent in 1901 to 8 percent in 1907.[5] The revival included small operations, prospects, businesses, and infrastructure, in addition to the large mines.

Area of Significance: Engineering

During the seventh period, the mining industry was significant in the area of Engineering on a national level. In an attempt to lower operating costs, increase production, and recover higher yields of metals from low-grade ore, the mining industry innovated some of its greatest engineering contributions. Large companies participated in the development of complex systems such as electric grids, compressed air, interconnected mine workings, and ore concentration processes. Tramways saw extensive development as the county became known as a center of tramway engineering. Through the successful design and construction of numerous systems, the county's industry contributed to improvement of tramway technology. The large companies also advanced the field of industrial systems management to coordinate their infrastructures, underground workings, and milling. The industry adopted machinery on an unprecedented scale and made its use commonplace. The mining industry forwarded the understanding of metallurgy. Mill design and machinery were much more efficient and applied to larger plants than ever. The county was home to some of Colorado's biggest mills, including the Silver Lake, Gold King, and Gold Prince. The industry also experimented with new apparatuses and processes, such as vibrating tables and magnetic separators for zinc, adopted nationally.

Area of Significance: Transportation

[5] Henderson, 1926: 97.

Regarding transportation, the county's ground system reached build-out during this period. The Gold King owners and Otto Mears completed the last additions to the county's railroad network, the former grading the Silverton, Gladstone & Northerly Railroad from Silverton up Cement Creek to Gladstone. Direct rail improved access in the Cement Creek drainage and enhanced the effect of the revival there. Mears extended the Silverton Northern Railroad in two directions, first from Howardsville up Cunningham Gulch to the Green Mountain Mine, improving the flow of machinery and supplies into and ore out of the valley. The other was from Eureka up to Animas Forks, instrumental in the construction of the Gold Prince operation and lowering transportation costs for other outfits. The county's road network drew considerable attention, as companies continued to improve existing arteries and graded new roads to individual mines. Roads played a critical role in widespread adoption of machinery by allowing wagons to haul larger and heavier loads. Finally, the industry relied on aerial tramways as a solution to ground transportation problems of remote mines. Tramways allowed companies to develop small mines into significant operations. The net result was an increase in the county's overall ore production.

Area of Significance: Communication, Commerce, and Politics/Government
Communications, commerce, and politics/government remained significant areas, with the trends discussed above amplified by the revival.

Area of Significance: Community Planning and Development
Community Planning and Development was significant on a local level as the revival drew a higher population and greater number of industrial operations throughout the county. Those towns that survived the 1890s enjoyed growth. The degree to which a municipal planning process, or divisions among class and ethnicity, guided the growth remains unknown. Animas Forks, Chattanooga, Gladstone, Mineral Point, and Poughkeepsie followed patterns that were typical of mining camps with worker housing and businesses including a mercantile, saloon, butcher, and assay shop as foundations. Additional residents congregated around this core. The larger towns of Eureka, Howardsville, and Silverton grew in accordance with their platted grids.

Area of Significance: Social History
Regarding social history, on a local level the heavy demand for mine labor impacted the county's demography significantly. Women were present since the mid-1870s, but during the revival their numbers increased. Women constituted around 20 percent of the population in 1880 and 25 percent by 1890. Most lived in Silverton, less in the other principal settlements, and few amid the mines. Contemporary Victorian values discouraged women from the male-dominated workplace. By 1900, women constituted slightly more than 30 percent of the population, however, and they could be found among the large mines where both single and married individuals worked for wages or helped their husbands. It became not uncommon to find women cooks, hostlers, maids, and even boardinghouse managers. Lena Stoiber exemplified the involvement of women in the mining industry, managing labor for nearly all of Silver Lake Basin. In the towns, women had greater latitude for employment options and ran or worked in restaurants, bakeries, hotels,

boardinghouses, mercantiles, tailor shops, and schools. In summary, the revival facilitated a softening of gender barriers, greater acceptance of women, and opportunity for their employment. These trends were not limited to San Juan County.[6]

Labor demand created by the revival fostered a shift in the county's ethnic diversity. In 1880 and 1890, approximately 35 percent of residents had immigrated from England, Ireland, Scotland, Germany, and other northern European countries. A few were Italian and French. By 1900, almost 50 percent of the residents were immigrants, with Italians and Slavs heavily represented. Italian miners in particular helped the Western Federation of Miners maintain a strong presence locally. The diversification of the population was part of a larger trend in Colorado's mining industry.[7]

During the revival, the county's industry participated in broad trends significant on state and national levels. Specifically, the cycles of boom and bust fostered the development of mobile, diverse, and adaptable society. Each boom, and especially the revival, drew laborers from a variety of backgrounds, and the busts propelled them to other areas and economic sectors. This contrasted sharply with traditional agrarian occupations.

The development of corporate mining during the revival sharply exacerbated the growing trend of a class-based social structure. At large mines workforces stratified into unskilled labor, skilled labor, several tiers of administrative personnel, and owners and investors. Labor had little mobility to ascend into higher positions, in part because increased mechanization required that supervisors and mangers possess formal education and training. Because large mines collectively employed the highest numbers of workers, they contributed heavily to the class-based social system.

The World War I Revival, 1915 – 1921

The eighth Period of Significance spans the years 1915 to 1921, when demand for and value of silver and industrial metals increased together, fostering a revival of mining. World War I was the root cause as European nations sought economic security in silver and consumed industrial metals for wartime production. The value of and demand for silver and industrial metals increased dramatically, stimulating mining. Prior to the revival, a few large mines contributed most of the county's output, while smaller operations were idle. During the revival, large mines conversely declined in production, offset by an increase in the small and medium-sized operations. The revival was relatively short-lived and plagued by factors that suppressed the full effect of the price increases and high demand for metals. The influenza epidemic, wartime administration of railroads, associated freight rate increases, and dwindling ore reserves prevented many companies from profiting. On the other hand, the introduction of flotation

[6] Susan Armitage and Elizabeth Jameson, *The Women's West* (Norman, OK: University of Oklahoma Press, 1987) 150, 181; Joseph Conlin, *Bacon, Beans, and Galantines: Food and Foodways on the Western Mining Frontier* (Reno: University of Nevada Press, 1986) 158; Sandra L. Myres, *Westering Women and the Frontier Experience, 1800-1915* (Albuquerque: University of New Mexico Press, 1999) 243; Reyher, 2000: 51; Schulze, 1977: 1900-14; Sally Zanjani, *A Mine of Her Own: Women Prospectors in the American West, 1850-1950* (Lincoln, NE: University of Nebraska Press, 2002) 29, 72, 108, 264, 306.

[7] Schulze, 1977: 1900-14; Duane A. Smith, "*The San Juaner, A Computerized Portrait,*" *The Colorado Magazine* 2.2 (1975): 140-1.

concentration and improvements to other milling technologies allowed some companies to produce ore previously too complex or low in grade.

In 1921, most of the county's mines closed, which brought the eighth period to an end. The national economy regressed into a post-war depression, so demand for and value of industrial metals fell sharply. Silver continued to fetch around $1.00 per ounce because the Pittman Act was in place, but this was insufficient to offset the problems with industrial metals. The sour economy discouraged investors from financing development and improvements, compounding the situation. Companies grappled with a decline in the amount and quality of available ore, increased operating costs, and dissipation of skilled labor.

Even though the World War I revival was minimized, it still exhibited events and trends significant on local, state, and national levels. The dominant activities were mining, ore treatment, ongoing residence, community building, and construction of infrastructure. The most relevant Areas of Significance include Industry, Engineering, Transportation, Commerce, Communication, Community Planning and Development, Social History, and Politics/Government. Many historic resources are likely to date to this period.

Area of Significance: Industry

The mining industry continued to be the economic foundation on which the population depended. The industry continued to support the railroad and Durango Smelter, without which it, might not have survived. The large mines contributed to ongoing development of production and milling in economies of scale. The extreme topography, harsh environment, and complex ore required a greater degree of mechanization than elsewhere in the state. The strategy fostered innovations in the field of ore treatment, in particular flotation and the recovery of zinc. The county industry contributed heavily to Colorado's economy during the revival. Contributions to the state's total metals output ranged from 4 percent in 1916 to 15 percent in 1920.[8] The revival included all sizes of operations. On local and statewide levels, the industry participated in the tungsten rise of the mid-1910s. Tungsten allowed steel makers to produce hardened alloys outstanding for durable hardware and weapons, material which came under heavy demand for the first time due to World War I. Colorado offered some of the richest known deposits, which drew investment, improved the state's profile in the greater mining industry, and fostered geological and mineralogical studies. San Juan County, and especially the Cement Creek area, participated in the tungsten interest.

Area of Significance: Engineering

The mining industry continued to be significant on local, state, and national levels. In an attempt to lower operating costs, increase production, and recover a higher yield of metals from low-grade ore, the local industry stimulated technological advancement. In the field of ore concentration, metallurgist Louis Bastian innovated the flotation process at the Gold King Mill in

[8] Henderson, 1926: 97.

1914.[9] In the absence of this technology, production was limited to specific types and grades of ore, while complex payrock remained fallow. San Juan County was notorious for its complex ore, and mines there offered an opportunity to test flotation and validate the extent of its effectiveness. During the mid-1910s, at least nine prominent mills experimented with flotation, collectively serving as a proving ground for the technology. Flotation became a commonplace process across the west by the 1920s.

The mining industry continued to experiment with other concentration apparatuses and processes such as vibrating tables and magnetic separators for zinc. During the mid-1910s, Arthur Redman Wilfley pioneered multi-deck vibrating tables at the Iowa and Mears-Wilfley mills. Commercial models were later released, allowing other companies to improve efficiency at their mills. At least the Sunnyside, Silver Ledge, and Kittimac used electrostatic and magnetic separators to recover zinc. Proving successful, the separators saw widespread use, and zinc became an important mill product.

In the arena of ore production, mining companies contributed to the practice of adaptive use as operating costs increased and available capital fell during the 1910s. Companies adapted existing resources to meet needs instead of purchasing new materials. Innovation and expertise in engineering were required to adapt salvaged materials, saving capital and permitting companies to produce in economies of scale. In the county, companies realigned entire tramways, refitted concentration mills, and reused machinery and construction materials.

Area of Significance: Transportation

Regarding transportation, the Denver & Rio Grande Extension remained the principal carrier of ore and concentrates from the county and Red Mountain district to the Durango Smelter and goods needed for industry and residence into the county. The Silverton, Silverton Northern, and Silverton, Gladstone & Northerly railroads also continued vital service of collecting ore and concentrates and distributing fuel coal and supplies to consumers. The county's road network served a similar function. Aerial tramways continued to be significant on a local level by allowing remote mines to maintain high levels of production.

Area of Significance: Communication, Commerce, and Social History

Communications, commerce, and social history remained significant during this period.

Area of Significance: Community Planning and Development

The principal towns survived the early 1910s slump and continued the trends discussed above. The settlement pattern saw a few changes as smaller towns either contracted or were abandoned. Silverton continued to serve as the commercial, communication, financial, transportation, and cultural center. Howardsville was the commercial hub of the Las Animas district. Eureka continued as a milling town when ASARCo built the Sunnyside Mill and was the principal commercial center for the district. Middleton remained a community of workers employed at the

[9] Colorado Mine Inspectors' Reports: Gold King; Henderson, 1926: 50; *Mineral Resources*, 1914: 299.

Kittimac, Hamlet, and nearby mines, and provided for their basic needs. Gladstone and Silver Ledge shrank to the size of Middleton. Animas Forks, Mineral Point, and Poughkeepsie were abandoned.

Area of Significance: Politics/Government
Trends in local government continued. The electorate further contributed to national policy on silver mining subsidies. When World War I stimulated an increase in silver prices, Congress drafted the Pittman Act in 1918 to lock the price at $1.00 per ounce. Opponents objected on grounds that the Act merely subsidized silver mining, but it became law, in turn stimulating mining throughout the west with accompanying increase in jobs and revived regional economies.

Great Depression Era Revival, 1933 – 1939

This Period of Significance began in 1933, when President Franklin Delano Roosevelt increased the value of gold, stimulating mining. Roosevelt signed into law the Gold Reserve and Silver Purchase acts the following year, formalizing increases in the values of gold and silver. The acts initiated a revival of mining across the west. period ended in 1939, when the county revival and mining slowed. The county's statistics and historical trends reflect what we can refer to as the Depression-era mining revival. The revival, which spanned 1933 through 1939, saw a spike of mining ventures in the county. The number of active mines tripled from 1920 or the period following World War II: twenty-eight small mines, eight medium-sized operations, six large producers, and several placer mines. Although the spike was minor compared to previous peaks of activity, it was significant in the context of the Great Depression. In the county, as elsewhere, the economy was dismal, financial insecurity high, unemployment increased, and sources of income few. Residents realized that the mines offered the only source of income in the county, gleaning ore for mere subsistence earning. By settling for whatever payrock existing mines offered, most residents were able to stay in the county.

While not lucrative or even stable, the mining industry participated in events and trends significant on local, state, and national levels. Dominant activities were mining, ore treatment, ongoing residence, community building, and construction of infrastructure. The most relevant Areas of Significance include Industry, Engineering, Transportation, Commerce, Communication, Social History, and Politics/Government.

Area of Significance: Industry
The mining industry continued as the economic foundation on which the population depended. The county's industry also contributed to regional and statewide economies, both of which were depressed.

Area of Significance: Engineering
Regarding engineering, the Shenandoah-Dives Mining Company developed one of the most advanced and efficient mines in the state, if not the west. The operation featured dozens of miles of underground workings that tapped low-grade ore veins and connected to the old workings of

earlier mines. Precision and expertise were required to complete such a network. The mine capitalized on ore production as workers generated enormous volumes of payrock sent down a tramway to the Mayflower Mill. The tramway and mill were so efficient at exploiting economies of scale that the company was able to profit even though metals values were low. By contrast, other mining companies explored adaptive use of existing properties. Capital was scarce, and companies salvaged materials and equipment. This practice required innovation, planning, a general understanding of structures and mechanical systems.

Area of Significance: Transportation
The Denver & Rio Grande Extension was the principal carrier of ore and concentrates from the county to distant smelters and goods needed for industry and residence into the county. Without the railroad, mining may have stopped. Aerial tramways remained locally significant as previously noted.

Area of Significance: Communication
Communications systems remained locally significant as noted above. .

Area of Significance: Commerce
The flow of goods and capital through the county and to outside economies was significant on the local level in the context of the Great Depression.

Area of Significance: Social History
The Great Depression forced people into a greater degree of self-reliance than before, and these qualities are prevalent in American culture today. Isolated regions dependent on single industries, like San Juan County, reinforced this trait because when their industries faltered, the residents had to either leave or become self-sufficient. When the residents eventually did move on, they spread the tendency to be self-reliant to other groups of people through cultural diffusion. The way in which the Great Depression manifested in the county also contributed to the trend of a mobile, diverse, and adaptable society. The boom and bust cycles of mining, exacerbated by the Depression, forced county residents to move in search of employment and adapt to changing conditions. The movement of people ensured that the population remained diverse.

Area of Significance: Politics/Government
The trends regarding county and local government continued from the previous periods, in addition to the ramifications of implementing national policy on pricing silver and gold. Western legislators supported the Gold Reserve and Silver Purchase acts in response to industrial interests as well as constituents in their voting districts.

Post World War II Recovery, 1946 – 1954

The tenth Period of Significance began in 1946, when post-ward conditions fostered a final widespread surge of activity among the county's mines. Although gold and silver were the most desirable components of ore, industrial metals including lead, zinc, and copper became mainstays. The demand for and value of these metals doubled from wartime levels and were higher than any previous time in national history. These factors, combined with low production costs and improved milling technology, rendered uneconomical grades of ore profitable to produce. The period ended in 1954, when county production abruptly dropped, and many mines closed. The Shenandoah-Dives Mining Company closed in 1953, but other outfits continued to send ore to the company's Mayflower Mill for custom treatment. Later in the year, however, the company closed the mill as well, leaving most independent outfits with no local facility to process ore. In response, most outfits ceased production. Although limited mining continued in the county, the industry never recovered.

During the post-war recovery, the mining industry participated in events and trends that significant on local and state levels. Dominant activities were limited to mining and ore treatment. The relevant Areas of Significance include Industry, Transportation, Commerce, Communication, and Politics/Government.

Area of Significance: Industry

The mining industry continued to be the economic foundation for the county's population, allowing residents to stay rather than gravitate to urban centers. The county industry also contributed to regional and state economies through ore production and consumption of goods and services.

Area of Significance: Transportation

The county mining industry depended on trucks to haul ore to the Mayflower Mill and concentrates from the mill to the railroad at Silverton for shipment to distant smelters. The industry also made extensive use of trucks to haul in machinery and supplies. The traffic prompted improvement of the road network and arteries connecting with Durango and Ouray.

Areas of Significance: Communication and Commerce

Communications and commerce remained significant in the systems and roles defined previously, allowing capital flow to support rural populations in southwestern Colorado during the post-war years.

PROPERTY TYPES AND REGISTRATION REQUIREMENTS

PROPERTY TYPE: PLACER MINE

Placer mine operations featured interests ranging from those of individuals to capitalized companies processing stream gravel and soil to collect particles of gold. A fundamental difference exists between *placer workings* and *placer mines*. At one time, the Animas River

featured thousands of feet of continuous placer workings that manifested as tailings piles, pits, and infrastructure features. Some of these may still be evident. A placer mine, by contrast, was a specific property, usually defined by claim boundaries, which an individual or company worked for gold. Extensive placer workings may actually include several individual placer mines that blend together. Archival research and the physical examination of extensive workings may be necessary to identify specific mines in heavily worked areas.

Placer Mine Subtypes

Stream Placer: Both organized companies and individual miners created stream placers when they worked a streambed for gold. Streams are small waterways that usually flowed year round across broad, gently sloped drainage floors. Individual miners often dug pits down to bedrock in streambeds and used any combination of gold pans, cradles, and small sluices to recover gold from excavated gravel. Organized companies often installed lengthy sluices and created trenches or other large excavations when removing gravel. Pits, trenches, piles of gravel and stream cobbles, and braided stream channels often denote placer mines today. If the stream flowed all year, miners usually piled tailings along the stream banks to maintain the waterway. Companies with lengthy sluices may have left rock piles and posts that supported the sluices and small, adjacent platforms that served as workstations. At substantial mines, companies often engineered networks of ditches and added other aspects of infrastructure such as residential buildings and blacksmith shops, sometimes represented today by earthen platforms.

Gulch Placer: Companies and individual miners created gulch placers when they worked a gulch, or narrow drainage, for gold. Because gulches tended to be confined and steep, miners had to pile tailings in a linear fashion along one or both sides, and over time, erosion reduced the piles to short linear segments, isolated mounds, and hummocky deposits. As erosion redeposited the tailings along the gulch floor, the associated stream channel often became braided. Extensive gulch placers operated by organized companies may offer the same infrastructure features as stream placers.

Hydraulic Placer: Because hydraulic mining operations used jets of water to mobilize high volumes of gravel in economies of scale, most extant sites tend to be expansive with broad deposits of tailings, deep incisions and gullies, and abrupt, precipitous cut-banks. Hydraulic mining required an infrastructure to deliver water both for the monitors and for washing gravel through sluices. Ditches, pipelines, and flumes often directed water from regional drainages to a reservoir upslope from the site. Pipelines then carried the water under pressure to the monitors, and ditches and flumes directed the runoff through the workings into sluices, where workers recovered gold. To support industrial activity, hydraulic mines also usually included a shop, other buildings, supports for pipelines, and roads. If the mine was more than one mile from the nearest settlement, the mining company often provided residences for workers on site. In general, engineering and archaeological features are prevalent at hydraulic mine sites.

Placer Mine Significance

Placer mining was of local significance to San Juan County in 1860 and 1861. The discovery of placer gold in Arrastra and Cunningham gulches, and along the Animas River from Silverton to Eureka, brought the first large numbers of Euro-Americans to the region. They were also the first Euro-Americans to penetrate the deep San Juans and document their findings. Early miners established a baseline understanding of the county's physical attributes and geography, thereby drawing attention to the region. Coupled with their discovery of gold, exploration became the foundation that lured prospectors during the early 1870s. This second wave was the beginning of permanent settlement and a nascent mining industry. Placer mines that date to the early 1860s are thus associated with Exploration/Settlement.

Placer mining was also of local significance during the revival of the late 1890s and 1900s. During this time, several companies developed large hydraulic placers in the Eureka area. These provided jobs, contributed to the local economy, and added to the county's overall gold output. Placer mines active during this timeframe were important in the areas of Industry and Economics. During the Great Depression, placer mining provided income and subsistence for unemployed workers. Placers worked during the Great Depression are associated with Commerce and Social History.

Steam and Gulch Placers: As a property subtype, stream and gulch placers were similar types of operations and share aspects of significance. They were locally important primarily during two Periods of Significance. The first is during 1860 and 1861, and the second is 1933 to 1939 for the reasons noted above.

Hydraulic Placer: Hydraulic mining was active primarily during the late 1890s and early 1900s. The Eureka district and Animas River were the only portions of the county with the necessary sedimentology for hydraulic mining. Although hydraulic mining was not widely practiced, it was locally significant in the areas of Economics, Industry, and Engineering. In economic terms, hydraulic placers provided jobs, contributed to the local economy, and added to the county's overall gold output. In terms of Industry, hydraulic placers were part of the county's industrial fabric. Regarding engineering, hydraulic mines required complex water distribution systems and the defensible allocation and use of water rights.

Placer Mine Registration Requirements

Steam and Gulch Placers: The eligibility of stream and gulch placers is predicated on meeting at least one of the NRHP criteria and adequate integrity to convey their significance. Placer mines eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important in the development of the county. Placers may be eligible under Criterion B provided they reflect the direct and active contribution in the life of an important person or persons. To be eligible under Criterion C, a resource must clearly represent the stream or gulch type of placer mine and possess enough integrity to convey the historic placer operation. Character-defining features will likely include excavations, tailings piles, work stations, and

infrastructure. Intact buildings and structure are rare and thus manifestly strengthen site eligibility. Stream placers may further be contributing elements of historic mining landscapes or larger districts.

Stream and gulch placers may be eligible under Criterion D, especially when studies of the infrastructure features of large mines, including networks of ditches, sluice beds, and work areas, may enhance current understanding of engineering applied to placer mining. If the resource possesses building platforms, testing and excavation of buried archaeological deposits may reveal information regarding workers' lifestyles and social structures of the workforce, as well as the functions of ancillary buildings.

Stream and gulch placers must retain aspects of physical integrity relative to its Period of Significance. Because structures may have been removed or destroyed subsequent to their productive period, integrity will relate to the property's ability to convey its significance or "recognizability" (see the National Register Bulletin: *Guidelines for Evaluating and Registering Archeological Properties*). For instance, material evidence may represent the work areas, engineering features, and structures or remnants of structures related to the historic mining operation. Eligibility of setting, feeling, and association is particularly crucial to the eligibility of these resources.

Hydraulic Placer: The eligibility of hydraulic placers is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Hydraulic placers eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. Hydraulic placers may be eligible under Criterion B because they were usually designed and subsequently supervised by mining engineers. To be eligible under Criterion C, a resource must clearly represent a hydraulic placer mine with integrity from the turn of the century. Character-defining features will likely include systems of water allocation and distribution, hydraulic workings methods, and the locations of sluices. In general, hydraulic mines were uncommon in the county and extant resources are therefore rare today. For this reason, examples are significant representations of formally engineered placer operations. Hydraulic placers may further be contributing elements of historic mining landscapes or larger districts.

Hydraulic mines may be eligible under Criterion D, especially when studies of infrastructure features, including water allocation and distributions systems, sluice beds, and work areas may enhance current understanding of engineering adapted to hydraulic mining. Testing and excavation of buried archaeological deposits may reveal information regarding workers' lifestyles as well as the functional layout of the operation.

Hydraulic placer mines must retain aspects of physical integrity relative to its Period of Significance. Because structures may have been removed or destroyed subsequent to their productive period, integrity will relate to the property's ability to convey its significance or "recognizability" (see the National Register Bulletin: *Guidelines for Evaluating and Registering Archeological Properties*). For instance, material evidence may include remnants of engineering features such as cut-banks, ditches, flumes, pipelines, sluice beds, penstocks, and reservoirs.

Integrity of design, setting, feeling, and association is particularly crucial to the eligibility of these resources.

Features Common to Placer Mines

Boom Dam: A dam intended to impound water for booming operations. Boom dams often featured a spillway or other form of breach that directed water into a boom ditch or drainage.
Boom Ditch: A ditch that directed water from a boom dam directly into placer workings.
Building Platform: A flat area that supported a building.
Building Ruin: The collapsed remains of a building.
Collection Ditch: A ditch that collected runoff from a placer mine for secondary uses or to impound sediments. A collection ditch should be located downstream from a placer mine.
Cut-Bank: The headwall of an excavation.
Dam: A water impoundment structure. Some dams for placer mines are earthen while others may consist of log cribbing filled with earth.
Ditch: An excavation that carried water to or from a placer mine. Ditches often tapped streams in adjacent drainages and featured a gentle gradient.
Flume: A wooden structure that carried water to or from a placer mine, or carried a stream around a placer mine.
Flume Remnant: The structural remnants of a flume.
Monitor Station: A platform, tongue of earth, or perch where a hydraulic monitor was stationed. Monitor stations were usually circular, cleared of rocks, and had a footing near center for the nozzle. The stations were strategically located amid hydraulic workings.
Penstock: A pipeline that carried water under great pressure for hydraulic mining. The penstock descended steeply from a pressure box down to the hydraulic workings, where feed pipes connected with hydraulic monitors. The penstock had gradual reductions in diameter, which increased the velocity and pressure of the water within.
Placer Pit: An excavation circular or ovoid in footprint where miners sought deep gravel.
Placer Trench: A linear excavation where miners sought deep gravel.
Placer Tailings: The hallmark of placer mining, tailings usually consist of ovoid or linear piles of gravel and rounded river cobbles.
Pressure Box: A wooden or masonry structure, usually far upslope from a hydraulic mine, that directed water into a penstock featuring a steep descent. A ditch or pipeline carried water to the pressure box from a stream or reservoir. The pressure box's elevation and the penstock's descent provided enough pressure for hydraulic mining.
Pressure Box Platform: Pressure boxes stood on earthen platforms cut out of the ground below a ditch or reservoir. A penstock, or its bed, will descend from the platform, which may feature stone masonry or timber footers.
Refuse Dump: A collection of industrial and structural debris cast off during operations.
Reservoir: A void behind a dam for water storage.

Shop Platform: Most company placer mines had simple blacksmith shops were tools and maintained and hardware manufactured. Shops stood on platforms of earth or tailings, which usually represent the building's footprint. An artifact assemblage of shop refuse including anthracite coal, hardware, and forge-cut iron scraps is a defining characteristic.
Shop Ruin: A collapsed shop.
Shop Refuse Dump: Blacksmiths threw shop refuse outside their buildings. When work was sustained, the volume of material became high enough to qualify as a dump. The artifact assemblage includes anthracite coal, forge-cut iron scraps, hardware, and forge clinker, a scorious residue generated by burning coal.
Sluice: A sluice was an indispensable structure for placer mining. It was a lengthy wooden flume with plank walls and a floor featuring riffles. A water current carried gravel through the sluice and the riffles caught the gold. Such a function required that the sluice be located on the floor of placer workings. Sluices ranged in size from 2' wide x 2' deep, to 6' wide x 6' deep. Piles of rocks and timber piers supported sluices.
Sluice Remnant: The remnants of a sluice, usually denoted by piers, posts, rock supports, and planks.
Supply Ditch: A ditch that delivered water to a placer mine.
Work Station: A platform alongside a sluice where workers supervised operations and maintained the sluice.

PROPERTY TYPE: HARDROCK PROSPECT

A prospect is a manifestation of an effort to locate profitable ore, and resources range in scale from shallow pits to extensive underground operations. A lack of significant production, the absence of ore storage facilities, minimal property development, and little capital investment were characteristic of development. Although most prospects tended to be simple, shallow, and lacked machinery, some were fairly advanced and possessed surface plants that required formal engineering and equipment. When a prospect was abandoned, equipment and structures may have been removed. The researcher is likely to encounter prospect sites with varying degrees of archaeological, engineering, and architectural integrity. Substantial operations were usually centered on an adit or a shaft with an associated waste rock dump of some volume, representing deep workings. While most prospects were labor-intensive, deep operations sometimes employed power appliances. Buildings, machinery, and other facilities usually shared the same orientation as the shaft or adit and were clustered together around the opening. Because equipment for deep prospecting was intended to be portable, items were usually removed when a site was abandoned, leaving primarily archaeological evidence such as building platforms, machine foundations, and artifacts. Prospect sites can be grouped into three general subtypes:

Hardrock Prospect Subtypes

Prospect Complex: When prospectors attempted to locate mineral formations, they often excavated groups of pits and trenches to expose bedrock. If the prospectors uncovered a promising lead, they drove adits and shafts to explore and sample the formation at depth. Collectively, the groups of pits, trenches, adits, and shafts can be termed prospect complexes. Pits and trenches will be surfacial, shafts and adits should be shallow, and the sum represents mineral sampling and a search for ore. It should be noted, however, that some prospectors drove shallow adits and shafts merely to fulfill assessment obligations to retain title to their mining claims. Experienced prospectors often followed an organized, strategic pattern when excavating their workings, which may become apparent when the features of a prospect complex are mapped.

If a prospector invested an appreciable amount of time in a complex, also necessary to drive an adit or a shaft, he usually constructed a few infrastructure components to support his work. One of the most common was a field forge where the prospector maintained his tools and fabricated basic hardware. Field forges were usually in the open and made with dry-laid rock masonry or small logs. Another was a residence, often either a simple log cabin or wall tent, unless a settlement lay nearby. Shafts required a hoist, and prospectors favored hand windlasses for their portability and low cost. A hand windlass was a wooden spool with a crank handle set in a frame over the shaft collar. Adits required wheelbarrows or ore cars to haul rock out. Because prospectors usually removed their equipment when they abandoned a site, archaeological features and excavations tend to represent prospect complexes.

Prospect Shaft: When prospectors discovered a mineral formation of promise, they often elected to sink a shaft to explore and sample it at depth. Initially, the prospectors would have installed a hand windlass to raise rock out of the shaft, and this primitive type of hoist had a depth capacity of around 100'. If they determined to continue sinking, the prospectors were forced to install a mechanical hoist and either sought capital or sold their property to an organized prospect outfit. Prospectors may have installed a horse whim, which was inexpensive and provided adequate depth capacity for further underground exploration. However, whims were slow and limited in performance such that many organized outfits installed power hoisting systems driven by steam or petroleum engines by the turn of the century.

When a shaft was deep enough to warrant a power hoist, the outfit usually erected other facilities as well. Blacksmiths maintained tools and fabricated hardware in shops, miners shuttled waste rock away from the shaft in ore cars on tracks, and portable boilers provided steam power. Surface plant components were usually clustered around the shaft, and a residence stood nearby if the shaft was in a remote location. All buildings and equipment met what the greater mining industry recognized as temporary-class criteria, which it defined as low in cost, portable, impermanent, and easy to construct. By definition, prospect shafts lacked evidence of ore storage or processing facilities.

If the shaft failed to encounter ore in profitable volumes, the outfit abandoned the site and usually removed all items of value. Given this, archaeological features and artifacts tend to represent prospect shaft sites today. The decay of timbering caused most shaft collars to collapse,

leaving areas of subsidence that can appear similar to large prospect pits. For a site to be defined as a shaft, the volume of waste rock should exceed the area of subsidence.

Prospect Adit: When prospectors discovered a mineral formation of promise, they often drove an adit to explore and sample it at depth. An adit was a horizontal entry underground usually 3' x 6' or less, and prospectors chose an adit over a shaft because an adit required less capital and effort. Prospect adits often featured surface plants equipped with little more than a blacksmith shop and a means of hauling waste rock out of the workings. Wheelbarrows were the simplest and least expensive device, and if the prospectors determined to continue driving, they may have used an ore car on a track. As the adit's length exceeded the penetration of fresh air, prospectors may have installed a hand-powered blower, a bellows, or a windsock to force air underground through tubing.

Surface plant components were usually clustered around the adit portal, and a residence usually stood nearby if the adit was in a remote location. By definition, prospect adits lacked evidence of ore storage or processing facilities. If the adit failed to encounter ore in profitable volumes, the outfit abandoned the site and usually removed all items of value. The decay of timbering caused most adit portals to collapse, leaving areas of subsidence that can appear similar to lengthy trenches. For a site to be defined as an adit, the volume of waste rock should exceed the area of subsidence.

Hardrock Prospect Significance

Because profitable ore could only be found through prospecting, this activity was a cornerstone of San Juan County's development. Small parties of prospectors began subsurface exploration in 1870 and were rewarded with the discovery of the Little Giant and other lodes. During the mid-1870s, prospectors arrived in significant numbers, explored the county's geography, defined its centers of mineralization, and found many of the significant veins. Their informal camps also became the seeds for the county's principal settlements. Arrival of the railroad in 1882 incited a wave of prospecting that lasted until around 1885. Between 1870 and 1885, most of the important ore formations were discovered, and the principal mines were started. Specific Areas of Significance apply to prospecting and extant associated resources, including prospect complexes, adits, and shafts.

In terms of *Exploration/Settlement*, prospectors and their outfits laid the groundwork for the establishment of a regional mining industry. They were usually the first to conduct extensive physical and mineralogical exploration, relaying information critical to subsequent mining interests. Prospectors were the first Euro-Americans to inhabit the region.

Regarding *Engineering*, simple prospect shafts and adits represent the application of systematic, strategic sampling, a hallmark of experienced prospectors, to prove the existence of ore. When developing deep prospects, organized outfits adapted known technology, machinery, and methods to primitive environmental conditions characterized by difficult terrain and climate and unknown geological conditions. Prospects also adapted conventional geological knowledge

and technology to predict the occurrence of mineral formations and ore. In so doing, they collectively contributed to understanding of the county's structural geology and mineralogy.

Regarding *Social History*, prospectors were an unusual segment of society with particularly adventuresome, independent, curious, robust, and survivalist qualities. Most possessed some formal education, learning further about geology and mineralogy through experience. Prospecting brought unconventional individuals to San Juan County, and they imparted their values and behaviors to the mining industry.

Regarding *Politics/Government*, prospectors organized the earliest mining districts in the San Juan Mountains, setting precedent for districts elsewhere in the mountains during the 1870s. Mining districts constituted an important frontier government that brought order to mining and settlers. These districts contributed to the formal division of southwestern Colorado into counties. In response to the surge of prospecting and mining in the Animas River drainage, the territorial legislature designated La Plata County in 1874. With regional growth, the legislature then carved San Juan County out of La Plata.

Hardrock Prospect Registration Requirements

Hardrock Prospects:

The eligibility of hardrock prospect complexes is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Hardrock prospects eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. Hardrock prospects may be eligible under Criterion B provided they reflect the direct and active contribution in the life of an important person or persons. To be eligible under Criterion C, a resource must clearly represent an organized prospect effort, wherein the assemblage of excavations reflects a systematic pattern with evidence of support facilities such as the blacksmith shop, if any existed. Prospect complexes may also be eligible under Criterion C if the resource possesses intact architectural or engineering features reflecting a type, period, or method of construction associated with prospecting. Hardrock prospects may further be contributing elements of historic mining landscapes or larger districts.

Hardrock prospects may be eligible under Criterion D, especially when charting the distribution of excavation types and sizes may reveal patterns. These patterns may reflect planning, sampling methods, and strategy specific to an area's geology or timeframe. Regional differences may also be determined by comparing prospect complexes. The methods and planning that prospectors employed is a central research topic. If the resource possesses building platforms, testing and excavation of buried archaeological deposits may reveal information regarding prospectors' lifestyles and social structures, which are not well documented. Meanwhile, prospect complexes featuring random excavation will reveal few buried archaeological deposits.

Hardrock prospects must retain aspects of physical integrity relative to its Period of Significance. Because these prospects featured few, if any, buildings or structures, integrity will

often relate to the property's ability to convey its archaeological significance or "recognizability" (see the National Register Bulletin: *Guidelines for Evaluating and Registering Archeological Properties*). Integrity of design, setting, feeling, and association is particularly crucial to the eligibility of these resources.

Prospect Shaft and Prospect Adit: Because prospect shafts and adits shared the same function, registration requirements are similar. The eligibility of both prospect shafts and adits is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Prospects shafts and adits eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. They may be eligible under Criterion B provided they reflect the direct and active contribution in the life of an important person or persons. To be eligible under Criterion C, a resource must clearly represent a typical shaft or adit operation. Character-defining features of prospect shafts may include the shaft, hoisting system, blacksmith shop, and other facilities or their remnants. In terms of prospect adits, features may include the adit portal, transportation system, blacksmith shop, and other facilities or their remnants. Because equipment and buildings may have been removed subsequent to productive operation, extant buildings, structures, and equipment or evidence of deep prospecting will contribute strongly to a site's eligibility. Prospect shafts and adits may further be contributing elements of historic mining landscapes or larger districts.
Prospects shafts and adits may be eligible under Criterion D, especially if a site possesses intact structures or buildings, and detailed examination may reveal how prospect outfits adapted conventional mining architecture and engineering to the environmental and geological conditions of the San Juan Mountains. Accessible and intact underground workings are especially significant, because few formal studies have been carried out regarding the underground work environment, engineering, equipment, and practices of drilling, blasting, and removing rock. Further, if workers lived on site, the residential area may offer meaningful buried archaeological deposits, such as privy pits. Testing and excavation may uncover artifacts capable of enhancing current understanding of the workers employed at prospect operations and how they lived.

As a property subtype, prospect shafts and adits are somewhat common, but examples retaining high degrees of integrity are rarer. Prospects shafts and adits must retain aspects of physical integrity relative to their Period of Significance. Because these prospects featured few, if any, buildings or structures, integrity will often relate to the property's ability to convey its archaeological significance or "recognizability" (see the National Register Bulletin: *Guidelines for Evaluating and Registering Archeological Properties*). Integrity of design, setting, feeling, and association is particularly crucial to the eligibility of these resources.

Features Common to Hardrock Prospect Resources

Boiler: A boiler was a vessel that generated the steam which powered machinery. Most boilers at prospect sites will be temporary-class upright, locomotive, or Pennsylvania types.

Boiler Foundation: Because portable boilers were self-contained and free-standing, prospect outfits usually stood them on platforms located near the hoist. Occasionally, however, workers erected rock or brick foundations or pads to support the boiler. The artifact assemblage around a foundation or platform can help the researcher identify it as that for a boiler. The assemblage should include clinker, which was a scorious, dark residue, as well as unburned bituminous coal, ash, water-level sight-glass fragments, boiler grate fragments, and pipe fittings. Some prospect outfits installed upright boilers on square or circular dry-laid rock pads or excavated a shallow pit underneath the boiler to allow ashes from the firebox to drop through. The pad's size should approximate the boiler's diameter. Pennsylvania boilers and locomotive boilers stood on skids, which usually required no support. However, where the ground was soft or uneven, workers often laid parallel rock alignments to prevent the boiler from settling. In the absence of rock supports, the skids occasionally became embedded in the ground and left two parallel depressions the length and width of the boiler. For locomotive boilers without skids, which were rare, workers erected a rock or brick pylon to support the high rear, and laid a rock or brick pad that supported the firebox end.

Claim Marker: Prospectors erected claim markers at the corners of their claims. Some were 300 by 1,500 feet in area, and others were 500' x 1500' in area. Markers ranged from cairns to blazes on trees to up-ended boulders. When a surveyor mapped and registered a claim, he usually etched the mineral survey number into a corner rock.

Claim Stake: A claim stake was the universally recognized form of claim marker. Claim stakes were usually 4" x 4" posts 4' high, although prospectors often substituted logs.

Draft Animal Track: Horse whims required a circular track around the apparatus so the draft animal could wind the cable drum. The tracks tended to be around 20' in diameter and cleared of major obstacles. Prospectors often graded semi-circular platforms adjacent to a shaft for a track.

Forge: Nearly all prospect operations of substance featured a forge where a blacksmith heated steel implements. Most forges were vernacular in construction in that they were assembled with local materials. Prospectors built walls 3' x 3' in plan and 2' high with rocks or small logs, inserted a tuyere, and filled the interior with sorted gravel. In some cases, prospect outfits imported factory-made iron pan forges to their sites.

Forge Remnant: Forges collapsed over time and may manifest as a mound of gravel and remnants of the walls, usually impregnated with coal and forge clinker. When coal burned at high temperatures, it left a scorious, dark residue known as *clinker*.

Headframe: A frame made of timber or logs that stood over a shaft. Headframes associated with horse whims were often large tripods or tetrapods. Power hoisting systems usually employed two-post gallows headframes.

Headframe Ruin: The collapsed remnants of a headframe.

Headframe Foundation: Headframe foundations usually manifest as parallel timbers that flank a shaft and extend toward the area where a hoist was located.

Hoist: Hoists at prospects were usually horse whims, steam, petroleum, or small electric models.

Hoist Foundation: Nearly all mechanical hoists were anchored to foundations to keep them in place, and a foundation's footprint can reflect the type of hoist. Foundations are common at

prospect shaft sites and can usually be found aligned with and at least 20' from the shaft. Because of the ease of construction and low cost, prospectors usually assembled hoist foundations with timbers, and occasionally with stone or concrete. Timber foundations decay and become buried over time, and often manifest today as rectangular groups of four to six anchor bolts projecting out of a hoist house platform.

Horse whims were usually bolted to timber foundations 2' x 2' in area at the bottom of a shallow pit. The trench for the cable and linkages often extends from the pit to the shaft.

Foundations for single-drum steam hoists are usually rectangular, flat, and feature at least four anchor bolts. They can range in size from 6' x 6' to as little as 2' x 3' in area. Foundations for single-drum electric hoists appear very similar to those for steam hoists. Steam hoists often left behind plumbing and gaskets, and the site should possess evidence of an associated boiler. The use of electric hoists often generated electrical insulators and wires.

Foundations for gasoline hoists are fairly distinct. Their footprint is that of an elongated rectangle at least 2' x 6' in area oriented toward and aligned with the shaft. Due to the engine's severe vibrations, prospectors often bolted hoists to concrete foundations at least one foot high. Gasoline hoist foundations usually feature at least two rows of three anchor bolts, with the rear two closer together than the rest. Gasoline hoists can leave distinct artifact assemblages including thin wires, spark plugs, small pipes, and fine machine parts.

Hoist House: Hoist houses, usually at least 20' from the shaft, enclosed a hoist, its power source, and often a blacksmith shop. Most prospect outfits followed a form conventional to the mining industry, a rectangular footprint and a front-gabled or shed roof. Hoist houses were vernacular in that they had no recognized architectural style, consisted of available materials, and were built as needed by the outfit.

Hoist House Platform: Hoist houses stood on platforms of leveled earth or waste rock at least 20' from, and aligned with, the shaft. Often, a platform is all that represents a hoist house, and it usually reflects the building's size and footprint. Evidence of a hoist and a shop is usually present.

Hoist House Ruin: The collapsed remnants of a hoist house.

Horse Whim: A horse whim was the most primitive type of mechanical hoist, and it was powered by a draft animal. Two types of whims were popular at different times (discussed above), and the researcher should specify the type of whim when recording a site. The *horizontal reel whim* consisted of a horizontally oriented cable reel at least 3 feet in diameter, fitted with a harness beam on top. The *geared whim* was compact and featured a vertical cable drum in a frame. A capstan, geared to the drum, featured a harness beam on top.

Horse Whim Pit: Prospectors often placed horse whims in shallow pits so the hoisting cable could pass through a trench to the headframe and pose no obstacle to the encircling draft animal. They often lined the pits with planks or logs to retain soil. Over time, the lining collapsed, leaving a concave depression where the whim was anchored, and a linear depression extending to the shaft. The pit should be at the center of a draft animal track.

Mine Rail Line: A track for ore cars.

Mine Rail Line Remnant: When prospectors dismantled a track, they often left in situ ties, impressions of ties, and sections of rails.
Pack Trail: A path, usually less than 8' wide, provided access to prospect workings.
Prospect Adit: A horizontal entry underground denoted by a waste rock dump. An adit tended to be short and less than 3' x 6', while a tunnel was larger. When collapsed, adits appear as trenches.
Prospect Pit: A circular or ovoid excavation surrounded by a small volume of waste rock.
Prospect Shaft: A vertical or inclined opening underground of shallow depth. When intact, shafts tend to be rectangular, and either 4' x 6' or 4' x 8' in interior dimension. When collapsed, shafts manifest as circular areas of subsidence.
Prospect Trench: A linear excavation flanked by a small volume of waste rock.
Shop: A building that enclosed blacksmith facilities where a worker fabricated and maintained tools and hardware. Simple shops usually featured a forge, a workbench, and possible hand-powered appliances such as a drill-press. Most prospect outfits followed a form conventional to the mining industry, rectangular footprint and gabled roof. Shops were vernacular, consisting of available materials, and built as needed by the outfit. In general, logs were commonly used prior to 1890, and lumber as early as 1880.
Shop Platform: Shops usually stood on earthen platforms near the entry underground. The platforms may feature forge remnants and almost always possess artifacts such as forge-cut iron scraps, anthracite coal, and clinker, which is a scorious, ashy residue created by burning coal.
Shop Ruin: The collapsed remnants of a shop.
Waste Rock Dump: The waste material removed from underground workings.

PROPERTY TYPE: HARDROCK MINE

Hardrock mines were underground operations that produced ore, but were not necessarily profitable. High operating costs, mismanagement, and ineffective technologies often consumed the income generated from production. Company mines ranged in scale from small and labor intensive to extensive, mechanized operations. Most shared basic characteristics, such as ore storage facilities, support buildings and structures, waste rock dumps often at least 125' x 125' in area, and roads for the transportation of materials and ore.

Although small mines were similar in composition to advanced prospects, in that surface plants included facilities to accommodate ore production. Ore bins permitted companies to store payrock between shipments, and companies that mined complex ore often erected ore sorting houses where workers manually separated waste and ore according to quality. Large mines differed greatly from prospects in that their surface plants supported intensive work underground. To facilitate ore extraction and materials handling large companies usually employed machinery and erected substantial buildings. Some companies further attempted to produce ore in economies of scale while minimizing energy consumption and costly labor, relying on advanced machinery and efficient ore handling systems. Shaft operations featured

power-driven hoisting systems that raised high tonnages of payrock from deep workings. Both tunnel and shaft operations employed compressed air systems, which permitted miners to bore blast holes with mechanical rock drills. Those companies that were either highly productive or in remote locations sometimes featured their own concentration mills to separate metalliferous material from waste.

The shop was a key facility differentiating large and small operations. The mechanical systems typical of large mines created heavy demand for advanced metalwork and carpentry. To meet these needs, substantial mining companies erected spacious shops equipped with power-driven appliances. Where possible, companies located the shop adjacent to the mine opening to minimize undue handling of heavy materials. Many shops featured a basic array of power appliances, including drill presses, lathes, trip hammers, and pipe cutters. The turn of the century saw a number of companies employ electric motors to power their shop appliances, by contrast to the upright steam engines of previous years. Most power appliances had to be anchored to foundations, which ranged from timbers to concrete pads.

The need for efficient transportation gave rise to another new type of facility. To overcome the challenges of winter weather and hostile terrain, many companies in the county built aerial tramways that descended from the mine to a shipping point or a concentration mill. Smaller operations installed simple single-rope reversible systems. Moderately-financed companies strung double-rope reversible systems, consisting of two-track cables and a pair of tram buckets linked by a cable loop. The Bleichert double-rope system, with its continuous loop of buckets, was the most efficient and costly, limiting the system to heavily capitalized companies.

In many cases, surface plants erected by highly productive companies required elaborate complexes. For efficient servicing, minimized plumbing, and better engineering, these companies generally clustered mechanical components and shops in either large tunnel houses or shaft houses. Ancillary facilities, such as separate shops, electrical transformers, explosives magazines, offices, and quarters for draft animals were independent. In general, the surface plants of substantial operations featured a primary shaft or tunnel house surrounded by several smaller buildings.

Hardrock Mine Subtypes

Shaft Mine: Shaft mines produced ore from vertical or inclined underground entries. Companies frequently arranged critical surface plant components around the shaft collar. Large shaft mines possessed complex, mechanized surface plants with multiple structures and buildings, while small operations were simple and featured facilities similar to those at deep prospects. The presence of an ore bin or sorting house, or the evidence thereof, can distinguish a mine from a deep prospect. Small to moderate shaft mines with diminished integrity are relatively common resources, while sites retaining high integrity and large, complex shaft mines are rarer.

Tunnel Mine: Tunnel mines produced ore through a horizontal tunnel. Companies usually arranged critical surface plant components around the tunnel portal. Large tunnel mines

possessed complex, mechanized surface plants with multiple buildings and structures. Small operations were simple and may have featured facilities similar to those at deep prospects. The presence of an ore bin or sorting house, or the evidence thereof, can distinguish a mine from a deep prospect. Small and moderate tunnel mines with diminished integrity are relatively common resources, while sites retaining high integrity and large, complex tunnel mines are rarer.

Hardrock Mine Significance

Hardrock mining in the county began in 1870 with the discovery of the Little Giant and other gold veins in Arrastra Gulch and spread throughout the Animas River valley by 1875. Through 1880, mining took form as an industry and slowly gained momentum. The successful operation of the Greene and Crooke smelters facilitated this growth. The industry further mushroomed when the railroad arrived in 1882, lowering the costs of mining, transporting ore to the large smelter at Durango, and improving the quality of life.

The industry declined sharply in 1885, reviving in 1890 with passage of the Sherman Silver Purchase Act. However, the price of silver collapsed at the end of 1893 when the Act was repealed. One result was a deep, nationwide economic depression and the other closure of silver mines across the west. In San Juan County, mining continued because the industry adapted. Attention shifted to gold and high grades of silver with mining companies developing the strategy of production in economies of scale. Because of this, the county's output remained substantial while much of the state suffered. When the general economy improved in the late 1890s, a revival swept Colorado and San Juan County. Companies across the state adopted the strategy of economies of scale, generating more tonnage of ore and higher yields than any time in the past. This trend lasted until 1910, when mining declined again. Increased demand and metals prices stimulated by World War I caused yet another revival in the county, which lasted through 1921.

The industry struggled into the Great Depression. Federal programs to increase the value of gold in 1933 and passage of the Gold Reserve and Silver Purchase acts the following year gave the industry renewed energy as well as job creation. World War II, and its drain on labor and resources, ended the Depression-era revival, although the industry recovered immediately after the war. This post-war revival ended in 1954 with closure of the Mayflower Mill.

Mining was consistently significant on a local level regardless of boom and bust cycles, but the industry was also often reflected state and national trends throughout the years discussed in Section E. Specific Areas of Significance may apply. *Exploration/Settlement* was relevant to the years preceding 1885. Mining companies, often on the heels of prospectors, brought social, economic, governmental, and transportation systems to this remote area. In short, regarding *Industry*, mining was the origin of settlement in the county. As the primary industry, mining also gave rise to developments in technology, engineering, and architecture related to ore production and milling, for which the county became known nationally among professional mining circles.

Regarding significance in the areas of Economics and Commerce, via investment, communication systems, banking, and acquisition and shipment of supplies, mining contributed to regional, state, and national economic systems, attracting prominent capitalists nationally.

Mining fostered a local economy by paying wages to workers, hiring consultants for services, and purchasing goods from sources mostly in major towns. Machinery manufacturers in Denver purchased material from sources within and outside of Colorado. Between the 1880s and 1930s, Denver hosted prominent mine-supply industries. The thousands of workers employed by the county's mining companies consumed food and domestic goods from a variety of sources. Employees thereby not only supported a complex national food transportation network, but the development of farming and ranching in Colorado. Finally, productive mining companies contributed to the area of Economics through the conversion of mineral resources into wealth, which infused the local economy with fresh capital that in turn fostered Commerce. The local level of significance continued through all Periods of Significance after 1861. Meanwhile, the county's total output was a major contribution to Colorado's wealth beginning in 1882.

Regarding Politics/Government, mining was integrally tied to and a direct function of political systems on statewide, national, and international levels. Political processes greatly influenced silver mining because the value of the metal was, at times, juxtaposed with government policy. The Bland-Allison Act of 1878 and the Sherman Silver Purchase Act of 1890 instituted price supports and acquisition quotas for silver. In response, mining companies across the west prospected for and produced the metal. Government repeal of the Sherman Silver Purchase Act and subsequent collapse of silver's value brought silver mining and prospecting to a temporary halt. Passage of the Pittman Act in 1918 increased the value again and stimulated mining, and in turn repeal of the Act in 1922 wrecked the industry. Federal programs related to the international conflict and defense influenced the production of many industrial metals, including zinc, copper, and lead. While few individual mine sites can be directly tied to specific political acts and policies, as a whole, the county's mining industry and interests contributed heavily to state and national trends and policies.

Regarding *Social History*, participants in the county's hardrock mining industry participated in the development and evolution of a class-based social structure. Beginning in the late 1870s, with active production mine owners and investors began an ascent to wealth while laborers formed a working class dependent on wages. Through the 1910s, two general categories of capitalists acquired productive properties and financed exploration. The first consisted of local investors of limited means and the second a wealthy elite based in Denver, the Midwest, and east. Profits reinforced existing fortunes and contributed to the formation of a middle class. In turn, because mining depended on wage laborers, companies facilitated a robust local working class. Industrial operations created an employment market that drew workers from throughout Colorado and other states. Cycles of boom and bust required that workers be mobile, by contrast with agrarian sectors. Furthermore, boom tended to draw laborers from a variety of ethnic backgrounds and traditions. The result was a mobile, adaptable, and diverse society. The mining industry can reveal much about themes of class, ethnic heritage, gender, and demography.

Regarding *Engineering*, San Juan County's mining industry innovated technological and engineering developments not only adopted by the greater mining world, but also in other industries and public sectors. Some county mines were among the earliest in Colorado to employ mechanical rock drills. The county was a center for tramway engineering and featured some of

the longest and most complex systems prior to 1920. A consortium of companies and the town of Silverton contributed to the development of electrical technology in general and specifically as applied to mining. In response to the extreme environment of the San Juan Mountains, engineers structurally designed buildings capable of withstanding tremendous natural forces, such as snow load, gale-force winds, and avalanche. The county was further a cradle for the strategy of producing low-grade ore in economies of scale through advanced engineering. Large companies pioneered the practice during the early 1890s and continued to refine it, rendering previously uneconomical ores profitable to produce and extending the viability of individual mines and even entire mining districts. Given that most county mines represented points along a spectrum of engineering and technology, no single operation may encapsulate all the above trends.

Hardrock Mine Registration Requirements

Shaft and tunnel mines range from small and simple to large and complex. As small mines are common resources, Barbara Wyatt's 2009 National Register White Paper "Evaluating Common Resources for National Register of Historic Places Eligibility should guide their evaluation. Large mines are much less common and may have contributed to the development of engineering or technological innovations. The eligibility of hardrock mines is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Hardrock mines eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. Hardrock mines may be eligible under Criterion B provided they reflect the direct and active contribution in the life of an important person or persons. To be eligible under Criterion C, a resource must clearly represent a tunnel or shaft mine. Because equipment and buildings may have removed when mines were abandoned, archaeological features may represent the operation. A site should reflect material evidence clearly conveying the mine's functional layout and surface plant design or individual components. Intact buildings, structures, and machinery are rare examples of the adaptation of engineering, technology, and architecture to mining. Some may reflect adaptation to the difficult environmental conditions high-altitude mining. Character-defining features of shaft mines may include remnants of the hoisting system, blacksmith shop, buildings, ore bin, or other facilities. Features of tunnel operation may include remnants of the tunnel house or shop, ore bin, machinery, or ancillary facilities. Hardrock mines may also be eligible under Criterion C if the resource possesses intact architectural or engineering features reflecting a type, period, or method of construction associated with mining. Hardrock mines may further be contributing elements of historic mining landscapes or larger districts.

If a site possesses structures and buildings, detailed examination may reveal how mining companies adapted conventional mining architecture and engineering to high-altitude conditions. Individual systems often lend themselves to detailed studies, and examples include compressed air, steam, hoisting, and ore sorting. Accessible and intact underground workings are an important source of information because few formal studies have been carried out regarding the underground work environment, engineering, equipment, and practices. Currently, historical

references are the principal body of information that researchers rely on for studying aspects of mining. Documentation of underground workings will contribute material fact to this arena of inquiry.

Hardrock mines may be eligible under Criterion D, especially when buried archaeological deposits, such as privy pits, thick boiler clinker dumps, and refuse layers in waste rock dumps may be present. Deposits amid a mine surface plant may include artifacts capable of enhancing current understanding of daily worker behavior, diet, and residence. In general, large mine sites tend to possess at least one of the features noted above. Small mine sites, by contrast, may lack buried deposits of substance or intact buildings and systems.

Integrity of design, setting, feeling, and association is particularly crucial to the eligibility of these resources. For a resource to retain integrity of *design*, material evidence, including archaeological features, must convey the mine's organization and engineering. In many cases, mines developed episodically, with new operators changing and adapting surface facilities as needed. In such cases, a resource reflects the evolution of surface facilities over time. To retain integrity of *setting*, the surrounding area must not have changed a great degree from its Period of Significance. In terms of *feeling*, the resource should convey the sense of historic mining operations. Integrity of *association* exists where buildings, structures, machinery, or other features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern the historic mining operation.

Features Common to Hardrock Mine Resources

Mine sites may possess an array of archaeological, engineering, and architectural features representing the surface plant. To help researchers identify and understand the features, their types are listed below according to the common systems that historically comprised surface plants. Because mines shared many of the same facilities as prospects, the features in common are not repeated below. Instead, the researcher should refer to Prospect Site Feature Types for additional context.

General Feature Types

Adit: A horizontal opening usually less than 3' x 6'. Collapsed adits manifest as linear areas of subsidence. Tunnels were larger horizontal openings greater than 3' x 6'.

Building Platform: A flat area upon which a building stood. If possible, the type of building should be specified in the feature description.

Cribbing: A latticework of logs usually intended to be filled with waste rock or earth. Some cribbing structures served as retaining walls for platforms and waste rock dumps, and others were foundations.

Explosives Magazine: Organized mining outfits erected magazines to store explosives away from a mine's surface plant. Some magazines were dugouts, some were stout stone structures, while others were no more than small sheds much like dog houses.

Machine Foundation: A timber, masonry, or concrete foundation for an unknown type of machine.

Mine Track: A rail line that facilitated the movement of ore cars around a mine.
Mine Track Remnant: When a rail line was dismantled, workers often left ties, impressions from ties, portions of rails, and the rail bed.
Pipeline: An assembly of pipes usually intended to carry water. Pipelines should not be confused with compressed air mains, which extended from a compressor into the underground workings.
Pipeline Remnant: When disassembled, pipelines left evidence such as linear depressions, series of footers, and lengths of pipe.
Privy: Most mines of substance featured a privy for the crew's personal use. Privies usually are small frame buildings with a door in the front and a bench inside with one or several cutouts for toilet seats. The buildings were vernacular in construction and stood on foundations of logs, lumber, or rocks over a pit.
Privy Pit: A privy pit was the waste receptacle underneath a privy building. When a pit was full, workers relocated the building, sometimes threw refuse into the depression, and covered it with a cap of earth or waste rock. Pits tend to manifest today as depressions less than 5' in diameter, often with artifacts and other materials in their walls and bottoms.
Refuse Dump: A collection of hardware, structural materials, and other cast-off items.
Road: Roads were graded for wagons and trucks and were usually at least 8' wide.
Shaft: A vertical or inclined opening underground usually at least 4' x 8' in area. Some shafts were divided into compartments. The largest compartment was the *hoisting compartment* and the smaller (usually less than 3' wide) was the *utility compartment*. Highly productive mines may have featured shafts with two hoisting compartments and one utility compartment. Evidence of a double-drum hoist should be associated with a three-compartment shaft. Collapsed shafts manifest as funnels of subsidence.
Shaft House: A shaft house was a large building that enclosed the shaft collar, the hoisting system, and usually a shop. Large shaft houses may have also encompassed an air compressor. Mine tracks extended away from the shaft and passed out of the building. Like typical mine buildings, shaft houses were vernacular in design and construction. They had no recognized architectural style, were assembled from available materials, and were built for function. Although each was unique, they were based on a handful of forms conventional to the mining industry. The most basic was rectangular in footprint with a front-gabled or shed roof and a cupola for the headframe. Large shaft houses may have been L-shaped, cross in plan, or possessed multiple extensions. The roof was highest over the headframe and sloped down toward the hoist. Logs were commonly used for small buildings prior to 1890, and lumber for large shaft houses as early as 1880.
Shaft House Platform: Shaft houses usually stood on leveled platforms of earth or waste rock. When dismantled, shaft houses left distinct footprints surrounding evidence of the hoist, boiler, and shop. Differences in soil types and consistencies can reflect a shaft house's footprint. Large shaft houses often stood on rock foundations that can define the structure's perimeter.
Shaft House Ruin: The collapsed remains of a shaft house.
Stable: Prior to the 1920s, mining companies relied on draft animals for both underground and surface transportation. The companies erected stables to house the animals, and the buildings

were often crude, low, and erected on poorly leveled ground. Distinguishing characteristics include wide doorways, feed mangers, and oat boxes.

Stable Ruin: The collapsed remnants of a stable.

Timber Dressing Station: Timber dressing stations were work areas where miners reduced logs into timbers for underground support. Most stations were outdoors near the mine opening, and they tend to be represented by collections of raw logs and numerous cut wood scraps. Some were within the shaft house or tunnel house.

Timber Stockpile: A stockpile of mine timbers, often located near the mine opening. Mine timbers are usually 6' to 7' long and notched at both ends.

Trestle: A structure that supported a mine rail line, walkway, or pipeline. Workers often built small trestles on the flanks of waste rock dumps to support dead-end rail lines.

Trestle Remnant: Posts, single piers, or partial stringers left from a trestle.

Tunnel: A tunnel was a horizontal entry underground 3' x 6' (interior dimensions) or larger. Collapsed tunnels often manifest as linear areas of subsidence, possibly with pipes or rails projecting outward.

Tunnel House: A tunnel house was a building that enclosed the tunnel portal, a shop, and a ventilation blower. A mine track, and sometimes a trench or flume to divert drainage water, passed through the building. Large tunnel houses may have also encompassed an air compressor and timber dressing station. Like other mine buildings, tunnel houses were vernacular in design and construction. They had no recognized architectural style, were assembled from available materials, and were built for function. Although each was unique, they were based on a handful of forms conventional to the mining industry. The most basic was a rectangular footprint with a gabled or shed roof. Large tunnel houses may have been L-shaped or possessed several extensions for the shop and machinery. In general, logs were commonly used prior to 1890, and lumber as early as 1880.

Tunnel House Platform: Tunnel houses commonly stood on cut-and-fill platforms graded at the tunnel portal. Large versions often had rock or concrete foundations. The platform or foundation, as well as differences in soil types and consistencies, can reflect the building's footprint. Artifacts and machine foundations can reveal the types of facilities that the building enclosed.

Tunnel House Ruin: The collapsed remains of a tunnel house.

Utility Pole: A pole that supported an electrical or communication line.

Ventilation Blower: Many operations employed ventilation blowers to force fresh air underground. They usually located the blower adjacent to the mine opening and attached an assemblage of ventilation tubes that extended underground. Large blowers had to be anchored to foundations, and most were belt-driven by an adjacent motor or steam engine.

Ventilation Blower Foundation: Blower foundations usually consisted of timbers, were 3' x 4' in area or less, and featured four anchor bolts. The foundations were embedded in the ground adjacent to the mine opening. A motor or small steam engine that powered the blower was usually bolted to an adjacent foundation.

Compressed Air System Feature Types

Air Compressor: An air compressor was a machine that compressed air that was piped underground to power rock drills. Mining companies employed a variety of types that rose and fell in popularity between the 1870s and 1940s.
Air Compressor Foundation: Because of their great weight and powerful motion, air compressors had to be anchored to solid foundations. Workers often constructed timber foundations for small compressors and used either rock or brick masonry, or concrete for large models. Based on a foundation's footprint, the researcher can often determine the exact type of compressor.
Compressed Air Main: A pipeline that carried compressed air from a compressor into the underground workings.
Compressor House: Limited primarily to large mines, a compressor houses enclosed an air compressor and its receiving tank. If the compressor was steam-driven, then the building also usually enclosed the boiler. The buildings were vernacular in design and appearance.
Compressor House Platform: Compressor houses stood on platforms graded with waste rock or cut-and-fill methods. The platform should feature a compressor foundation, a motor mount or boiler setting ruin, and an artifact assemblage consisting of machine parts and pipe fittings.
Compressor House Ruin: The collapsed remains of a compressor house.

Hoisting System Feature Types
Headframe: Mining operations erected four general types of headframes to meet the needs of ore production. The first is an enlarged version of the two-post gallows discussed above with Prospect Shafts. The second was the *four-post derrick*, which consisted of four posts joined with cross-braces and diagonal beams, all supported by two back braces. The third is the *six-post derrick*, which featured six posts instead of four. The last is a large *A frame*. Production-class headframes were more than 30' high and stood on well-built timber foundations.
Headframe Foundation: Production-class headframes required solid foundations surrounding the shaft. The foundations were usually buried with waste rock ballast for stability and hence were embedded in the ground. Several structures were common. One was a squat timber frame, and the other was carefully leveled log cribbing. Concrete was occasionally used. The headframe was fastened to timber footers extending toward the hoist. The foundation's length usually equaled the headframe's height.
Headframe Ruin: The collapsed remnants of a headframe.
Hoist: To meet the needs of ore production, mining companies engaged in production almost always employed power hoists.
Hoist Foundation: Few shaft mines retain their hoists and instead feature foundations, which are distinct today.
Hoist House: See Prospect Site Feature Types.
Hoist House Platform: See Prospect Site Feature Types.
Hoist House Ruin: See Prospect Site Feature Types.

Power System Feature Types

Boiler: Many small, marginal mining operations employed portable boilers to power hoists and minor pieces of equipment, as did prospect outfits. However, mining companies wishing for a permanent, efficient source of steam usually installed return-tube boilers.

Boiler Foundation: Boilers were usually dismantled when a mine closed, and in some cases, the masonry setting was removed as well. Distinct pads and footers may remain, and the type of boiler can be determined from this foundation. Artifacts such as ash, clinker, and scorched rocks and bricks are usually associated with boiler foundations.

Portable boilers left the most elementary foundations. Vertical boilers stood on dry-laid brick or stone pads, and workers arranged rock alignments for the skids of locomotive units. Some locomotive boilers lacked skids and instead were supported by simple rock or brick pylons, discussed above under prospects. Typical return-tube boiler foundations were, flat, rectangular, and around 10' x 22' in area. Workers usually used rocks, although well-funded companies substituted bricks. In many cases a foundation may still retain the *bridge-wall*, which was a low row of bricks that forced flue gases against the boiler's belly. When visible, the bridge-wall crosses the foundation near its center.

Boiler Setting Ruin: When workers dismantled return-tube boilers, they almost always left the masonry foundation in situ. Collapsed settings range in appearance from mostly intact walls to mere piles of rubble. With some examination, the researcher may be able to determine the boiler type and location of the firebox. If the walls are intact, a ruin may feature the masonry bolts that anchored the façade, and the posts that supported the boiler shell. Most setting ruins also feature a bridge-wall, which was a low brick divider in the setting's interior. The wall usually stood between the firebox and the smoke chamber, and it forced flue gases up against the boiler's belly. Most return-tube boiler settings consisted of common bricks or rocks, and they featured cleaning ports near ground-level. Well-capitalized companies often lined fireboxes with fire bricks.

Boiler Clinker Dump: When workers shoveled residue out of a boiler's firebox, they usually dumped the material on the waste rock dump near the boiler. Boiler clinker dumps tend to be distinct and consist primarily of boiler clinkers, which are dark, scorious, ashy clasts created by burning coal. Boiler clinker dumps also usually include charred slate fragments, unburned bituminous coal, and structural and industrial hardware.

Motor: The common motor consisted of a cylindrical body, a belt pulley, and electrical wiring. Most motors were less than 4' x 5' in area.

Motor Foundation: Due to great weight and stresses created by motion, workers anchored motors to stout concrete foundations usually less than 4' x 5' in area. Foundations tend to be slightly rectangular, feature four to six anchor bolts, and are aligned with the machine that the motor powered.

Transformer House: Companies that employed electricity for lighting and power often erected transformer houses to shelter electrical equipment. They usually located the buildings away from the rest of the surface plant in case of fire. Transformer houses are relatively small, rarely exceeding 30' x 30' in area, and usually feature brackets and mounts on posts for the

transformers, as well as ports in the walls and numerous insulators for wires. Construction is vernacular, and form may be shed or gabled.
Transformer House Platform: Workers usually erected transformer houses on cut-and-fill platforms that possess telltale artifact assemblages of electrical items. Examples include cast iron transformer cases, porcelain or slate switch panel fragments, fuses, porcelain insulators, high-voltage porcelain insulators, glass insulators, and wires.
Transformer House Ruin: The collapsed remnants of a transformer house.

Ore Storage and Processing Features
Ore Bin: Mining outfits erected ore bins to contain payrock for shipment. Ore bins could be of the sloped-floor variety or open, flat-bottom structures.
Ore Bin Platform or Foundation: A platform or foundation that supported an ore bin. Open, flat-bottom bins usually stood on a platform located on the flank of a waste rock dump so workers could dump payrock from an ore car. Sloped-floor bins usually stood on a combination of a platform, which supported the bin's head, and log or timber pilings that supported the remainder.
Ore Bin Ruin: The collapsed or partial remnants of an ore bin.
Ore Chute: A chute that directed payrock into an ore bin or into a vehicle.
Ore Chute Remnant: The collapsed remnants of an ore chute.
Ore Sorting House: Ore sorting houses were complex structures that featured an ore bin at bottom, an overlying sorting room, and bins or chutes at top to receive raw ore.
Ore Sorting House Platform or Foundation: Platforms and foundations for sorting houses usually appear similar to those built for ore bins. The difference can manifest as discrete piles of large waste cobbles flanking the foundation. The piles are often different in appearance from the rest of the mine's common waste rock, and often consist of rough cobbles uniform in size.
Ore Sorting House Ruin: The collapsed remnants of a sorting house.

Shop Feature Systems
Backing Block: Some shops featured backing blocks to help workers sharpen the drill steels used by rock drills. A backing block consisted of an iron rod 4" x 4" or less in cross-section and up to 8' long embedded in the shop floor near the forge. The block's surface featured a series of deep divots where the blacksmith rested the drill-steel's butt, and he leaned the drill steel's neck against an anvil to brace the item for sharpening. Many mining outfits substituted a railroad rail for the iron rod.
Drill-Steel Sharpening Machine: During the 1910s, well-funded mining companies began adopting compressed air-powered machines to automate the process of sharpening drill-steels. Most sharpeners were upright units 2' x 3' in area, 3' to 5' high, and featured an assemblage of clamps and power hammers mounted on a cast iron pedestal. Sharpeners were always located in a shop.
Drill-Steel Sharpening Machine Foundation: Because drill-steel sharpening machines destroyed unpadded concrete foundations over time, they were usually bolted to foundations consisting of

timbers or timber footers over concrete. Sharpener foundations are always located in a shop or on a shop platform, are usually 2' x 3' in area, and possess four to five anchor bolts.

Forge: Almost every mine shop featured a forge where blacksmiths heated iron. Several types of forges were popular, and most were 3' x 3' in area and 2' high. The *gravel-filled rock forge* consisted of dry-laid rock walls, the *wood box forge* had plank walls, and both were filled with gravel. The free standing *iron pan forge* featured an iron pan supported by iron legs. Companies that required high volumes of work also installed cylindrical and square iron box forges usually 4' x 4' in area.

Forge Remnant: Over time, rock and wood box forges decay, leaving mounds of gravel that often feature anthracite coal, clinker, and forge-cut iron scraps.

Lathe Foundation: Some mechanized shops featured a lathe to facilitate metal- and wood work. Lathes were usually bolted to parallel timbers around 2' x 8' in area or less.

Power Hammer Foundation: Mechanized mining companies installed power hammers to expedite metalwork. Many power hammers consisted of obsolete rockdrills bolted to timber posts, and they pounded items clamped to underlying tables. When removed, power hammers may be denoted by a heavy timber post up to 6' high and an adjacent timber stump where the table was located.

Shop: Nearly every mine had a shop for the manufacture and repair of tools, hardware, and machinery. Shops included blacksmith facilities at the least, some were equipped with power-driven appliances for advanced work, and many were equipped for basic carpentry. To minimize handling of heavy iron, mining companies built their shops near the mine opening. Shop buildings followed several basic vernacular forms in construction, appearance, and design. Most were custom facilities, built as needed with available materials, and planned according to a company's interpretation of function and efficiency. Prior to the 1890s, shops tended to be simple, rectangular, and had blacksmithing equipment in a major portion and a carpentry area in the rest. Many were of log construction, but mining companies preferred frame construction. During the 1890s, shops increased in size to accommodate more appliances, and by the 1900s, corrugated sheet iron grew in popularly for siding and roofs.

Shop Platform: Shops almost always stood on platforms of leveled earth or waste rock. When the building was removed, a distinct platform usually remained. An artifact assemblage including forge clinker, pieces of hardware, forge-cut iron scraps, cut pipe scraps, and cut wood scraps can help identify a shop platform.

Shop Ruin: The collapsed remains of a shop.

Shop Refuse Dump: A concentration of shop refuse generated by sustained blacksmithing and metalwork. The artifact assemblage is distinct and consists of forge clinker, forge-cut iron scraps, cut pipe scraps, and pieces of hardware. Carpentry shops left an abundance of cut wood scraps, sawdust, and hardware.

PROPERTY TYPE: AERIAL TRAMWAY

Aerial tramways were mechanized transportation systems that allowed companies to develop mines in some of the most difficult physical environments. Engineered with precision and built to exacting specifications, tramways bore ore from mine to receiving point over difficult terrain and in all weather. Although these systems required an initial investment of capital and labor, they ultimately lowered transportation costs. This asset factored heavily into San Juan County's mining industry's increased productivity from the 1890s through the 1930s. Tramways, especially advanced systems, facilitated production in economies of scale, and mining companies were able to generate higher volumes of low-grade ore from inaccessible deposits than was otherwise possible. Due to companies' broad success with these systems, they built more locally than most other mining regions nationwide. Coupled with the sophistication of systems like the Silver Lake and Sunnyside, San Juan County emerged as a recognized center of tramway engineering.

The county's mining industry favored four types of tramways, each related to variables of capital, production, and the skills of engineer and crew. The tramways, further described as Property Subtypes below, are the: single-rope reversible, double-rope reversible, Hallidie single-rope, and Bleichert double-rope. Although the types varied in scale, capacity, and cost, all shared a basic template. Tram buckets rode cables between an upper terminal at the mine and a lower terminal at a receiving point. Miners input ore into a bin at the upper terminal and transferred it into the tramway buckets, which carried the material to the lower terminal. There, workers emptied the buckets into another bin, sent the empty vehicles back up to the mine, and repeated the process. In the case of smaller operations, the lower terminal was often a shipping point where wagons carted the ore for the last leg of its journey to a mill or the railroad. At larger operations the terminal was often attached to a mill, and the tramway provided an important all-season link to the mine. When possible, tramways should be recorded with their associated mines or terminus stations. They can be recorded as independent resources, however, when other elements of a comprehensive system have been lost.

Aerial Tramway Subtypes

Single-Rope Reversible System: The single-rope reversible system was the simplest and least costly tramway. The builder had to be skilled in field engineering but did not need formal training in mechanical systems. Single-rope tramways were the first systems built in the San Juan Mountains, beginning with the Little Giant in 1871, and saw use through the 1950s. Their light duty and short range limited them to smaller outfits.

The single-rope tramway consisted of little more than a fixed cable descending from an ore bin down to another bin at the bottom terminal. A bucket, suspended from a pulley, rode the cable back and forth. When the bucket was empty, a worker winched it up to the mine with a second cable, and when the bucket was full, he lowered it via a hand brake. On some tramways, the winch was at the bottom terminal and the rope passed around a wheel at the top for mechanical advantage. The terminals consisted of little more than the two bins, possibly covered by roofs, with anchors for the cable. The top bin featured a mount for the winch and a chute for

loading the bucket. The bottom bin had a plank platform so a worker could dump the ore. Winches ranged from hand-turned units to steam or gasoline hoists. As a resource type, extant single-rope reversible tramways are uncommon. Resources with intact engineering features, such as hardware and structures, are rare and may be significant examples of their type.

Double-Rope Reversible System: The double-rope reversible tramway operated much like the single-rope system, but its dual ore buckets increased carrying capacity. It remains uncertain when double-rope tramways were first introduced to the county, but they were in use by the 1890s. Also known as a *jig back tramway*, the double-rope system featured two buckets that rode over stationary track cables in a balanced fashion. At the mine a worker lowered a full bucket down to the bottom terminal with a hand brake, and it pulled the lighter, empty vehicle up to the top terminal. The cable connecting the buckets wrapped around a sheave wheel anchored to a heavy timber frame in the upper terminal. The wheel featured a flange for the brake shoe. Towers of frame construction were sometimes necessary to support the track cables on lengthy spans. As with the single-rope system, terminals consisted of little more than bins. However, each terminal had two bins with chutes, one for each bucket.

The system was inexpensive and within the technological grasp of experienced miners, making it ideal for companies with limited capital. Although the mining outfit only had to pay for hardware and installation, terminals required design and planning, even if informally and in the field. Often, terminals were vernacular in design and construction. The builder adapted the general double-rope template to the mine's surface plant and environment. Hardware may have been factory-made for the purpose, adapted from other uses, or salvaged from idle mines. Construction materials were either ordered according to the tramway's custom specifications or scavenged from elsewhere. As a resource type, extant double-rope reversible tramways are uncommon. Those resources with intact engineering features, such as hardware and structures, are rare and may be significant examples of their type. Archaeological potential may exist at other sites.

Hallidie Single-Rope System: The Hallidie system derived its name from the endless cable loop extending between top and bottom terminals. The loop rotated around sheave wheels in the terminals, carrying numerous buckets around the circuit. The system was mechanized in conjunction with a gravity operation, moving ore in a constant flow. With a series of frame towers supporting the cable and buckets, the tramway could be extended for thousands of feet over varied terrain, allowing a company to link an inaccessible mine with a shipping point or mill.

The buckets affixed to the cable were in constant motion, thus the design characteristics specific to the Hallidie system. The sheave wheel had to be firmly anchored within a stout frame in both terminals to resist powerful horizontal stress, but clearance around the wheel was required for the buckets. Thus, the wheel rotated on a long axle vulnerable to wrenching and distortion. When empty buckets entered the top terminal, workers loaded them with payrock while the buckets were in motion. The buckets then passed around the sheave, traveled down to

the bottom terminal, and dumped their contents into a receiving bin. The towers featured pulleys or idler wheels to support the cable between spans, and a single cross-member at the tower crown provided a sufficient mount.

Hallidie systems saw limited use in the county because they were expensive, required exacting engineering, and were supplanted by the superior Bleichert design by the early 1890s. Hallidie systems combined vernacular and professional design and construction. Rarely were experienced miners, and even formally trained mining engineers, able to design and install a Hallidie system unassisted. Instead, a mining company often consulted a tramway manufacturer, who adapted system requirements to the specifics of the mine and its environment. The strict tolerances of the system's components, such as terminal structures and tower alignments, required integration and design by an engineer specialized in tramways. But these engineers were limited in some cases by the available construction materials, talent of local contractors, and budget of the mining company. As a resource type, extant Hallidie tramways are rare. Those resources with intact engineering features, such as towers and aspects of the terminals, are significant examples of their type. Archaeological potential may exist at other sites.

Bleichert Double-Rope System: The Bleichert tramway was based on the Hallidie design, but offered several important improvements. As the name implies, the Bleichert double-rope system featured two sets of cables to Hallidie's one. A stationary track cable linked the top and bottom terminals, as supported by a series of towers like the Hallidie system. A separate cable loop known as a traction rope pulled the buckets along a continuous circuit. The system was mechanized, usually operated under gravity, and moved ore in a constant flow. Unlike Hallidie tramways, the buckets were not permanently fixed to the traction rope and instead had a releasable grip. When buckets arrived in the top terminal, workers detached them, stopped their motion, pushed the buckets around the terminal interior on suspended rails, and filled them at leisure without spillage. When in motion, the traction cable tugged the buckets, which rolled along the fixed track cable on hangers with pulleys.

Because of the two cables, Bleichert systems had several performance advantages. They could work at almost any pitch, be up to four miles in length, and carry high tonnages of ore. Although Bleichert systems were more expensive than Hallidie tramways, they were more advantageous for heavy production for these reasons. The two cable sets and detachable grips resulted in design characteristics specific to Bleichert systems. The sheave wheel was enclosed on all sides in a heavy timber frame that could stand independently from the rest of the terminal's support structure. The loading area within the terminal was open, and a steel hanging rail for the buckets bolted to overhead stringers. The towers featured a single cross-member at top for the track cables and another cross-member 4' to 8' below for the traction cable's pulleys or idler wheels. Bleichert systems were the most widely used mechanical tramway in the county, even though they were expensive and required exacting engineering. Bleichert systems combined vernacular and professional design and construction in the same way as Hallidie tramways discussed above. As a resource type, extant Bleichert tramways are rare. Those resources with

intact engineering features, such as towers and aspects of the terminals, may be significant examples of their type. Archaeological potential may exist at other sites.

Aerial Tramway Significance

Broadly speaking, tramways saw use throughout most of San Juan County's productive hardrock mining era. Dempsey Reese and partners erected the first locally and in greater southwestern Colorado in 1871 for the Little Giant Mine. Outfits continued to employ tramways on a limited scale as late as the 1960s. As a resource type tramways were significant during narrower timeframes as defined by the above-described Periods of Significance. Tramways began to play a key role in the county's mining industry in 1890, when systems at the Titusville and other mines demonstrated the value of the technology. Tramway installation increased exponentially over the next ten years and contributed materially to the mining industry's ongoing success. Tramways were in common use throughout the county by the early 1900s. The systems facilitated development of inaccessible properties and production of low-grade ore in economies of scale. When the industry declined sharply in 1921, so did the centrality of tramways. Tramways again became significant during the Depression era mining revival. However, by the 1940s, truck transportation replaced tramways at many large operations.

Specific Areas of Significance may apply tramway resources during discrete Periods of Significance. Regarding Industry and Transportation, tramways influenced the physical footprint of the mining industry as well as its rate of production. As a general transportation system, tramways allowed companies to develop properties and extract ore from otherwise inaccessible locations. Although development and production are related, development was an initial phase in advance of actual ore production, and more mines were developed in the county than yielded ore. Property development was a major source of employment, and expenditures stimulated the economy. Ore production, essential to industry success, was greatly enhanced by tramways. Further, tramways facilitated development of some remote mines into the county's largest producers, exemplified by the Silver Lake and Sunnyside mines. Tramways were instrumental in the production of low-grade ore in economies of scale, shuttling huge tonnages at little cost. In part due to tramways, previously uneconomical grades of ore became profitable to produce. By extracting and moving high volume of ore, tramways extended the lives of individual mines. In summary, tramways were central to the county positioning among Colorado's most productive regions during the Periods of Significance noted above.

Tramways were also significant in the area of Engineering as the county was recognized as a center for tramway use featuring some of the longest, most advanced, and innovative systems in the west. Individual systems such as the Silver Lake and Gold Prince particularly contributed to the field of tramway engineering, while other large systems served as proving grounds for engineers to solve problems such as linking segments, angling around or over mountains, developing hardware, and assembling functional systems amidst difficult environmental conditions. On a broader level, tramway systems of various sizes globally contributed to mechanical engineering as a general field. Engineers adapted large-scale design

templates, mechanical principles, types of structures, and standardized hardware to the unique conditions of mining in the San Juan Mountains.

Finally, tramways contributed to the field of systems engineering, especially in the mining industry. The operation of a mine, production of ore, transportation of material to a mill or shipping point, and processing was a large-scale comprehensive system. Tramways provided the critical link of transportation as coordinated within a holistic operation. In a fundamental physical sense, the tramway interfaced with a mine's activity requirements as related to input of supplies and output of ore. Overall, the system had to function efficiently in a continuous flow of materials. Variables included design, carrying capacity, speed of operation, and communications between the top and bottom terminals. Systems management also included economic factors. The engineer had to consider construction and maintenance costs as juxtaposed with resultant benefits.

Aerial Tramway Registration Requirements

Aerial tramways range from small simple single-rope iterations to large Bleichert systems of documented significance. The eligibility of aerial tramways is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Aerial tramways eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county.

Tramways may be eligible under Criterion B provided they reflect the direct and active on-site contribution in the life of an important person or persons. Some tramways, especially large systems, can be traced to particular engineers and construction contractors.

To be eligible under Criterion C, a resource must clearly represent a type of aerial tramway. Because equipment and buildings may have removed when mines were abandoned, archaeological features may represent the system. A site should posses material evidence clearly conveying the system design, end points, or individual components, such as tower locations. Intact buildings, structures, and hardware are rare examples of the adaptation of engineering, technology, and architecture to mining. Some may reflect adaptation of tramway engineering to the difficult environmental conditions high-altitude mining. Character-defining features of tramways may include foundations or platforms for towers and terminals representing the tramway alignment in total. If the terminals were components of larger buildings, such as an ore sorting house at the mine or a mill at the bottom end, the terminal itself need not be fully distinguishable if that larger building is no longer extant. Material evidence of the larger building, however, should be present. Extant short single and double-rope reversible tramways may lack integrity, while larger systems often possess more compelling extant archaeological, architectural or engineering features clearly conveying aspects of the system in total. In summary, tramways may be eligible under Criterion C if the resource possesses intact architectural or advanced engineering features reflecting a type, period, or method of

construction associated with mining. Tramways may further be contributing elements of historic mining landscapes or larger districts.

Tramways may be eligible under Criterion D, especially when system hardware, structures, buildings, or their remnants may reveal aspects of tramway engineering. Single and double-rope systems may provide information about small-scale ad hoc engineering and the skills of untrained but experienced miners. Large systems may provide general information regarding professional mechanical engineering and its adaptation to local operations. Large systems may enhance current understanding of contemporary construction practices, coordination of materials, and operations in high-altitude conditions.

Integrity of design, setting, feeling, materials, and association is particularly relevant to the eligibility of these resources. For a resource to retain integrity of *design*, material evidence, including archaeological features, must convey the tramway's alignment and engineering. In many cases, tramways developed episodically, with new operators changing and adapting facilities as needed. In such cases, a resource reflects the evolution of surface facilities over time. To retain integrity of *setting*, the surrounding area must not have changed a great degree from its Period of Significance. In terms of *feeling*, the resource should convey the sense of historic mining operations. Integrity of *association* exists where buildings, structures, machinery, or other features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern the historic mining operation.

Features Common to Aerial Tramways

Ore Bin: Top terminals had bins for the input of crude ore onto the system and more bins to receive it at the bottom terminals. The bins were sloped floor types described above with mines.
Ore Bin Platform or Foundation: See mine Property Types above for a description.
Sheave Frame: All tramway types except for single-rope reversible systems had sheave wheels in the terminals for the traction cables. The sheaves were large-diameter iron wheels that spun on axles bolted to stout timber frames. On double-rope and Bleichert systems, the frame encompassed the wheel, while it left clearance around wheels for Hallidie systems. The frames were usually rectangular, cubic, with several layers of stringers tied with vertical posts. Diagonal buttresses braced the frame against horizontal forces.
Terminal Frame: Formally designed terminals had independent frames that supported the building and its components, often separately from the sheave frame. The frames were vernacular in design in that they were adapted to the conditions, needs, and performance of the system, and its integration with the mine. Frames for Bleichert systems had hanging rails for the tram buckets bolted to the ceiling beams. The foundation was of concrete or timbers anchored to bedrock, and may have featured guides to direct the track cables to their anchors.
Terminal Building: The terminal building, usually custom-designed, encompassed the tram mechanism, braking station, and open floor where workers loaded or emptied tram buckets. Buildings were vernacular in construction, adapted to the environment, topography, and location at the mine. Form varied, but materials were usually lumber framing with corrugated sheet iron.

Tension Station: Lengthy Bleichert tramways consisted of multiple segments that operated independently. Tension stations joined the segments and served several functions. They allowed buckets to move uninterrupted from one segment to another, allowed the overall system to change pitch, and had anchors for the track cables. The stations consisted of timber frames on concrete or rock masonry foundations. Galleries through the structure provided passages for the buckets.
Tension Station Foundation: When dismantled, stations left symmetrical patterns of concrete, rock masonry, and timber footers for the frame. Tram hardware and debris usually lies scattered around.
Tram Tower: Towers supported cables between long spans.
Tram Tower Platform: Towers usually stood on earthen platforms cut out of a surrounding slope. Platforms for small towers were simple flat areas, while those for large towers may have featured rock retaining walls. Heavy structural materials and tram hardware may lie downslope.
Turning Station Foundation: Turning stations allowed lengthy tramways to curve around obstacles such as mountains. Also known angle stations, the structures were a union between two independent segments, and in this regard, were similar to tension stations. Turning stations, however, also required the supervision of workers, sometimes to manually switch buckets from one line to another. Thus, turning stations were usually enclosed by a frame superstructure. The stations were custom-designed.

PROPERTY TYPE: ORE CONCENTRATION FACILITY

One of the main objectives of mining is to reduce ore into its constituent metals. In historic mining operations in San Juan County, the process began with crushing and grinding the ore, followed by separating metalliferous material from waste in a stage known as concentration. The resultant concentrates were sent to a smelter for roasting and melting in furnaces. The smelter yielded an unrefined blend of metals known as matte, and advanced plants located in cities along Colorado's piedmont and in the Midwest refined the matte into pure metals. In general, ores of purity or simplicity required fewer processing steps while complex, refractory ores required time-intensive treatment and numerous steps. In the county, a variety of facilities carried out these processes, operating either as independent mills or in conjunction with specific mines.

Some mining companies erected *concentration mills* to complete the crushing and concentration steps ordinarily carried out by smelters. This saved companies costs in two areas. First, the companies did not incur the high costs of shipping waste-laden ore, and second, they avoided paying fees charged by smelters for complete treatment. Concentration mills, also known as *reduction mills*, produced only concentrates and no refined metals. They processed ores featuring gold, silver, tungsten, and industrial metals. The mills ranged in scale from small facilities to sprawling industrial complexes, and metallurgists based treatment processes on specific types of ore. San Juan County hosted three general categories of concentration mills.

The first and most prominent was the concentration mill, the second was the amalgamation stamp mill, and the third, rarely used after the 1870s, was the arrastra.

Ore Concentration Facility Subtypes

Concentration Mill: A concentration mill was a facility that employed primarily mechanical and occasionally chemical means to separate metalliferous materials from waste. The recovered material was known as concentrates and manifested as mineralized, metalliferous sand and rock dust. Concentration mills existed in a variety of scales and were usually built over a series of terraces incised into a hillslope so that gravity could draw ore through the processing stages. Small mills usually featured only several stages of crushing and concentration, while large mills were heavily equipped to process both great volumes of ore and complex material that resisted treatment.

Engineers usually followed a general template when designing concentration mills. An ore bin stood at the mill's head and fed crude ore into a primary crusher, usually located on the mill's top platform. The resultant gravel descended to a secondary crusher located on the platform below, from where it passed through a screening system. Oversized material returned for secondary crushing and material that passed the screen went on for concentration at small mills or tertiary crushing at large mills. Following another screening, the ore descended to subsequent mill platforms for concentration.

On the concentration platforms, apparatuses such as jigs, vanners, vibrating tables, and settling tanks separated waste known as gangue from the metalliferous material. Depending on the size of the mill and the complexity and volume of the ore, the apparatuses achieved separation in numerous steps. The lowest platforms usually featured the mill's power source and a drier to evaporate moisture from finished concentrates.

Often when a mill was abandoned, structures and machinery were removed, leaving stair-step platforms, machine foundations, and hardware. Tailings left from ore processing were usually flumed to an area downslope from the mill and today may manifest as substantial deposits of finely ground sand and rock flour. In San Juan County, many mills were no more than costly failures, which the absence of tailings often reflects. Every mining district in the county except for Poughkeepsie featured at least several mills. However, due to salvage efforts, tailings removal, alteration, and especially natural decay, very few mill sites remain intact. Archaeological sites may be particularly significant representations of the county's historic concentration industry.

Amalgamation Stamp Mill: Two definitions apply to the term *stamp mill*. Often, concentration mills employed batteries of stamps to provide secondary crushing prior to the separation of waste. In this case the term stamp mill refers to the stamp battery, a component of a concentration mill. However, unusually simple gold ore lent itself to pulverization in a stamp battery prior to being exposed to mercury to recover the metal. A jaw crusher usually provided primary crushing, the stamps carried out the rest of the physical reduction, and the resultant

slurry washed over amalgamating tables at the battery's toe. The tables were coated with mercury, which amalgamated with the gold and allowed the spent tailings to continue out of the mill. Workers periodically scraped off the amalgam and heated the mass in a retort, which volatized the mercury, leaving impure gold to refine. These treatment facilities are generally termed *amalgamation stamp mills*.

Because amalgamation stamp mills featured a fraction of the equipment installed at more complex concentration mills, they tended to be smaller and simpler. Regardless, amalgamation stamp mills shared with concentration mills a few fundamental characteristics. First, because they relied on gravity to draw ore through stages of crushing and metals recovery, metallurgists usually erected stamp mill facilities over terraces cut out of a slope. Second, amalgamation stamp mills usually featured a receiving bin above the primary crusher to hold crude ore destined for processing. Third, the mid-level or lower platform featured the power source, often a horizontal steam engine and boiler. Last, the mill required a water source. It should be noted that engineers installed tertiary crushing and possibly concentration appliances in some amalgamation stamp mills, which better prepared the ore and recovered any gold that escaped amalgamation.

Arrastra: An arrastra was a simple, but inefficient apparatus for recovering metals from ore. An arrastra consisted of a circular stone floor usually less than 30' in diameter with low sidewalls and a capstan at center. A draft animal, tethered to a harness beam fastened to the capstan, walked a path around the stone floor. Drag-stones, chained to the harness beam, ground the ore on the stone floor, where it amalgamated with mercury that a worker introduced. Some outfits substituted water power for draft animals.

Ore Concentration Facility Significance

Ore concentration mills played a key role in the long-term success of hardrock mining in the county because they reduced crude ore into a profitable commodity. Without a local means for treating ore, mining companies would have been limited only to those grades of payrock that were profitable enough to ship to distant smelters, and such material was in limited supply. From the 1880s through the 1920s, the industry repeatedly improved the methods for recovering metals from the county's notoriously difficult and complex ores. As a result, the mills rendered low grades of ore profitable and allowed mining companies to shift from producing silver and gold to lead, zinc, and copper. This greatly prolonged mining, helped the industry adapt to changing metals markets, and directly supported the county's international reputation as a center of innovation and technology. Without effective mills, the mining industry might have failed. Historic concentration processes were characterized by three principal categories of facilities.

Concentration Mill: Concentration mills can be associated with several Areas of Significance beginning in the late 1870s and continuing through the 1950s. Regarding Engineering, the county's complex ores defied conventional metallurgical methods proven to be effective in other regions. To render complex ore economically viable, local metallurgists made improvements to

the Stoiber-McCartney vibrating table and Bastian flotation cell in addition to creating new inventions, such as Arthur Redman Wilfley's sand pump and multi-deck vibrating table. These advances proliferated throughout the west.

The county's troublesome ore also provided metallurgists opportunities to refine the entire treatment process. In 1883, David Brunton adapted current practices in the North Star Mill, the first fully successful concentration mill in the county. Edward Stoiber did likewise in 1890, pioneering the treatment of previously unprofitable grades of ore. The Silver Ledge and Sunnyside mills became sites for testing new zinc separation machinery, while flotation was adopted earlier in the county than elsewhere. Each time, metallurgists elsewhere successfully imitated concepts developed in San Juan County. Concentration was the forefront of a movement away from simple and labor-intensive methods to advanced and highly mechanized processes permitting the separation of multiple metals using economies of scale. This involved the coordination of testing and treatment methods, complex mechanical systems, and hundreds of workers in massive facilities. Evolution in economies of scale proved crucial for the state and national mining industry because it rendered previously uneconomical ores profitable, extending the viability of individual mines as well as entire mining districts. Properties associated with these advances may be further eligible in the areas of Industry or Science.

Other Areas of Significance involve themes of Economics, Commerce, and Social History. These areas are relevant to mills as to mines, since the two property types were integrally tied (see above Property Type: Hardrock Mine).

Amalgamation Stamp Mill: These ore treatment facilities were the earliest mechanized type of mill in the county, as well as in greater southwestern Colorado. The Little Giant Mill, the first in the San Juans, was an amalgamation stamp facility erected in 1873. A few other amalgamation stamp mills operated locally during the mid-1870s but few were built subsequently. Thus, the period of significance generally comprised 1873 through 1880. During the 1870s, miners exhausted most simple gold ore that could be easily processed in amalgamation stamp mills, such that they lost favor to concentration mills and smelters.

Regarding significance in the area of Industry, amalgamation stamp mills were instrumental to the success of the county's early hardrock mining industry, if not subsequently as local ore proved unsuitable for amalgamation. During the early 1870s, the county lacked ore treatment facilities, and shipping crude ore to extant mills, mostly on the Front Range, was prohibitively expensive. Local mills emerged as the only profitable means of treating gold ore mined locally. By treating ore at acceptable rates, the mills allowed mining to realize its potential as an industry. As such, amalgamation stamp mills were also significant in the area of Exploration/Settlement for their association with the mining frontier. The industry grew, fostering settlement and facilitating emergence of political, economic, and social systems.

Arrastra: These primitive facilities were the first type of ore treatment mill in the county, as well as in southwestern Colorado. The Little Giant arrastra, built in 1870, was the first in the deep San Juans, and it was followed by several more during the next several years. A few other

arrastras operated in the county during the mid-1870s but were rarely built afterward. Thus, the timeframe of importance was from 1870 until 1880 (Periods of Significance two and three). During the 1870s, miners exhausted most of the simple gold ore that could be easily processed in arrastras, and they lost favor to concentration mills and smelters.

Arrastras share the same function and narrow timeframe of significance as amalgamation stamp mills. Their Areas of Significance are similar, as well, except for a fundamental difference. In the Area of *Exploration/Settlement*, arrastras allowed prospectors and small outfits to test ore and then produce gold in remote and unproven regions. When results were positive, investment, organized companies, and better mills followed, and they became the beginning of industry and settlement.

Ore Concentration Facility Registration Requirements

Ore concentration facilities form a spectrum ranging from small and simple arrastras to large and complex concentration mills. Small and simple mills tended not to participate in important engineering and technological advances, but often provided the vital service of ore treatment in particular districts. By contrast, large complex mills often hosted development of engineering and technology, in addition to providing essential local service. Because concentration mills, amalgamation stamp mills, and arrastras were very different facilities, registration requirements will be discussed individually below.

Ore Concentration Mills:

The eligibility of ore concentration mills is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Ore concentration mills eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. Ore concentration mills may be eligible under Criterion B provided they reflect the direct and active on-site contribution in the life of an important person or persons. Some mills, especially large complexes, can be traced to particular engineers and metallurgists. To be eligible under Criterion C, a resource must clearly represent a type of ore concentration mill. Because equipment and buildings may have removed when mills were abandoned, archaeological features may represent the complex. A site should posses material evidence clearly conveying the system design and engineering, such as terraces, aspects of infrastructure and support facilities. The general ore treatment process should be identifiable. Intact structures and equipment strengthen site eligibility. Buildings may represent the adaptation of design, materials, and construction methods to the conditions of a high-altitude environment. Treatment appliances, or direct evidence thereof, can reflect the adaptation of conventional metallurgy to the complex ore of the San Juan Mountains. In summary, mills may be eligible under Criterion C if the resource possesses intact architectural or advanced engineering features reflecting a type, period, or method of construction associated with mining. Mills may further be contributing elements of historic mining landscapes or larger districts. Mill sites may provide context or constitute discrete landscapes in themselves, especially when tailings dumps are present.

Concentration mills may be eligible under Criterion D, especially in the following cases. Buried archaeological deposits such as privy pits, thick boiler clinker dumps, and refuse layers in tailings dumps may include artifacts capable of yielding information that augments current understanding of workplace behavior and diet. If workers lived on site, residential deposits may further illuminate that social history. Secondly, an assemblage of structures, foundations, or machinery related to the ore treatment process may reveal how metallurgists designed or chose concentration processes for complex ore. Thirdly, extant infrastructure may demonstrate how engineers designed water, power, ore input, and tailings disposal systems. By contrast, small mill sites may lack buried deposits of substance.

Mills were prime targets for salvage of structural materials and machinery when abandoned. The general mill complex, its building locations, flow-path for ore, and infrastructure should be identifiable. The particular crushing and concentration processes can be extrapolated from common features, listed below. Integrity of design, setting, feeling, materials, and association is particularly relevant to the eligibility of these resources. For a resource to retain integrity of *design*, material evidence, including archaeological features, must convey the arrangement of buildings, infrastructure, and general flow-path for ore treatment. In many cases, companies retrofitted mills to improve processing. In such cases, a resource reflects the evolution of facilities over time. To retain integrity of *setting*, the surrounding area must not have changed a great degree from its Period of Significance. In terms of *feeling*, the resource should convey the sense of historic ore treatment operations. Integrity of *association* exists where a site's features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern the historic milling operation.

Amalgamation Stamp Mills:

The eligibility of amalgamation stamp mills is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Amalgamation stamp mills eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. Amalgamation stamp mills may be eligible under Criterion B provided they reflect the direct and active on-site contribution in the life of an important person or persons. Some mills, especially large complexes, can be traced to particular engineers and metallurgists. To be eligible under Criterion C, a resource must clearly represent an amalgamation stamp mill. Because equipment and buildings may have removed when mills were abandoned, archaeological features may represent the complex. A site should posses material evidence clearly conveying the system design and engineering, such as terraces, aspects of infrastructure and support facilities. The primary crusher, stamp battery frame or foundation, and amalgamation tables should be identifiable. Intact structures and equipment strengthen site eligibility. Buildings may represent the adaptation of design, materials, and construction methods to the conditions of a high-altitude environment. Individual pieces of machinery, or their direct evidence, can reflect the adaptation of conventional amalgamation methods to the gold ore of the San Juan Mountains. In summary, mills may be eligible under Criterion C if the resource possesses intact architectural or advanced engineering features reflecting a type, period, or

method of construction associated with mining. Mills may further be contributing elements of historic mining landscapes or larger districts. Mill sites may provide context or constitute discrete landscapes in themselves.

Amalgamation stamp mill sites may be eligible under Criterion D, especially in the following cases. Buried archaeological deposits such as privy pits, thick boiler clinker dumps, and refuse layers in tailings dumps may include artifacts capable of yielding information that augments current understanding of workplace behavior and diet. If workers lived on site, residential deposits may further illuminate that social history. Secondly, an assemblage of structures, foundations, or machinery related to the ore treatment process may reveal how metallurgists adapted conventional amalgamation methods to complex local ore. Thirdly, extant infrastructure may demonstrate how engineers designed water, power, ore input, and tailings disposal systems. Smaller mill sites may lack buried deposits of substance.

Eligible mills should possess physical integrity, most likely relative to the 1870s Periods of Significance. Mills were prime targets for salvage of structural materials and machinery when abandoned. The general mill complex, its building locations, flow-path for ore, and infrastructure should be identifiable. The particular crushing and concentration processes can be extrapolated from common features, listed below. Integrity of design, setting, feeling, materials, and association is particularly relevant to the eligibility of these resources. For a resource to retain integrity of *design*, material evidence, including archaeological features, should convey the arrangement of buildings, infrastructure, and general flow-path of crushing and amalgamation. In many cases, companies retrofitted mills to improve processing. In such cases, a resource reflects the evolution of facilities over time. To retain integrity of *setting*, the surrounding area must not have changed a great degree from its Period of Significance. In terms of *feeling*, the resource should convey the sense of historic ore treatment operations. Integrity of *association* exists where a site's features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern the historic milling operation. Common features encountered at mill complexes are listed below.

Arrastras:

The eligibility of arrastras is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Arrastras eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. However, arrastra sites tend to possess few clearly dateable artifacts and were not thoroughly documented by contemporaries, rendering dates of operation difficult to confirm. As such, unless a timeframe can be established, few arrastras may be eligible under Criterion A. Arrastras may be eligible under Criterion B provided they reflect the direct and active on-site contribution in the life of an important person or persons. However, it may be difficult to document association with particular individuals for these properties. To be eligible under Criterion C, a resource must clearly represent an arrastra's character-defining features. Few if any complete arrastras remain extant, but the circular stone floor should be in situ. Other features including the sidewalls, capstan, mechanized power source, or support facilities strengthen site

integrity. Arrastras may further be contributing elements of historic mining landscapes or larger districts.

Arrastras are likely to be eligible under Criterion D for their potential to yield information, as few arrastras have previously been documented in the Rocky Mountain states. Little is currently understood about how miners constructed and operated the facilities. Surface features and artifacts may enhance current knowledge, and, even when only the floor is visible, arrastras can possess buried archaeological deposits and features that may contribute important details.

Eligible arrastras should possess physical integrity, most likely relative to the 1870s Periods of Significance. Structural elements may have deteriorated or been removed, however, requiring analysis of remaining integrity. For instance, stone floors were often dismantled and surrounding ground excavated and processed for gold amalgam, leaving most resources with insufficient integrity for eligibility. Integrity of design, setting, location, and association are particularly relevant to the eligibility of these resources. For a resource to retain integrity of *design*, material evidence, including archaeological features, should represent the arrastra floor, portions of the power train, and waste disposal methods. To retain integrity of *setting*, the surrounding area must not have changed a great degree from its Period of Significance. In terms of *feeling*, the resource should convey the sense of historic ore treatment operations. Integrity of *association* exists where a site's features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern the historic milling operation. Common features encountered at ore concentration facilities are listed below.

Features Common to Ore Concentration Facility Resources

Mill sites can possess an array of archaeological, engineering, and architectural features that were components of the crushing, concentration, power, and support facility systems. To help researchers understand ore treatment processes, the Feature Types below are arranged according to the general flow path employed at mills.

General Feature Types

Arrastra: An arrastra consisted of a circular stone floor ringed with low sidewalls and a capstan at center. A draft animal tethered to a harness beam bolted to the capstan walked around the floor, dragging stones chained to the beam.

Arrastra Remnant: Arrastra remnants may retain portions of the floor, sidewalls, and capstan.

Assay Shop: Mills usually featured assay shops to track the efficiency of metals recovery and concentration. A metallurgist periodically tested samples of unprocessed crude ore and compared the results with tests on tailings and concentrates. If he found that the metals recovered by the mill approximated the amount in the crude ore, the metallurgist knew the mill functioned efficiently. The assay shop may have been within the overall mill building at small facilities, or provided with its own building at large plants. The shops had distinct appliances such as a free-standing or masonry assay furnace, blower, coal bin, and stout workbenches. Assay shop buildings were usually constructed with the same materials and workmanship as the associated

mill. Most were frame, had ample windows, a chimney for the furnace, and a heavy sub-frame or foundation for crushing machinery. The shops were vernacular in design in that they had no recognized architectural style and were custom-designed for function and economy. A tall brick chimney, machine foundations, and artifact assemblage of assay debris are often distinguishing characteristics.

Assay Shop Foundation/Platform: Assay shops often stood on earthen platforms or foundations of concrete and rock masonry. Distinct characteristics can define a platform as that for an assay shop. Foundations or other remnants of an assay furnace, its blower, and small crushers may remain. Artifact assemblages typically include furnace clinker, fire-bricks, broken assay crucibles, mineral samples, and laboratory artifacts.

Cistern: A concrete, masonry, or timber chamber that contained water for mill use. Because mills usually relied on gravity to pressurize plumbing, cisterns tend to be located upslope from a mill.

Conveyor: Mills relied on gravity to draw ore through a sequence of crushing and concentration machinery installed on terraces. Many designs used conveyors to return the ore to the upper terraces for reprocessing or from one treatment stage to another. Early conveyors consisted of a bucket line or spiral feed, and later conveyors consisted of belts on rollers. A timber or steel frame was the chassis for the assembly.

Conveyor Remnant: A partially disassembled conveyor.

Ditch: An excavation that carried water to a mill.

Flume: A wooden structure usually constructed with plank walls and a plank floor. Workers built flumes to convey water to or tailings away from a mill, or to transfer slurry from one process to another within the mill.

Flume Remnant: The collapsed or buried remnants of a flume.

Machine Foundation: A foundation that anchored an unknown mill machine.

Mill Building: Mill buildings were distinct buildings in the mining landscape. Most enclosed the ore treatment machinery, power source, and other facilities under one roof. The buildings tended to be large, sloped in profile to conform to stair-step terraces or foundations, and irregular in plan. Each mill was unique in design and incorporated elements of engineering. Most were based on a custom-designed frame that not only supported the walls and roof, but also appliances, bins, and the system of driveshafts and belts that ran the machinery. Given this function, most frames varied in design and construction within the mill, but were made of heavy timbers. The foundations for small mills consisted of log or timber footers direct-laid on the ground, while stone or concrete can be encountered at large plants. Well-designed mill buildings stood independently from interior structures such as bins and stamp batteries, allowing for replacement of components. Most, however, were integrated into the interior structures for economy of materials. These vernacular designs prior to the 1910s tended to include board-and-batten siding or walls of mere planks were common, while corrugated sheet iron and tarpaper dominated later.

Mill Building Foundation: Mills stood on stout foundations that not only supported the building, but also machinery and structures within. The foundations had footers around the circumference for the walls and additional footers on the terraces for the frame and machinery. At small mills,

foundations were timber and log embedded in earth. At large mills, the foundations consisted of concrete or masonry and were often integrated with walls retaining the terraces.
Mill Building Ruin: A collapsed mill building.
Mill Platform/Terrace: Because mills relied on gravity to draw the ore through crushing and concentration, they were built over a series of terraces cut out of a slope. Often, the terraces are the principal features representing a mill. Each terrace supported a stage of treatment. When recorded, platforms should ideally be numbered from the top down and described according to function.
Mill Tailings Dump: A deposit of finely ground rock flour and sand usually downslope or downstream from a mill.
Pipeline: An assembly of pipes that carried water.
Pipeline Remnant: Evidence of a disassembled pipeline.
Privy: Most mill complexes included a privy for the crew's use.
Privy Pit: The pit that underlay a privy. Privy pits are often less than 5' in diameter and may feature artifacts visible in the walls and floor.
Pump Foundation: Often of concrete, pump foundations are rectangular, less than 2' x 4' in area, and may feature pipes.
Receiving Bin: Nearly all mills featured an ore bin at the head to receive crude ore for processing. The bins typically had sloped floors and discharge chutes in the front, which directed the ore into a stamp battery or primary crusher. The walls consisted of a timber frame sided on the interior with heavy planks.
Receiving Bin Platform or Foundation: Receiving bins stood on foundations and platforms similar to those for ore bins at mine sites. Timber or log footers embedded in the ground supported the frame, and cribbing or masonry may have supported the head and toe.
Receiving Bin Ruin: The collapsed remnants of a receiving bin, usually jumbled frame elements, plank siding, and foundation footers.
Refuse Dump: A collection of hardware, structural materials, and other cast-off items.
Reservoir: Some milling operations erected dams in drainages to impound water for use.
Utility Pole: A pole that carried electrical or telephone lines.
Water Tank: A large vessel, usually cylindrical, made of planks or sheet iron. To pressurize plumbing, water tanks were usually located near the head of a mill.
Water Tank Platform: Often a circular or semicircular platform for a tank. The platform's floor may feature a pipe.

Crushing System Feature Types
Jaw Crusher: A jaw crusher reduced crude ore from the receiving bin into gravel, completing the first stage of physical reduction. The heavy machine, also known as a Blake crusher, was located on the mill's upper terrace. Crushers usually featured jaws and dual flywheels powered by a belt. Small units were around 2' x 4' in area and large units were up to 4' x 8' in area.

Crusher Foundation: Due to severe vibrations, crushers were often anchored to stout timber or masonry foundations with timber footings. Small piles of crushed gravel often underlie crusher foundations.

Stamp Battery: Early mills relied on stamp batteries for primary crushing. After the mid-1880s, batteries often provided secondary crushing, reducing the gravel produced by a jaw crusher. A stamp battery consisted of a heavy timber gallows frame, heavy iron stamps that dropped into a battery box, and a cam shaft that raised and let the stamps fall. The cam rotated in the top of the frame, and it was fitted with a large bullwheel turned by a belt. The stamp shoes were fixed to steel rods that slid in guides. Batteries usually featured stamps in groups of five. The timber frame for a single group tended to be 7' wide, up to 15' high, and stood over a cast iron battery box bolted to a timber pedestal. Initially, workers shoveled ore into the battery box for crushing, and by the 1890s, automatic feeders introduced the ore.

Stamp Battery Frame: In many cases salvage efforts dismantled the iron hardware from a stamp battery, leaving the timber frame. Bolts for the cam shaft and semi-circular guides for the stamp rods are usually are evident.

Stamp Battery Pedestal: Often, stamp mills were dismantled for use elsewhere, leaving a pedestal as the principal representation today. Stamp battery pedestals were rectangular, often 2' x 5' in area and 2' high, and consisted of timbers set on end. The pedestal anchored a cast-iron battery box in which the stamps crushed the ore.

Screening Station: Successful concentration and amalgamation required the crushed ore to be absolutely uniform in particle size after crushing. Screens in between each crushing stage allowed fine material to proceed while returning coarse particles for reprocessing. Trommels were preferred because they screened ore in a continuous flow. A trommel consisted of wire mesh cylinders nested together and bolted to a steel frame. As they rotated, fine material passed through while coarse particles rolled out and were returned.

Crushing Rolls: A crushing rolls was an apparatus that provided secondary or tertiary crushing for ore already reduced to gravel. The apparatus featured a pair of large iron rollers set slightly apart in a cast-iron or heavy timber frame. As they rotated, the rollers drew gravel into the gap and fractured it. Small units were around 4' x 4' in area while common units were 6' x 6' in area. Crushing rolls were usually located on an upper mill terrace below the primary crusher.

Crushing Rolls Foundation: Crushing rolls were often anchored to a rectangular timber foundation consisting of heavy horizontal beams bolted to posts that leaned slightly inward.

Huntington Mill: A Huntington mill was an apparatus that finely ground previously crushed ore, and some were used for amalgamation. The machine was based on a cast-iron pan approximately 6' in diameter and 3' to 4' deep ringed with a channel. A set of heavy iron rollers rotated across the pan floor and ground the ore to a slurry. Fine particles passed through screens breaching the walls and left via the channel.

Huntington Mill Foundation: Huntington mill foundations were factory-made, and the timbers often feature beveled edges. The foundation usually consisted of rectangular timber footers 6' x 9' in total area. The machine stood on heavy posts forming a 6' x 6' cube at one end, and the other end featured a raised block with a brace for the drive shaft.

Ball Mill: A ball mill was a steel vessel similar to today's cement mixer. The vessel tapered at one or both ends, rotated in heavy bearings, and was powered by a canvas belt and shaft. As the vessel rotated, steel balls inside tumbled and pulverized the ore into a fine slurry. Small units were 4' in diameter and 6' long. Balls mills were used for tertiary crushing in concentration mills, and to recover gold with mercury in amalgamation plants.
Ball Mill Foundation: Ball mills were anchored to heavy concrete foundations distinct in footprint. The foundation featured three parallel pylons, usually 1' thick. Two pylons supported the vessel's ends. The one for the narrow end was usually 2' long and 4' high, and the pylon for the broad end was 3' long and slightly lower. The third pylon, often square, stood away and anchored the driveshaft.
Rod Mill: A rod mill operated according to same principles as a ball mill, with like applications. The vessel, however, was cylindrical, and steel rods inside ground the ore.
Rod Mill Foundation: Rod mill foundations were similar to those for ball mills. Parallel pylons, usually 1' thick, 3' long, and as high, supported the vessel, and another pylon smaller in size anchored the driveshaft.

Concentration System Feature Types
Amalgamation Table: Amalgamation tables were only used in mills that processed simple gold and silver ores. The tables stood on heavy timber frames and sloped away from the toe of a stamp battery. The tabletops were usually copper, coated with mercury, and around 6' x 12' in area. The slurry of pulverized ore produced by the stamp battery trickled over the copper plate, and the mercury caught the gold. In early mills, a flume diverted the spent slurry out of the mill as tailings. Later, the flume delivered the slurry to other amalgamation appliances such as Huntington mills.
Amalgamation Table Frame: Amalgamation tables were usually removed from mills when facilities were abandoned, leaving a heavy timber frame around 6' x 12' in area and at least 4' high.
Jig: A jig was a concentration appliance that enhanced the separation of metalliferous particles from waste. Common jigs consisted of a wood body with a V-shaped bottom that featured drain ports and wood walls dividing the interior into cells. A frame over the cells supported a cam shaft powered by a canvas belt. The shaft gently moved plungers up and down, agitating the slurry in the cells. The action kept light waste in suspension while allowing heavy metalliferous material to drop out and settle in the floor. A water current flushed the waste away. Most jigs were around 4' x 9' in area and 4' high.
Vanner: A vanner was a concentration apparatus between 4' x 8' and 6' x 13' in area. The machine featured a broad rubber belt that passed around rollers at both ends of a mobile iron frame. An eccentric cam imparted a vibrating motion that caused heavy metalliferous particles to settle on the belt. The lighter waste remained on the surface, and a jet of water washed it into a flume. The waste may have flowed out of the mill as tailings or continued to another set of concentration appliances. Scrapers removed the metalliferous material into another flume for recovery.

Vanner Foundation: Vanners were usually bolted to timber foundations that featured cross-members at both ends, stringers linking the cross-members, and braces for the frame. A flume for the waste slurry usually passed by the vanner's toe.
Vibrating Table: The vibrating table, introduced during the late 1890s, was one of the most successful and widely used concentration apparatuses. Vibrating tables featured a slanted tabletop, often 5' x 15' in area, clad with rubber and narrow wooden riffles. The tabletops were often mounted at a slant on a mobile iron frame that oscillated. The motion caused heavy metalliferous material to settle against the riffles while a current of water washed the light waste into an adjacent flume.
Vibrating Table Foundation: Vibrating table foundations featured anchor bolts projecting out of three timber cross-members. Two cross-members were at the ends, and a third was parallel and near one of the ends. The foundations are typically around 12' to 15' in length.
Flotation Cells: Introduced during the early 1910s, flotation was a highly successful stage of concentration for complex ore. Flotation cells were based on a large rectangular wooden tank divided into compartments. Paddles agitated a slurry solution in each cell and swept a froth of metalliferous material over the cell's sides. The froth either flowed into a flume or into a second set of cells for additional concentration. A plank walkway often extended along the tank, and the assemblage stood on timbers on one of the mill's lower terraces.
Cyanide Tank: Cyanidation was an alterative to amalgamation for recovering gold from complex ore. Finely ground slurry was introduced into cyanidation tanks, where a dilute cyanide solution leached out the gold. Slowly rotating agitation arms on the tank floor ensured a constant blend. Similar to a water tank, the vessels were usually located on a mill's lowest terrace and provided a last stage of ore treatment.
Settling Tank: Some concentration mills featured settling tanks on the lowest platform where heavy metalliferous fines gravitated out of spent slurry. Settling tanks were similar to wooden water tanks and often featured a revolving arm at center to exacerbate the settling process.

Power System Feature Types
Boiler: Prior to the 1910s, steam engines powered most mills. Return-tube boilers usually generated the steam. See Hardrock Mine Feature Types for a description of boilers.
Boiler Foundation: See Hardrock Mine Feature Types.
Boiler Setting Ruin: See Hardrock Mine Feature Types.
Boiler Clinker Dump: See Hardrock Mine Feature Types.
Motor: See Hardrock Mine Feature Types.
Motor Foundation: See Hardrock Mine Feature Types.
Overhead Driveshaft: Few mill appliances had their own independent power sources, and central engines or motors drove most. Sets of overhead driveshafts and canvas belts transferred motion from the engine or motor to the appliances. Overhead driveshafts, also known as line shafts, featured belt pulleys over each mill appliance and rotated in bearings bolted to the mill building's frame.

Steam Engine: Prior to the 1910s, steam engines were a common source of power for mills. Usually located on the mill's lowest terrace, the engine transferred motion to a system of overhead driveshafts via a canvas belt. Most engines were horizontal units between 2' and 3' in width and 8' to 12' long. A steam engine required a boiler.
Steam Engine Foundation: Steam engine foundations are often rectangular, studded with anchor bolts, and between 2' and 3' in width and 8' to 12' long. Workers built engine foundations with heavy timbers, brick or rock masonry, or concrete, and the foundations often featured a pylon for the outboard flywheel bearing.
Transformer Station: Those mills with electric power required transformer stations to convert and distribute the current. See Hardrock Mine Feature Types for a description.
Transformer Station Platform: See Hardrock Mine Feature Types.
Transformer Station Ruin: See Hardrock Mine Feature Types.

PROPERTY TYPE: SMELTER

Smelters were essential facilities for the mining industry. They were the final recipients for crude ore delivered from mines and the concentrates generated by mills. Smelters converted the ore and concentrates into metals. The Greene Smelter, built in 1874, was the first functional smelter in San Juan County and facilitated the county's mining industry for five years. Without the plant, the industry would have remained static, if not failed altogether. The Greene Smelter closed in 1879, dismantled, and incorporated into the Durango Smelter, which began treating ore in 1882. The Martha Rose Smelter, Silverton's second local plant, began at the same time but failed within the year. In 1894, Thomas F. Walsh opened Silverton's third local smelter, the only functional plant in nearly a decade. Walsh's plant filled an important niche until it closed around 1898. The county was without a local smelter until 1900, when the San Juan Smelting & Refining Company filled the void with the Kendrick-Gelder Smelter. This facility served the same market as the Walsh Smelter and operated until 1909. Declining ore production discouraged further smelting ventures, and the Durango and Standard smelters in Durango received the county's ore and concentrates.

San Juan County's smelters used a combination of mechanical, chemical, roasting, and smelting processes to convert ores and concentrates into metals. Most facilities required flat space, a source of abundant water, and well-graded roads, thus tending to be limited in scale and variety of components. The smelters usually featured several large buildings, high-volume coal and coke bins, and several free-standing steel furnaces. The companies usually designed the smelter complexes according to a standard plan, and as a result, various components shared common orientation. Slag, the waste produced by smelting ore, almost always lies around a smelter site and manifests as fine-grained or glassy cobbles dark gray to black in hue.

Smelter Significance

Between 1874 and 1879, the mining industry depended on the Greene Smelter to reduce ore to its constituent metals. With successful concentration mills, mining could have continued in the absence of the smelter, but companies would have shipped their concentrates to distant facilities at great cost. Given this, without the Greene Smelter, mining would have been severely stunted. By contrast, when the Walsh and Kendrick-Gelder smelters began operations, they were not the principal ore treatment plants. Instead, the Walsh and Kendrick-Gelder smelters offered supplemental ore treatment services and accepted specific types of ore for which the other Silverton and Durango facilities were not equipped. Thus, the Walsh and Kendrick-Gelder plants allowed certain mines to remain profitable from 1894 through 1909. The output of these mines represents a significant contribution to the county's overall production. The above trends fall within Industry as an Area of Significance.

Smelters may further be significant in the area of metallurgical Engineering. The county's complex ores defied conventional metallurgical practices and methods proven to recover metals in other regions. To render complex ores profitable, John Porter and other experts with the Greene Smelter combined their experience with calculation and devised effective processes. This became a foundation for the methods employed at the successive Durango Smelter, the most successful smelting plant in southwestern Colorado. The Walsh and Kendrick-Gelder plants offered similar advances for the complex ores of the Red Mountain district and northern portion of San Juan County.

Regarding Economics, the three smelting companies contributed to complex regional, statewide, and national economic and financial systems. Investment, banking, and acquisition and shipment of supplies occurred on interstate and intrastate levels. The smelting companies also diverted money into the local economy by paying wages to their workers, hiring consultants for services, and buying goods from local businesses. The companies also purchased machinery and other industrial goods from manufacturers mostly in Denver and outside of Colorado. Smelting companies supported primarily Colorado's and secondarily other economies. On a local level, smelting companies purchased their ore from mining outfits throughout the county. Such business disbursed money throughout the region.

Regarding Politics/Government, mining, and in turn smelting, was integrally tied to political systems on local, statewide, national, and international levels. After all, smelters relied on production of silver ore, a primary focus of policy decisions in the context developed here. Federal programs stimulated demand and inflated silver's values to levels that rendered mining profitable. The Bland-Allison Act of 1878 and the Sherman Silver Purchase Act of 1890 instituted price supports and acquisition quotas for silver. Repeal of the Sherman Silver Purchase Act and subsequent collapse of silver's value brought mining and smelting to an abrupt halt for several years. Industry workers, capitalists, and companies provided political support for elected officials who advocated for programs that kept the value of metals high. Further, Colorado mining elite, including Thomas Walsh and Thomas Porter, contributed financial support to legislators who influenced federal policy. Business activity at smelters at times reflected political developments.

Smelter Registration Requirements

The eligibility of smelters is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Smelters eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. The county's three smelter sites may be eligible under Criterion B provided they reflect the direct and active on-site contribution in the life of an important person or persons. If the significance is related to an important individual's design of the plant or complex, then Criterion C applies. To be eligible under Criterion C, a resource must clearly represent a smelter. Because equipment and buildings may have removed when smelters were abandoned, archaeological features may represent the complex. A site should possess material evidence clearly conveying the system design and engineering, such as the footprint, terraces, and aspects of infrastructure and support facilities. The general flow path of the ore from input to furnace should be identifiable, if not the process specifics. Intact structures and equipment strengthen site eligibility. A site retains high integrity when its features clearly represent each stage of ore treatment, as well as individual machines and appliances. Buildings, structures, and machinery may represent the adaptation of metallurgical engineering and technology to local ore and the conditions of a high-altitude environment. Slag dumps and flows may be another important character-defining feature. In summary, smelter sites may be eligible under Criterion C if the resource possesses intact architectural or advanced engineering features reflecting a type, period, or method of construction associated with mining. Smelters may further be contributing elements of historic mining landscapes or larger districts. Extensive smelter sites may provide context or constitute discrete landscapes in themselves.

Smelter sites may be eligible under Criterion D, due to the potential to yield information, especially in the following cases. Buried archaeological deposits such as privy pits, thick clinker dumps, and refuse layers in tailings dumps may include artifacts capable of augmenting current understanding of workplace behavior and diet. If workers lived on site, residential deposits may further illuminate that social history. Secondly, an assemblage of structures, foundations, or machinery related to smelting may reveal how metallurgists adapted the smelting process to complex local ore. Thirdly, extant infrastructure may demonstrate how engineers designed water, power, transportation, and slag disposal systems. Smaller mill sites may lack buried deposits of substance.

Eligible mills should possess physical integrity relative to its Period of Significance. Smelters were often targets for salvage when abandoned, but surface features and archaeological evidence can represent the complex's design, infrastructure, and waste disposal in order to approximate the smelting process. Integrity of design, setting, feeling, location, and association are particularly relevant to the eligibility of these resources. For a resource to retain integrity of *design*, material evidence, including archaeological features, should convey the smelting process, plant design, arrangement of buildings, and infrastructure. To retain integrity of *setting*, the surrounding area must not have changed a great degree from its Period of Significance, with the exception of some removal of structures and equipment. In terms of *feeling*, the resource should

convey the sense of historic ore treatment operations. Integrity of *association* exists where structures, buildings, machinery, and archaeological features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern the historic smelting operation. Common features encountered at smelter complexes are listed below as well as under the ore-concentration property type.

Features Common to Smelter Resources
The features below comprise an abbreviated list of those characterizing smelter sites. Most smelters relied on the same water and power systems as ore treatment mills and included preliminary stages of crushing, screening, and concentration. The researcher should review Ore Treatment Mill Feature Types for additional description.

Blower: Smelters relied on blowers to force an air blast into a furnace. A typical blower featured a ring of vanes encased in a wood or sheet iron shroud with a port for the outflow. A motor or steam engine powered the blower, often standing nearby. Blowers ranged from 3' to 8' in diameter.
Blower Foundation: A foundation that anchored a blower. Foundations were usually rectangular, less than 6' x 8' in area, and consisted of masonry, concrete, or timbers.
Coal Bin: Because smelters consumed high volumes of fuel, they almost always featured substantial bins for coal or coke. The bins were usually sloped-floor structures that facilitated a gravity-drawn flow of fuel from the structure.
Coal Bin Ruin: The collapsed remnants of a coal bin.
Coal Bin Foundation: Due to their great weight, coal bins usually stood on masonry or timber foundations. Scatters of coal or coke strongly suggest that a given foundation supported a coal bin.
Furnace: The small smelters in the county relied on two general types of furnaces. The earliest and least efficient was a brick or masonry structure with multiple chambers lined by fire bricks. Combustion in lower chambers created superheated gases that melted ore in upper chambers. The masonry should feature evidence of intense heat and slag. The type of furnace used in the Greene and later smelters was a free-standing, cylindrical steel vessel lined with fire bricks. These furnaces tended to be from 6' to 20' in diameter and as high, and workers input crushed ore in the top and drew out molten material through ports in the bottom.
Furnace Remnant: The collapsed remnant of a furnace.
Furnace Foundation: The early masonry furnaces stood on rectangular foundations of brick or rock integral to the chamber walls. The free-standing furnaces stood on brick or rock pads larger in footprint than the steel vessel. A foundation for a blower is usually nearby. Furnace foundations almost always feature slag and evidence of heat.
Furnace Platform/Terrace: Furnaces usually stood on dedicated platforms or terraces within the smelter building. Because the furnace provided one of the last stages of ore treatment, the platform was among the lowest at a smelter. Evidence of a furnace, such as slag flows or a

foundation, should remain. Free-standing steel furnaces often left little more than the foundation surrounded by slag flows, while masonry types may have left structural ruins.
Slag Dump: Slag is a vitreous waste left after ore melted and metal content was drawn off. Smelting companies disposed of their slag in dumps downslope from the smelting complex.
Slag Flow: Uncontrolled releases of slag from a furnace created flows on the furnace platform. The flows appear similar to lava or smooth concrete.
Smelter Building: Smelter buildings were similar to those for ore treatment mills. Where possible, they were built over a series of platforms or terraces so gravity could draw the ore through the stages of preparation and smelting. Each terrace was usually dedicated to a specific treatment stage. For a description of the general constitution of these buildings, see Ore Treatment Mills above.
Smelter Building Foundation: The foundations for smelters were similar to ore treatment mills.
Smelter Ruin: The collapsed remnants of a smelter building.

PROPERTY TYPE: MINING SETTLEMENT AND RESIDENCE

Because most county mines and prospects were distant from the principal town of Silverton, prospectors, miners, and other workers lived near their work. Prospectors established temporary camps, mining companies erected company housing, and other workers provided their own residences. All mining districts featured enough activity and people to support both organized and unincorporated settlements. Most forms of residence and settlement exist as individual resources. They are sometimes components of other sites, in which case they should be included with their parent resources.

Mining Settlement and Residence Subtypes

Prospector's Camp: When examining an area or developing a claim, prospectors usually established impermanent camps abandoned after brief occupation. Prospectors' camps were simple, may have lacked formal buildings, and were located in the most favorable environment an area had to offer. In terms of residence, individual and pairs of prospectors often lived in wall tents because of their low cost and portability. Occasionally, prospectors intensely examining an area erected primitive log cabins as longer term bases of operations. Camps also may have included a well-built hearth for outdoor cooking, and a field forge for blacksmithing. Because prospect camps were intended to be impermanent, they often left little material evidence. The residence tends to manifest as a small earthen platform, log cabins, if any, are in ruins, and a sparse scatter of food cans and hardware reflect occupation. For such assemblages of features and artifacts to qualify as a prospector's camp, they must be either directly associated with nearby prospect workings or located in an area that was subject to prospecting. If a camp is directly associated with a specific prospect complex, shaft, or adit, then it would be part of that larger Property Subtype.

Workers' Housing: Workers' housing is a resource subtype category encompassing various types of buildings where mining industry workers lived. Buildings ranged from primitive cabins to single-family houses to boardinghouses. The unifying element is that residents who lived in these buildings were confirmed mining industry workers. Houses and boardinghouses near mines and mills are likely to meet the definition because of their proximity to these industrial operations. Similarly, houses in unincorporated settlements usually qualify because most men were employed at nearby mines. Residences in towns such as Silverton, however, require archival documentation to substantiate the occupation of inhabitants. Often, mining companies built cabins and boardinghouses for their employees. Although these residences are workers' housing, they should be recorded as components of larger mine or mill sites when possible.

Workers' housing can be recorded as an independent resource under several conditions: first, when workers' housing cannot be directly attributed to a specific industrial complex or single employer. For example, residences may lie near a cluster of mines, and yet be far enough away from any one so that the residences cannot be attributed to a specific operation. Second, when residences are within an unincorporated settlement dependent on mines or mills and inhabited by a population dominated by industry workers, it may be registered independently. Finally, when residential features are a component of a larger industrial site, but the industrial aspects have been destroyed or have little integrity, the residential features may be recorded independently. They indeed may be the only surviving intact portion of the site. In this case, the residential features would constitute a site unto itself, but the lost industrial complex should be noted.

As a resource, workers' housing includes all features associated with inhabitation and other domestic activities. The sites were usually complexes centered on at least one residential building, and often several. Buildings may have been cabins or formal houses occupied by a miner and family, or shared by a handful of unmarried workers. Boardinghouses provided accommodations for unmarried workers who dined and spent leisure time in a communal setting. Isolated mines and mills commonly had boardinghouses for workers and separate cabins or houses for the superintendent and family. Typically, archaeological features such as building platforms, foundations, and ruins represent residential buildings today. Some workers' housing still exist as standing buildings. Small houses and boardinghouses may be of log or frame construction, while large boardinghouses are almost always frame. Nearly all are vernacular in function, construction, and form. Vernacular buildings adapted conventional designs and construction methods to the environment and building materials available locally. The builder's economic resources, skills, preferences, and needs influenced the built form.

Workers' housing complexes almost always possess site features in addition to the residences, many of which are primarily archaeological in nature. Privy pits and refuse dumps reflect primitive waste disposal practices. The dumps usually extend downslope from the residence doorway and consist of domestic refuse, and materials generated by food preparation. Residents usually cleared an area by the building for chopping firewood, cleaning laundry, and

other outdoor activities. Complexes for numerous workers often included root cellars for the storage of perishable food.

Isolated Residence: Isolated residences are places of developed inhabitation that cannot be clearly tied to an industrial operation due to insufficient evidence. Such resources lack characteristics or artifacts that can associate the resource with prospecting, mining, logging, transportation, or agriculture. Determining whether a resource in a mining district is an isolated residence can be subjective since it may have served as base of operations for prospectors, hunters, or homesteaders. Isolated residences are simple resources and usually consist of a few residential features, generic artifact assemblages, and no industrial or commercial attributes. If buildings stand, they are likely to be small cabins or frame houses vernacular in appearance and form, as defined above.

Unincorporated Settlement: Popularly known as mining camps, unincorporated settlements were informal communities established in response to several factors, but often a mineral boom. When prospectors and miners joined a local rush, they tended to erect residences in a common area that offered flat ground, open space, and water. In San Juan County, Poughkeepsie and Mineral Point are examples. Informal settlements also grew as communities to house the workforce of a primary industry, such as a group of mines. Gladstone was one such settlement.

Unincorporated settlements were rarely planned in advance and instead evolved organically according to local housing needs. The communities usually possessed no formal organization or infrastructure, and buildings tended to be disbursed among the most favorable micro-environments. Mining companies and individual workers built residences near their employment, which assumed form as a settlement when concentrated in one area. When the population became large enough, entrepreneurs and community activists established basic services and businesses such as a post office, mercantile, saloon, and restaurant-hotel. The businesses then formed the settlement center, even if residences were few and scattered.

As a center for a working population, an unincorporated settlement usually was the hub of a local transportation network. Several wagon roads linked settlement with the nearest nodes of commerce as pack trails fanned out to places of employment. Because draft animals were a principal transportation method, residences for multiple people often featured corrals. Sanitation was limited to privies, and water came from streams, springs, and wells. By the mid-1890s, some settlements enjoyed electricity for lighting, wired from nearby mines or mills.

The architecture in unincorporated settlements tended to be vernacular in appearance and form. The buildings were rarely designed by architects, and were instead planned in the field for function and economy. Residents imitated familiar methods and forms as best they could, adapting them to the local environment and incorporating available materials. Milled lumber was preferred for its regularity, but residents substituted local building materials such as logs and stone masonry. When a settlement was in infancy, almost all its buildings were wall tents, small cabins, and buildings combining logs, lumber, and canvas. Mature settlements often featured at least several substantial frame buildings, as well as log cabins with plank or board-and-batten

siding. By the 1900s, residents made increased use of corrugated sheet metal. Some business buildings had false-fronts and nearly all possessed gable roofs.

Today, few if any unincorporated settlements survive in a well-preserved state. Although some settlements still possess intact buildings, most have been reduced to archaeological sites. Features such as earthen platforms, foundations, and ruins represent buildings. Such ruins are usually center to associated features such as yards, refuse dumps, privy pits, root cellars, and wells. At sites completely overgrown, differentials in vegetation may outline features. If a researcher suspects a site to be an unincorporated settlement, he or she should survey a large area for outlying residences, primitive infrastructure such as community springs, and industrial complexes. Companies frequently built ore treatment mills and sawmills in drainages near settlements.

Townsite: When a mineral boom matured from the prospecting phase toward development and production, the nascent industry drew a working population. The shift ushered in a stage of growth, and a common result was the evolution of unincorporated settlements into organized towns. In many cases, the towns remained small and were abandoned within a short time, but if the industry was successful, some became large and sophisticated. Small townsites may be recorded and evaluated as individual sites or districts as discussed above. The town of Silverton, as a major regional center, requires additional context beyond that generalized to the mining industry.

Small or large, both forms of community shared basic physical characteristics and organization patterns. An identifiable business district was the most elementary, offering goods and services proportional in volume and diversity to the population. Towns in early stages of growth usually featured a few mercantiles, saloons, restaurants, and hotels, as well as a butcher, bakery, assayer, laundry, livery, and blacksmith. As the population increased in number and sophistication, entrepreneurs began additional businesses such as newspapers, law practices, surveying, confectioneries, clothing retailers, stationary and book stores, medical and dental, and hygiene. Although not heavily documented, women and families were an essential demographic of mining town and reflected a stable working population. They demanded social institutions such as schools, churches, social organizations, and public meeting halls. Gaming houses and prostitution were rare in the county's small towns, with Silverton as one exception.

Business districts, however small, served as town centers surrounded by formal residences usually occupied by members of an upper socioeconomic status. In many towns, proprietors lived in their commercial buildings on an upper story. The town core conformed to a surveyed grid of lots and blocks, while outlying residences may have been scattered. These were usually inhabited by workers and members of a lower socioeconomic status. Workers also rented space in boardinghouses or took a room in a house. As the town grew and population diversified, both the business and residential districts divided further along socioeconomic or ethnic lines.

Town architecture was a function of community development, success of the mining industry, timeframe, distance from shipping and manufacturing centers, and available materials. In a town's early period, the architecture tended to be vernacular in appearance and form.

Builders preferred milled lumber and manufactured elements, but made extensive use of local materials when these were costly or unavailable. Logs were the most common local material for walls and roof beams, with stone for foundations.

The earliest buildings in a town were wall tents and log cabins. Within several years of establishment, residents assembled buildings from combinations of lumber, log, canvas, and sheet metal. Frame construction was preferred, but expensive until the town had a sawmill or wagon road to outside commercial centers. In form, most buildings were simple with gabled roofs and one or two stories. Commercial buildings may have featured false-fronts and plank walks or stoops. Buildings usually stood on informal foundations, had roofs sided with shingles or log strips, and featured walls clad with boards and batten, plank, or clapboard. Wealthier individuals at times added some ornamentation, such as trim to display status or imitate architecture in established cities.

Architectural improvements were hallmarks of community maturation and economic stability. New buildings tended to be more substantial and standardized construction materials dominated. An increase in value of building lots, the perceived obsolescence of log construction, and social preference for frame construction contributed to gradual architectural evolution. Elements of architectural style began to appear as early as the 1880s, including ornamentation suggestive of Greek Revival, Italianate, and Queen Anne styles and pattern books. Even though some business owners did not attempt a specific architectural style, they still decorated their buildings with lathed columns, molding, ornamental brick or woodwork, and polychromatic effects. Vernacular form and appearance, however, continued to be universal. Although brick and stone replaced lumber for some of the most important buildings in Silverton, the county's small towns saw little masonry construction. The residents did, however, use sheet metal stamped with imitation brick and stone patterns, which suggested masonry from a distance.

Most mining towns possessed infrastructures proportional in sophistication to the success of the mining industry, population, and expectation of permanency. On a base level, most infrastructure related to transportation, communication, and limited public utilities. Transportation infrastructure usually featured trunk roads that carried freight and passenger traffic to town, and feeder roads extended to the surrounding mines and mills. Streets and footpaths directed traffic within the town, and even though many towns were arranged according to a grid, roads and paths did not always conform. The ultimate transportation system was the railroad, which served Silverton, Howardsville, Eureka, Animas Forks, and Silver Ledge.

Communication systems were initially limited to the postal service and newspapers. By the early 1880s, Silverton, Howardsville, and Eureka were linked by telegraph, followed by a telephone system within several years. By around 1900, many towns of lesser importance also subscribed to telephone service. Water systems existed in both towns and workers' housing erected by mining companies. Water systems appeared in Silverton during the 1880s, and some other principal towns followed during the subsequent thirty years, although most small towns never saw service. The introduction of flush toilets, bathtubs, and sinks during the 1890s fostered a demand for sewer systems in the large towns and advanced workers' housing complexes. Common systems consisted of little more than pipes and culverts that drained into local

waterways. One of the most important forms of public utility was electricity, available when the town of Silverton and the Silver Lake Mines Company built local power plants during the early 1890s. The ability to subscribe to domestic and commercial service was based on socioeconomic status, which excluded many residents until the 1940s.

Mining Settlement and Residence Significance

Settlement and residence property subtypes provided shelter and granted inhabitants an environment where they could attend to the basic necessities of life. Both individual residences and settlements served as bases for cultural practices, leisure, socializing, communication, transactions between individuals, education, and numerous other activities. In sum, settlements and residences were the support system for participants in the mining industry and in turn facilitated permanent settlement. Individual subtypes are associated with narrower Areas of Significance outlined below.

Prospectors' Camps: Because prospectors' camps were a function of prospecting, they share the same Periods and Areas of Significance as Hardrock Prospect Property Types. The timeframe spans 1870, when prospectors arrived in significant numbers, until 1885 when mining subsumed prospecting. Regarding Exploration/Settlement, temporary encampments were bases of operations for prospectors at the forefront of the mining frontier. Camps allowed prospectors to search for ore, characterize a region's geology, and conduct general exploration. These important steps preceded the establishment of the mining industry. Prospectors and organized outfits were the first Euro-American settlers to inhabit the county, especially when the rush developed.

Regarding Social History, camps inhabited by groups of prospectors served as frontier communication centers where individuals exchanged information and news. The camps also served as primitive social centers for a segment of the industry that often went without human contact for long periods of time. To search and labor in the wilderness, prospectors had to be adventuresome, independent, curious, physically robust, and skilled at survival. Most possessed at least some formal education. Seeking wealth often attracted individuals who did not conform to the traditional values of an agrarian lifestyle.

Regarding Politics/Government, prospectors organized the earliest mining districts in the San Juan Mountains, setting a precedent for districts elsewhere in the 1870s. In general, mining districts were tantamount to a frontier government that brought order to mining. This trend is relevant to camps as places of district administration. By supporting the presence of prospectors, camps can in turn be associated with the division of southwestern Colorado into counties. In particular, the territorial legislature originally designated La Plata County in 1874 in response to the surge of prospecting and mining in the Animas River drainage. Because of continued growth, the legislature then carved San Juan County out of La Plata.

Workers' Housing: Among the Areas of Significance relevant to workers' housing, Architecture applies to cabins, houses, and boardinghouses. Usually vernacular in form and construction,

residential buildings reflect the adaptation of building methods and design to the physical environment and available materials of the San Juan Mountains. Boardinghouses can represent how mining companies adapted conventional engineering and architectural practices to meet the needs of housing large crews in the environment of the San Juans. Well-capitalized organizations erected handsomely appointed accommodations for their workers to attract skilled workers and entice them to remain. Less commonly companies sought to provide comfortable housing out of humanitarian concern and social progressiveness. Between around 1890 and 1920, companies installed plumbing and electric lighting, and a few even provided showers, flush toilets, steam heat, dining halls, and commercial kitchens. Such appointments set an example followed by companies elsewhere.

Regarding Community Planning and Development, workers' housing complexes were often apart from larger communities, thus constituting a distinct settlement pattern. Workers' housing supported population distant from concentrated settlements, contributing to permanent settlement.

Regarding Economics, workers' housing, especially boardinghouses and bunkhouses, were microcosms of intrapersonal financial transactions. Cumulatively, workers' housing participated in regional economic systems, including agriculture and commerce. Merchants in the major towns handled food and goods and the acquisition of such contributed to local economies.

Regarding Social History, communal residences were important centers of communication and socialization. They were also the place of cultural diffusion among employees of different ethnicities. Residences sheltered much of the mining industry's workforce, saw it fed, and allowed people to attend to the necessities of life outside of the workplace.

Isolated Residences: By definition, isolated residences cannot be directly attributed to an industry or other pattern of subsistence. For this reason, their historical associations and Areas of Significance remain unknown until detailed research or archaeological investigation provides clarifying information.

Townsites and Unincorporated Settlements: Both forms of settlement are associated with similar Areas of Significance. Regarding Architecture, settlements were places where both companies and residents adapted conventional design and construction to the physical environment and materials available in the San Juan Mountains. Most buildings were vernacular, influenced by the builder's financial resources, needs, skills, and experience. Townsites also were later a vehicle for the introduction of defined architectural stylistic elements.

Townsites and unincorporated settlements were significant in the area of Community Planning and Development. Townsites, and to a lesser degree unincorporated settlements, introduced platting, community organization, infrastructure, municipal ordinances, and business development. Townsites and unincorporated settlements also influenced the distribution of population, social classes, gender, businesses, and some industrial facilities. Townsites and

unincorporated settlements were transportation nodes and transfer points for the movement of goods and people. The supplies, equipment, and services required by mining companies and the population often flowed into settlements prior to their distribution to consumers, and ore and mill products flowed out. Such a function influenced where communities grew and how large they became.

Regarding Economics, settlements participated in the same complex local, statewide, and national economic systems as noted above in relation to workers' housing. Regarding Commerce, townsites and unincorporated settlement were local centers of banking, business, and trade. They also served as anchors and conduits for capital and investment. The presence of established settlements, especially towns, lent legitimacy to a local mining industry, fostering confidence among potential investors. When these investors provided capital, the settlements became the points through which that capital flowed to associated mines and mills.

Regarding Social History, townsites and unincorporated settlements were centers of social relationships as well as passive and active cultural development. Passive development occurred when cultural traditions practiced by different ethnicities diffused among the population. Active development occurred when inhabitants purposefully sought out cultural performances, lectures, salons, organizations, and community events. In addition, employment the mining industry impacted social patterns. Further, townsites and unincorporated settlements attracted a variety of individuals who did not work directly in mines or mills but were important to the development of the social fabric. This included women, families, day laborers, and businessmen. Their arrival fostered a demand for cultural and social institutions, both constructive and recreational. Institutions that communities accepted were schools, churches, civic associations, unions, and meeting halls. Institutions less condoned included venues catering to substance abuse and saloons.

Regarding Industry, towns and unincorporated settlements supported the mining industry by housing the workforce, providing goods and services, and hosting mines and mills. Towns and unincorporated settlements were also nodes of infrastructure, including transportation, communication, and utility systems.

Regarding Politics/Government, townsites and unincorporated settlements were centers of law enforcement and judicial systems created in response to social and mining disputes and crime. Administrative and regulatory bodies developed in towns to oversee local government activities, claim registration and regulation, and records keeping. Settlements also served as polling stations, where populations proved instrumental in the election of government officials.

Mining Settlement and Residence Registration Requirements

Prospectors' Camps:

The eligibility of prospectors' camps is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey their significance. Camps eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. Prospectors'' camps may be eligible under Criterion B provided they

reflect the direct and active on-site contribution in the life of an important person or persons. For instance, an important person lived in the camp. However, few camps possess sufficient archival documentation to demonstrate the presence of an important person. To be eligible under Criterion C, a resource must clearly represent short-term residence associated with mineral discovery, mineral boom, or general exploration. Because prospectors' camps were purposely impermanent, most lack buildings and manifest as archaeological features. Clearly definable resources with integrity are uncommon because brief occupation left minimal evidence. Tent or cabin platforms, sparse artifact assemblages, and corral remnants are important character-defining features. Prospectors' camps may also be eligible under Criterion C if the resource possesses intact architectural features or facilities necessary for prospecting, such as cabins and field forges. These are significant and rare manifestations of historic prospecting efforts.

Under Criterion D, in the relatively rare cases where camp sites possess building platforms, privy pits, and refuse dumps that feature buried archaeological deposits, testing and excavation may reveal information regarding the lifestyles, social structures, and demographics of prospectors, as well as the presence of families and women. Such information has not been extensively documented. However, because camps were occupied briefly, material evidence tends to be ephemeral. Prospectors' camps featured few built elements, most of which were usually removed when the site was abandoned.

Resources that can be confirmed as prospectors' camps and possess physical integrity relative to a stated Period of Significance are significant. Integrity of setting, feeling, location, and association are particularly relevant to the eligibility of these resources. To retain integrity of *setting*, the surrounding area must not have changed a great degree from its Period of Significance. In terms of *feeling*, the resource should convey the sense of historic prospecting and residence. Integrity of *association* exists where archaeological artifacts and features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern historic occupation.

Workers' Housing: This subtype comprises a spectrum ranging from simple cabins to large complexes with multiple boardinghouses. Because most workers' housing was a function of the mining industry, it shares similar Periods of Significance. The eligibility of workers' housing is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey its significance. Housing eligible under Criterion A must be associated with at least one Area of Significance noted above, events and trends important to the county. Housing may be eligible under Criterion B when occupation by an important person or persons can be confirmed. The important individual must have lived or worked at the complex or been directly present during its construction. If the important individual designed the complex or building but did not live there or was otherwise associated with the site, then Criterion C applies.

Workers' housing may be eligible under Criterion C under certain conditions. Here, it is best to distinguish between resources with standing buildings from those that have been reduced to archaeological features. Currently, workers' housing in the forms of cabins, houses, and boardinghouses stand intact in the county. Small and simple houses and cabins can represent the

austere, vernacular architecture typical of wage workers in the San Juan Mountains. Boardinghouses are uncommon and can also reflect architectural adaptation to the needs of a mining operation and its workforce. Character-defining features may include adaptations to environment and geography, such as function, construction method, and materials use.

Archaeological integrity requires intact assemblages of surface artifacts and features clearly conveying the organization and infrastructure of the housing and information about the residents and their lifestyles. Evidence of how the residents inhabited the complex, conducted domestic activities, and added support facilities are additional information a site may yield. Workers' housing may be eligible under Criterion D for its potential to yield meaningful information. An analysis of a complex and its features may augment existing understanding of the design of complexes, architectural practices and methods, and the residential environment associated with the mining industry. Workers' housing often possesses building platforms, privy pits, and refuse dumps that represent buried archaeological deposits. Testing and excavation may reveal information regarding the lifestyles, social structures, and demographics of workers, as well as the presence of families and women. Such information is significant because these subjects have not been extensively documented.

Resources that can be confirmed as workers' housing and possess physical integrity relative to a stated Period of Significance are significant. Integrity of setting, feeling, location, design, and association are particularly relevant to the eligibility of these resources. To retain integrity of *setting*, the surrounding area must not have changed a great degree from its Period of Significance. In terms of *feeling*, the resource should convey the sense of historic residence. Integrity of *association* exists where archaeological artifacts and features convey a strong sense of connectedness between the property and a contemporary observer's ability to discern historic occupation. For housing to retain integrity of *design*, material evidence, including archaeological features, must convey organization and planning of the complex. For individual buildings to possess integrity of design, their floorplan, form, and construction must be readily discernable. Resources may include standing buildings that were re-occupied periodically. Integrity of *materials* and *workmanship* requires most materials to be original, and any repairs completed with materials and workmanship similar to the original.

Isolated Residences: Since isolated residences often cannot be tied to a specific industry without substantial research, but the presence of buried archaeological deposits may yield information related to what industry residents were associated with. In this case, the site may be eligible under Criterion D.

Townsites and Unincorporated Settlements: This subtype comprises a spectrum ranging from small unincorporated settlements with a handful of buildings to formally organized towns. The eligibility of townsites and unincorporated settlements is predicated on meeting at least one of the NRHP Criteria and adequate integrity to convey its significance. In general, each settlement was important at least on a local level, and some were tied to historical trends and patterns significant on statewide and sometimes national levels. Settlements eligible under Criterion A

must be associated with at least one Area of Significance noted above, events and trends important to the county. Settlements may be eligible under Criterion B when occupation by an important person or persons can be confirmed. For instance, the individual's specific residence or place of employment must be identified, and in such cases, the place with the greater association will qualify.

Settlements may be eligible under Criterion C under certain conditions. Although some townsites currently possess standing buildings, all include a majority of archaeological features. Integrity at least on an archaeological level is required for eligibility. Townsites and settlements may be eligible in their entirety if the archaeological, architectural or engineering features and artifacts clearly convey broad patterns of the community. The settlement's organization and design is one example. Although most designs were based on grids, some communities grew spontaneously in response to local conditions. Road intersections, railroads, and local topography greatly influenced a settlement's final form. The distribution of residences, businesses, and industrial facilities constitutes another broad pattern. The transportation infrastructure, water sources, and waste disposal practices, however primitive, are additional patterns of potential significance.

Archaeological integrity requires intact assemblages of surface artifacts with the potential to yield important information. Artifacts are necessary to interpret timeframe and function in the community, as well as its individual buildings. Boardinghouses, cabins inhabited by families, and different businesses left distinct types of artifacts. By analyzing the artifacts, the researcher may be able to determine the function of some buildings, even when represented solely by archaeological remnants. A researcher may further be able to interpret socioeconomic status, gender, ethnicity, and modes of employment of residents through artifacts; characterizing aspects of lifestyle such as diet, health, and consumerism.

Standing buildings possessing integrity relative to a Period of Significance may be eligible individually or as contributing elements of a larger site. Settlements still inhabited today often possess more recent construction. If the number of such buildings overly disrupts the townsite's historic fabric, then the townsite as an entity may no longer possess the necessary level of integrity. Even if a townsite lacks integrity as a whole, standing buildings may be individually eligible under Criterion C. If the building retains architectural integrity relative to its Period of Significance, it may represent a type common to that era. Buildings altered over time may represent serial occupation and changes in preferred materials, styles, and spatial requirements. Some buildings possess innovative designs, construction methods, and materials uses in response to the conditions of a specific area. Such buildings may be eligible as adaptations of architecture to the environment, climate, and geography of the San Juan Mountains. In a few cases, buildings can be attributed to important architects and builders. If the building retains integrity relative to the original design, it may be eligible as the work of a master architect or builder, known or unidentified. Even when largely reduced to archaeological features, townsites may further be eligible under Criterion C as historic mining landscapes.

Settlements and townsites may be eligible under Criterion D for their potential to yield meaningful information. An analysis of architectural features may augment existing

understanding of the commercial and residential environment associated with the mining industry. Broad-scale studies of settlements often reveal aspects of community development, distribution of gender, modes of employment, socioeconomic status, and business practice. Settlements often possess building platforms, privy pits, and refuse dumps that feature buried archaeological deposits. Testing and excavation may reveal information regarding types of businesses, lifestyles, social structures, and demographics of residents, as well as the presence of families and women. Such information is significant because these subjects were not extensively documented.

Eligible townsites and unincorporated settlements must possess physical integrity relative to their Period of Significance. Features commonly encountered at settlements are listed under the feature types below. Most of the seven aspects of integrity defined by the NRHP apply to settlements. For a settlement to retain integrity of *design*, material evidence, including archaeological features, must convey community organization and planning. Individual buildings can retain integrity of design in two principal ways. Unaltered buildings can exhibit their original form, floorplan, and construction. Buildings altered through serial occupation retain integrity of design if they reflect evolution within the historic period. Integrity of *materials* and *workmanship* is retained when a building exhibits predominantly original materials and construction methods. Modern repairs must be made with compatible materials and workmanship. To retain integrity of *setting*, the area around the resource must not have changed a great degree from its Period of Significance, with allowance for removal of buildings and structures. To retain integrity of *feeling*, the resource should convey the sense of historic community. Integrity of *association* exists where features convey a strong sense of connectedness between the settlement and a contemporary observer's ability to discern historic occupation.

Features Common to Mining Settlement and Residence Resources

As historic resources, settlement subtypes possess a diverse array of architectural and structural features and their archaeological manifestations. Only the most common features are defined below.

Prospectors' Camp Features

Corral Remnant: Prospectors usually relied on pack-animals to carry their goods and penned the animals in informal corrals near their camps. Corral boundaries maximized natural obstructions, and had fences of branches, stumps, and wire.

Dugout: A dugout was among the most impermanent and primitive forms of residence. They were created by prospectors who lacked wall tents but were unwilling to invest time and resources in other accommodations. A dugout consisted of an excavation in a slope, 8' x 10' or larger in area, roofed with logs or branches covered with earth. The front often had a log or rock masonry façade, window, and doorway. A chimney or stovepipe extended from the roof. Dugouts were not limited to residential use. Root cellars, hay storage, and explosive magazines can resemble these resources. To recognize a resource as a dugout, it may be center to an assemblage of domestic refuse, which reflects inhabitation.

Dugout Ruin: Dugouts usually collapsed when abandoned. Ruins manifest as ovoid depressions embedded with structural materials. A sparse artifact assemblage of domestic refuse should be present.
Fire Hearth: Prospectors often built large outdoor rings or rock structures for cooking and heating fires. The ring should be near the tent or cabin platform and exhibit signs of aging such as collapse and revegetation.
Pack Trail: Pack trails often radiated outward from prospectors' camps to the areas under examination and to the nearest commercial centers. Most were created by foot and pack animal traffic, while others were intentionally graded to fulfill claim assessment requirements. Pack trails are no wider than 8'.
Tent Platform: Prospectors often graded small platforms, usually less than 20' x 20' in area, for wall tents. In some cases, prospectors placed rocks on the platform's edges or corners to support a tent's wood pallet floor and drove stakes along the edges to guy the walls. A paucity of structural artifacts, the presence of tarpaper washers, and disbursed domestic artifacts characterize tent platforms.

Workers' Housing Features
Boardinghouse: Mining companies erected boardinghouses for crews of four or more workers. The residents lived in a communal atmosphere, may have shared sleeping quarters, and usually consumed meals prepared in the building. Privies, outdoor work areas, and domestic refuse dumps or scatters are usually associated with boardinghouses. In form, the buildings were often greater than 20' x 25' in area, one or two stories in height, and rectangular, L-shaped, or irregular in plan. Roofs were usually gabled with a loft underneath, and foundations were informal on earthen platforms. Although builders preferred lumber, they used locally available materials to save capital. Boardinghouses were typically vernacular, in that the builder adapted conventional form and construction methods to local conditions, available materials, and interpreted needs.
Boardinghouse Platform: Boardinghouses usually stood on earthen platforms, which may feature rock or log footers and a collapsed a root cellar. The platform often represents the building's size and footprint.
Boardinghouse Ruin: The structural remnants of a boardinghouse.
Bunkhouse: Bunkhouses were a type of company housing where workers slept and spent leisure time, but did not regularly prepare food. Instead, they ate in a boardinghouse or company dining hall. Given this, bunkhouses often feature few food-related artifacts relative to the size of the building and the number of inhabitants. In form, construction, and style, bunkhouses were similar to boardinghouses.
Bunkhouse Platform: A platform where a bunkhouse stood. The platform should feature few food-related artifacts, and the platform usually represents the structure's size and footprint.
Bunkhouse Ruin: The structural remnants of a bunkhouse.
Cabin: A cabin was a self-contained residence for several workers or a family. In form, cabins were less than 20' x 25' in area, rectangular or L-shaped in plan, and one story high. Workers built cabins with any combination of logs, lumber, canvas, and sheet iron. Cabins were typically

vernacular, in that the builder adapted conventional form and construction methods to local conditions, available materials, and need. Because cabins were self-contained households, they usually offer a wide array of domestic artifacts. Privies and refuse scatters are often associated.

Cabin Ruin: The collapsed remains of a cabin.

Cellar Pit: Cellars, at times mistaken for dugout residences, were subterranean structures that provided cold storage for perishable food. They usually had plank walls retaining an earthen pit, a plank or log roof covered with earth, and a sunken doorway. In some cases, cellars were underneath cabins and boardinghouses. When the walls and roof collapsed, the cellars tend to manifest as pits with notches marking the entry. A lack of domestic refuse is a common attribute.

Chimney Remnant: A collapsed chimney, usually consisting of rocks or bricks. Chimneys are usually components of building platforms.

Cistern: Organized, well-capitalized residential complexes occasionally included cisterns for fresh water. Cisterns were plank, concrete, or stone masonry chambers sunk into the ground, usually with inlet and outflow pipes.

Corral: Pack animals provided transportation in the mining industry before 1940, when automobiles became common. Company housing complexes, unincorporated settlements, and towns almost always had corrals to impound multiple animals. The corrals varied widely in size, plan, and constitution, depending on the number of animals and type of operation. Livery businesses tended to build large corrals geometric in plan with wooden or wire fences, feed troughs, and stables. Mining and logging companies, on the other hand, built smaller corrals that utilized natural features as barriers to save construction costs. Such corrals were built in open areas bordered by streams, rock outcrops, thickets, and slope changes, and incorporated combinations of branches, upended stumps, and wire as fencing.

Corral Remnant: After abandonment, corrals may feature evidence of their boundaries such as wires, branches, upended stumps, individual fence posts, and cobble alignments marking a fence line. The interior should either be open or feature vegetation younger than in the surrounding area.

Developed Spring: Settlements depended on water for existence, and residents were able to subsist on surface sources when a community was still in its early stages of growth. Springs were preferred because of their purity. When water was difficult to collect, the residents developed the spring by excavating a chamber, lining it with planks or masonry, and diverting drainage around the excavation.

Domestic Refuse Dump: People usually threw their solid refuse downslope from their residences, forming deposits of domestic artifacts. Large deposits that were high in volume qualify as dumps. Artifacts are usually domestic in nature, primarily food-related, and include food cans, fragmented bottles and tableware, and personal articles.

Domestic Refuse Scatter: A refuse scatter is a light amount of domestic artifacts disbursed over a broad area. Domestic scatters usually extend downslope from a residential feature.

Privy: Until flush toilets became common during the 1940s, most people outside of principal towns relied on privies for their personal use. Privy buildings enclosed toilet benches with cut-out holes as the seats. Most buildings were vernacular with shed or gabled roofs, plank floors,

and a plank door. The residents often preassembled the walls, leaned them together, and nailed the corners. The buildings stood over a pit on posts or rocks.

Privy Pit: Privy pits were excavated in the ground underneath privies to receive waste. When a pit became full, the residents relocated the privy building, topped the depression off with domestic refuse, and shoveled over a soil cap. The cap subsided as the pit contents leached away and decayed, creating a depression usually less than 6' in diameter. Pits often feature backdirt downslope, some domestic refuse in the interior, and ashy soil. The pit may be surrounded by more refuse and footers for the privy building.

Residential Building: Settlement sites may feature buildings that material evidence defines as residential, but the buildings do not clearly possess the characteristics of boardinghouses, bunkhouses, or small cabins. Such buildings can be recorded as general residences.

Residential Building Platform: A platform, confirmed by artifacts, which supported an unspecified residential building.

Residential Building Ruin: The structural remnants of a residential building.

Road: Residential complexes usually required roads to accommodate traffic. Roads are at least 8' wide.

Root Cellar: Residences and businesses that handled high volumes of perishable food had root cellars for storage. Such enterprises were commonly boardinghouses, restaurants, hotels, and markets. Root cellars, often mistaken for dugouts, were excavated near their associated buildings. Walls usually made of rocks, logs, or lumber retained the earthen sides and a roof covered with more earth. Because root cellars were not residences, they usually offer few domestic artifacts and lack stovepipe ports.

Spring Box: A spring box was a small enclosure built over a developed spring. The structures had plank walls, often a masonry or concrete chamber, a roof, and an entry door.

Stable: Mining companies and livery operators erected stables to house draft animals used for wagon drayage. Stables were vernacular, poorly constructed, and assembled from inferior materials to save costs. In form, stables were square to rectangular, and one-story high with shed or gabled roofs. Logs were used for the foundation and walls, and lumber and sheet metal for the roof. Defining characteristics include wide doorways, low ceilings, broad gaps in the walls, and mangers and stalls in the interior.

Stable Ruin: A collapsed stable.

Well: Because many settlements lacked reliable and clean sources of water, residents turned to wells. Three types were common in mining districts. The earliest was a hand-dug shaft lined with dry-laid masonry and crowned by a platform at the collar. Once hardware was available, residents sank pipes into the ground and fitted them with hand-pumps. In some cases, communities or mining companies installed steam- or gasoline-powered pumping stations over large-diameter wells.

Townsite and Unincorporated Settlement Features

Townsites and unincorporated settlements usually included similar features described above with Workers' Housing.

Assay Shop: An assay shop was a facility where a trained metallurgist tested ore samples for their mineral content. In function, content, and form, the shops were like those described with the Ore Treatment Mill property subtype above. The shops in unincorporated settlements may have been an independent business or run by a mining company, while those in towns were usually businesses.

Assay Shop Foundation/Platform: Assay shops often stood on earthen platforms or foundations of concrete and rock masonry. Distinct characteristics can define a platform as that for an assay shop. Foundations or other remnants of an assay furnace, its blower, and small crushers may remain. Artifact assemblages typically include furnace clinker, fire-bricks, broken assay crucibles, mineral samples, and laboratory artifacts.

Blacksmith Shop: Blacksmiths were vital to mining communities because they manufactured hardware, maintained tools, and shoed draft animals. Nearly every community had a blacksmith, who kept shop on the fringes of the business district. Community blacksmith shops were equipped like those at mines, and the buildings were vernacular and simple in form. They were square, rectangular, or L-shaped, one-story, and gabled. In construction, they consisted of combinations of logs, lumber, and sheet iron, and were rough. The floor was the underlying earthen platform and the foundation usually of logs or rocks. The interior was open and featured workbenches, a coal bin, forge, anvil block, and blower to force air into the forge.

Blacksmith Shop Platform: Blacksmith shops usually stood on earthen platforms larger than the building for storage of materials and large items. Rock alignments and deposits of forge clinker usually define the building's footprint. The artifact assemblage is distinct and includes much forge clinker, forge-cut iron scraps, hardware, and sheet iron.

Blacksmith Shop Ruin: The collapsed remnants of a blacksmith shop.

Commercial Building: Commercial building is a general term applied to a building that housed a business. Commercial buildings were usually located in or near a town's business district. The buildings assumed a variety of plans, were as high as two stories, and usually featured gabled roofs. Commercial buildings in most settlements were vernacular and consisted of any combination of log and lumber construction.

Commercial Building Foundation/Platform: Primitive commercial buildings stood on logs or rocks laid on earthen platforms. Large buildings may have stood on formal foundations of masonry or concrete. Artifacts and buried archaeological deposits are often few because most service and retail businesses generated little refuse.

Commercial Building Ruin: The collapsed remnants of a commercial building.

Ditch: Many unincorporated settlements and towns featured ditches that delivered fresh water for consumption and other uses. The ditch, an early public utility, tapped the nearest reliable source and carried the water through the settlement.

Hotel: A hotel was a business that housed guests on a short-term basis. A boardinghouse, in contrast, provided long-term accommodations. In the early years of unincorporated settlements and towns, hotels were small and featured only several rooms. In mature settlements, the hotels were more substantial and complimented by a dining and drinking establishment. In form, hotels

had varying floorplans, were often two stories in height, and usually featured gabled roofs. In construction, small buildings were usually made of logs and stood on foundations of logs or rocks, while large hotels were constructed of lumber with formal foundations. Most were vernacular in appearance and had may have featured false-fronts, boardwalks, and ornamental trim.

Hotel Foundation/Platform: Small hotels stood on rock alignments and logs laid on earthen platforms, while larger hotels may have had formal masonry or concrete foundations. The platforms tend to be large and may feature a cellar pit if the hotel had a kitchen. The artifact assemblages are often distinct and can include a high proportion of small personal items, clothing hardware, decorative domestic wares, furniture parts, and lamp parts. Large and numerous privy pits are often associated.

Livery: A livery was a business that temporarily boarded draft animals. Defining characteristics include corrals, collapsed fences, evidence of stables, earth packed by animal traffic, and manure deposits. Because of noisome pests and odors, liveries were usually located on the fringes of a settlement. The artifact assemblage should include a high proportion of tack straps and hardware.

Mercantile: A mercantile was a retail establishment that sold a variety of goods. In form and construction, mercantiles were similar to the commercial buildings described above.

Mercantile Foundation/Platform: Mercantiles may be identified by a substantial platform or foundation, an associated privy pit, and little evidence of residence, such as food-related items.

Restaurant: A restaurant was a food service business that may have also sold baked goods. Similar in form and construction to commercial buildings, restaurants featured a dining room, a kitchen, a storage area, and a root cellar. Work areas also usually existed behind the restaurant building. The artifact assemblage is distinct and includes high proportions of cans, broken tableware, butchered bones, and stove clinker. Large and numerous privy pits were behind the buildings.

Restaurant Foundation/Platform: Restaurant platforms are similar to those for commercial buildings, except they almost always offer large quantities of food cans, fragmented tableware and bottles, butchered bones, and kitchen implements.

Saloon: A saloon was a business that served primarily alcoholic beverages and, possibly, light dining fare. Most saloons ranged in construction from small log buildings in nascent settlements to formal frame buildings in developed towns. They usually featured a bar room, storage area, and root cellar.

Saloon Foundation/Platform: Saloons stood on platforms similar to those for commercial buildings. The artifact assemblage is distinct and includes high proportions of fragmented bottles relative to other items.

Property Type: Rural Historic Mining Landscape

Rural Historic Landscapes are a large-scale property type representing the history of an area's human occupation, life ways, and land use. The National Park Service recognizes other types of landscapes for National Register nomination, such as designed historic landscapes and

cemeteries. The National Park Service describes Rural Historic Landscapes in detail in its *National Register Bulletin: Guidelines for Evaluating and Documenting Rural Historic Landscapes*. In overview, the Bulletin states:

> A rural historic landscape is defined as a geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features.[10]

Areas that experienced intensive mining form a subset, Rural Historic Mining Landscapes. Such landscapes provide a physical context for individual resources, and when viewed in total, the resources and their setting constitute a greater whole. Extensive tracts of land, its natural features, and individual historic resources represent the history, people, and traditions of mining in San Juan County.

The National Park Service organized the defining characteristics of Rural Historic Landscapes into eleven categories: land uses and activities; patterns of spatial organization; response to the natural environment; cultural traditions; circulation networks; boundary demarcations; vegetation related to land use; buildings, structures, and objects; clusters; archaeological sites; and small-scale elements. The first four are the result of processes, while the latter seven are physical attributes.[11] A rural historic mining landscape can also be described as a "landscape of work."[12] Mining outfits molded the landscape for the efficiency, organization, and economics of finding ore, extracting it, and processing the material. Mining landscapes of work include features characteristic of hardrock mining. Prospects are concentrated in areas where ore was likely to be found, while mines lie on land where ore formations were confirmed, regardless of topography. Ore treatment mills were sited either at the mines or in drainages where water and open ground were available. Companies erected workers' housing at mines and mills that were distant from established communities. Unincorporated settlements and formal towns grew in the most suitable environments near the centers of mining and milling. Circulation systems in the form of pack trails linked prospects with communities, and roads connected mines, mills, and transportation centers. Ditch systems diverted water from streams to reservoirs for industrial and community consumption. The forests around the mines and communities were cut over to provide wood for heating, steam power, and lumber. Sawmills were located close to the mature stands to minimize the distance workers hauled the cut logs. All are variations on the working landscape as related to the San Juan County mining industry.

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[10] Linda Flint McClelland, et al.,. *National Register Bulletin: Guidelines for Evaluating and Documenting Rural Historic Landscapes* (National Park Service, 1999) 1.

[11] McClelland, et al., 1999:3.

[12] Denise P. Messick, J.W. Joseph, and Natalie P. Adams, *Tilling the Earth: Georgia's Historic Agricultural Heritage, A Context* (Stone Mountain, GA, New South Associates, 2001) 62.

Rural Historic Mining Landscape Significance

Because multiple historic resources and natural features make up rural historic mining landscapes, significance can be assessed in terms of the broad historical theme of the mining industry, associated settlement, and infrastructure development. Potential Areas of Significance include Architecture, Community Planning and Development, Engineering, Industry, and Landscape Architecture. Because of the complexity and diversity of constituent historic resources, coupled with ongoing and evolving use, most landscapes may be significant under multiple areas and criteria. Extended Periods of Significance must be considered when determining the significance of rural historic mining landscapes.

Regarding Architecture and Engineering, mining industry participants adapted conventional designs and construction methods to the environment of the San Juan Mountains. Conditions included topography, natural landscape features, local climate, and available buildings materials. In the context of a landscape, a spectrum of buildings can represent the evolution of architecture specific to the mining industry. Similarly, structures may be significant representations of mining engineering, and multiple structures within a single landscape may reflect the evolution of function, design, methods, workmanship, and materials.

Regarding Community Planning and Development, landscapes may reveal settlement patterns pertaining to hardrock mining. Unlike traditional settlement patterns, mining industry participants established residential complexes near centers of mining or related industry regardless of environmental conditions. Proximity to mines and industry was a first priority, and the best micro-environment for residence or community was secondary. Landscapes may reflect the development patterns of industrial aspects of mining and natural resource influence on settlement. It should be noted that settlement is not limited to concentrations of residences, such as townsites. Workers' housing and prospectors' camps scattered throughout the county comprise an alternate another settlement pattern.

Regarding Economics and Commerce, assemblages of sites including mines, mills, roads, and railroads reflect the overall process of converting natural resources into wealth. The mines produced ore that was carried over the roads to mills. The ore was processed at the mills, metals recovered, and concentrates shipped by road or rail to a smelter for the final processing. Each stage furthered the ore-to-wealth cycle. Each stage also represents a divestment of money into the region through workers' wages and consumption of goods. Communities in the landscape were local economic centers where the divested funds supported commerce.

The area of Industry is fundamental. Mining landscapes are tied to and representations of the mining industry, which was the most important factor in the exploration and development of the county. The industry was the principal force behind the county's economy, infrastructure, permanent settlement, and development. The industry and its impacts on the land made San Juan County one of Colorado's most productive sources of mineral wealth, a center known in greater mining circles. Prospectors and mining outfits adapted known methods and technology to the physical environment, geology, and mineralogy of the San Juan Mountains. Through their efforts, prospectors and companies contributed to the development of mining technology and engineering in numerous ways. Many innovations were adopted widely and forwarded mining

and infrastructure elsewhere. Some innovations were smaller in scale, such as individual pieces of machinery or structures. Others were macro in scale, such as tramways and enormous mines and mills.

The area of Landscape Architecture pertains to landscapes purposefully manipulated. Infrastructure such as water systems and railroads are forms of purposeful large-scale land uses. Townsites, with grids of buildings and scattered outlying industries, are another. Large mine and mill complexes, where portions of the land were designated and altered for specific functions, are a third. On a large scale, designed systems associated with mining changed the appearance of landscapes.

Rural Historic Mining Landscape Registration Requirements

To qualify for nomination, a landscape must meet at least one of the NRHP Criteria and possess related physical integrity. Under Criterion A, a landscape and its contributing resources must date to one of the mining industry's Periods of Significance and one of the associated Areas of Significance, trends and events important to the county. Landscapes such as individual mines or milling complexes may be eligible under Criterion B through residence, employment, or other involvement by a significant person or persons. The associated resource must retain physical integrity relative to that person's occupation during their productive period of time. A prominent mineral surveyor may have platted numerous claims in a region, for example. Larger scale landscapes are less easily documented under Criterion B generally, as they evolved organically through the actions of numerous people.

Mining landscapes may be eligible under Criterion C if any buildings, structures, archaeological features, or natural features represent mining, its subsidiary industries, or related settlement patterns. Landscapes occupied for extended periods of time can reflect evolution in land use, while those occupied for a narrow period might reflect land use patterns of that era. Intact buildings and structures can be significant and often rare contributing elements of mining landscapes. Most contributing resources comprising the landscape should retain integrity at least on an archaeological level. Modern intrusions should either be minimal or compatible with the historic land use. The researcher must discuss how the landscape's characteristics and contributing elements represent an aspect of the mining industry.

Landscapes may be eligible under Criterion D when they hold a high potential to yield information based on a holistic representation of buildings, structures, or archaeological features. The arenas of inquiry may be broad and rely on information offered by the landscape as a whole. If residential complexes within the landscape possess building platforms, privy pits, and refuse dumps with buried archaeological deposits, testing and excavation may reveal important information regarding lifestyle and demographics of occupants. When information from multiple complexes is compared, regional patterns may become apparent. Important areas of inquiry include but are not limited to diet, health, distribution of gender, families, ethnicities, professional occupation, and socioeconomic status. Comparative studies of industrial sites may reveal patterns of the application of systems engineering, ore treatment processes, and equipment. Other patterns regarding construction methods, materials, structural design, and

architecture may become apparent. Such information can be compared to geology, mineralogy, and the successful or failed operations for a full understanding of a region's industry. Intact underground mine workings is another area of inquiry under Criterion D. Groups of mines may feature connected workings that can contribute to the understanding of broad-scale mine engineering, planning, and operations.

Eligible rural historic mining landscapes must possess physical integrity relative to one of the county's Periods of Significance. Landscapes in the county changed to varying degrees through continuity in use, as well as degradation of resources following abandonment. Overt modern intrusions can compromise integrity if out of keeping with land use patterns characteristic of historic mining. Such intrusions should be few and unobtrusive. The presence of some characteristics is more important to integrity than others. Historic settlement patterns, vegetation patterns, circulation systems, and small-scale features typical of mining should be present. Because the natural environment was a prominent backdrop for mining during the county's Periods of Significance, a preserved natural setting is important to integrity.

Many of the seven aspects of integrity defined by the NRHP may apply to rural historic landscapes, although not all need be present. *Location* is the place where the significant activities that shaped land took place and remain apparent. To retain integrity of *design*, landscape features, both manmade and natural, must convey organization and planning relative to mining land use. *Setting* is the physical environment surrounding a historic property. Both large-scale and small-scale features form a setting that conveys mining land use and settlement patterns. To retain integrity of setting, a landscape and bordering area must not have changed a great degree in overall character. To retain integrity of *feeling*, the landscape should convey mining and associated settlement. Integrity of *association* exists where a combination of natural and manmade features conveys a strong sense of connectedness between the landscape and a contemporary observer's ability to discern the historic mining industry or settlement.

SECTION G: GEOGRAPHICAL DATA

The geographical area covered by this document consists of San Juan County, near the center of the San Juan Mountains in southwestern Colorado.

SECTION H: IDENTIFICATION AND EVALUATION METHODS

Two general research tracks proved to be effective in providing accurate contextual information and informing Property Types. The collections of six important research facilities in the Denver area provided primary archival and secondary source material. The institutions in order of relevance are Denver Public Library Western History Collection, Colorado School of Mines, Colorado State Archives, University of Colorado at Boulder library system, and History Colorado (the Colorado Historical Society). Of these, Colorado School of Mines, Colorado State Archives, and Denver Public Library possessed the richest collections relevant to mining. Key events and trends were synthesized from contemporary publications, including mining periodicals, newspapers, mine inspectors' and engineers' reports, manuscript collections, and other archival materials. Secondary sources, primarily popular literature, were used to clarify some information, synthesize historical overviews, and provide contextual information for broad trends.

Two approaches were useful for identifying discrete Periods of Significance: examination of the materials identified above and statistical analysis of population, ore production figures, and numbers of active prospects, mines, and mills between 1860 and 1980. This information was tabulated in five year increments when possible, and mines divided among small, medium, and large scale operations. Colorado Mining Directories (1870-1915), newspapers, Colorado Mine Inspectors' Reports (1915-1980) and other archival materials were used to reconstruct the number of mines and mills active between 1870 and 1980. Susanne Schulz's census compilation, *A Century of the Colorado Census,* provided population figures. Charles Henderson's *Mining in Colorado* provided production figures between 1874 and 1923, while the Bureau of Mines' *Minerals Yearbook* provided figures for 1931 to 1980. The above-described statistical analysis revealed some inherent challenges. Production figures for some periods may be inaccurate, while active mines and mills may have gone unreported. The period 1885 to 1897 in particular was poorly documented in archival resources. Overall, however, statistical analysis proved effective for identifying Periods of Significance and their associated trends. For example, sudden rises in both population and numbers of prospects can be interpreted as a period of discovery, mineral exploration, and boom. Gradual population growth combined with high production figures and an increase in small and medium-sized mines reflected the early phase of productive mining. A slight contraction in population, decrease in small mines, increase in large operations, and increase in production figures suggested the maturation of mining.

Regarding further comparison and contrast, several Multiple Property Documentation Forms document the mining industry in Colorado. The author co-authored *The Mining Industry in Colorado* with Jay Fell, Ph.D., in addition to solely authoring the *Amendment to Tourist Era and Metal Mining Resources in Boulder County*. These documents served as models for *Historic Mining Resources of San Juan County*. Descriptions of mining technology in Section E 2 of this context as well as the property types described in Section F were reproduced and adapted from *The Mining Industry in Colorado* with author permission.[1] The author's treatise on mining technology, *Riches to Rust*, and his work on the Las Animas Mining District, *Basins of Silver* also served for heavy reference. Text from the latter publication is also reproduced here. However, *Historic Mining Resources of San Juan County* differs from the above publications in its emphasis on the adaptation of mining and ore treatment to the difficult environmental, geological, and mineralogical conditions of San Juan County.

[1] Steve Baker, *Cement Creek West Study Unit-AML Historic Site Survey* (Montrose, CO, Centuries Research, 1998); Steve Baker, *The 1999 Abandoned Mine Land Reclamation Program Recording of Historic Mining Sites in the Treasure Mountain Study Unit of the Upper Animas Drainage, San Juan County, Colorado* (Montrose, CO: Centuries Research, 2000); .Ross S. Curtis, *Recording of Historic Mining Properties in the Galena Mountain Study Unit, San Juan County, Colorado* (Durango: Durango Archaeological Consultants, 2001); Julie Singer, Jonathan Horn, and Eric Twitty, *Martha Rose/Walsh Smelter (5SA1177) Archaeological Assessment, San Juan County* (Silverton:, Silverton Restoration Consulting, 2006); .Eric Twitty, *Mining Cement Creek: A Selective Inventory of Historic Mine Sites on the East Side of the Cement Creek Drainage, San Juan County, Colorado* (Boulder: Mountain States Historical, 2000); Eric Twitty, *The Silverton Mining District k: A Selective Inventory of Principal Historic Sites, San Juan County, Colorado* (Boulder: Mountain States Historical, 2002); Eric Twitty, *Kittimac Mine, Site 5SA181A, Level II Documentation* (Boulder: Mountain States Historical, 2005); Eric Twitty, *Legal Tender Tunnel, Site 5SA795, Level II Documentation* (Boulder: Mountain States Historical, 2005); Eric Twitty, *Level II Documentation of the Contention Tramway, Site 5SA1184.1* (2006,), forms on file at the Colorado Office of Archaeology and Historic Preservation; Eric Twitty and Jonathan Horn, *Level II Documentation of the Gold Prince Tramway, Site 5SA585* (2006), forms on file at the Colorado Office of Archaeology and Historic Preservation.

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Section E 1: San Juan County's Mining Districts

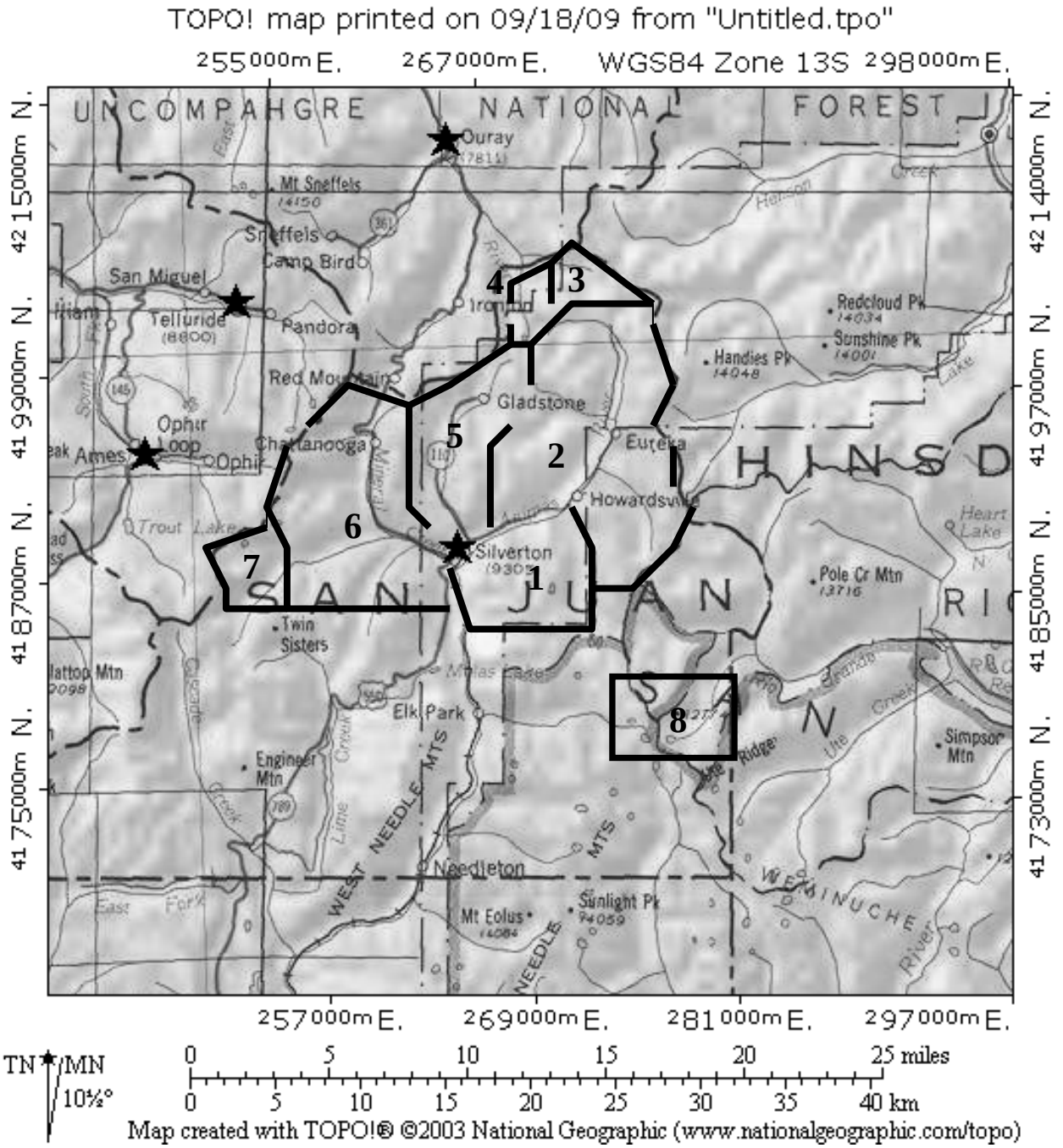


Figure E 1: The map is an index of San Juan County's mining districts. 1 = Las Animas; 2 = Eureka; 3 = Mineral Point; 4 = Poughkeepsie; 5 = Cement Creek; 6 = Mineral Creek; 7 = Ice Lake; 8 = Bear Creek.

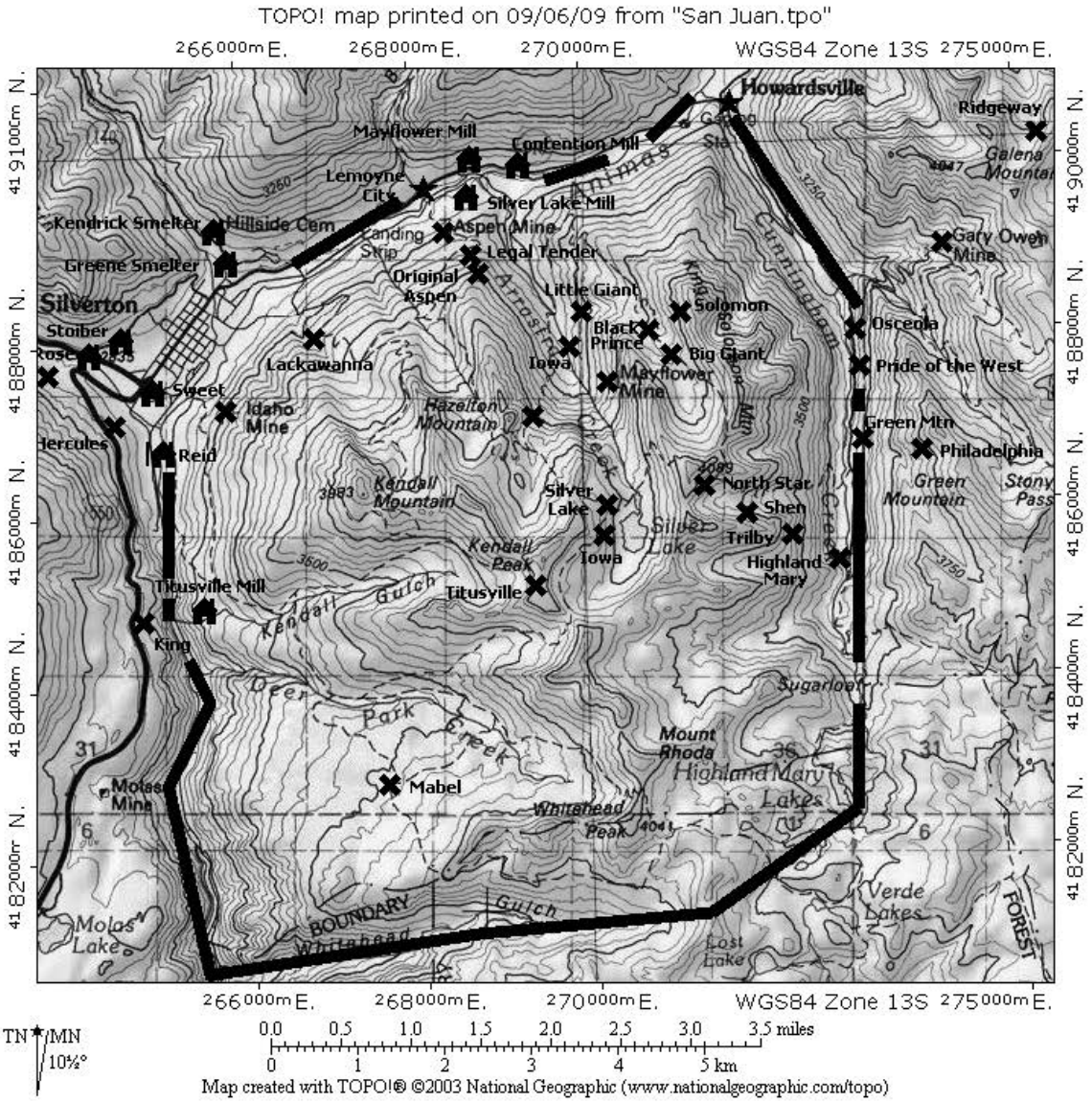


Figure E 2: The map depicts the principal mines, mills, and boundaries of the Las Animas Mining District.

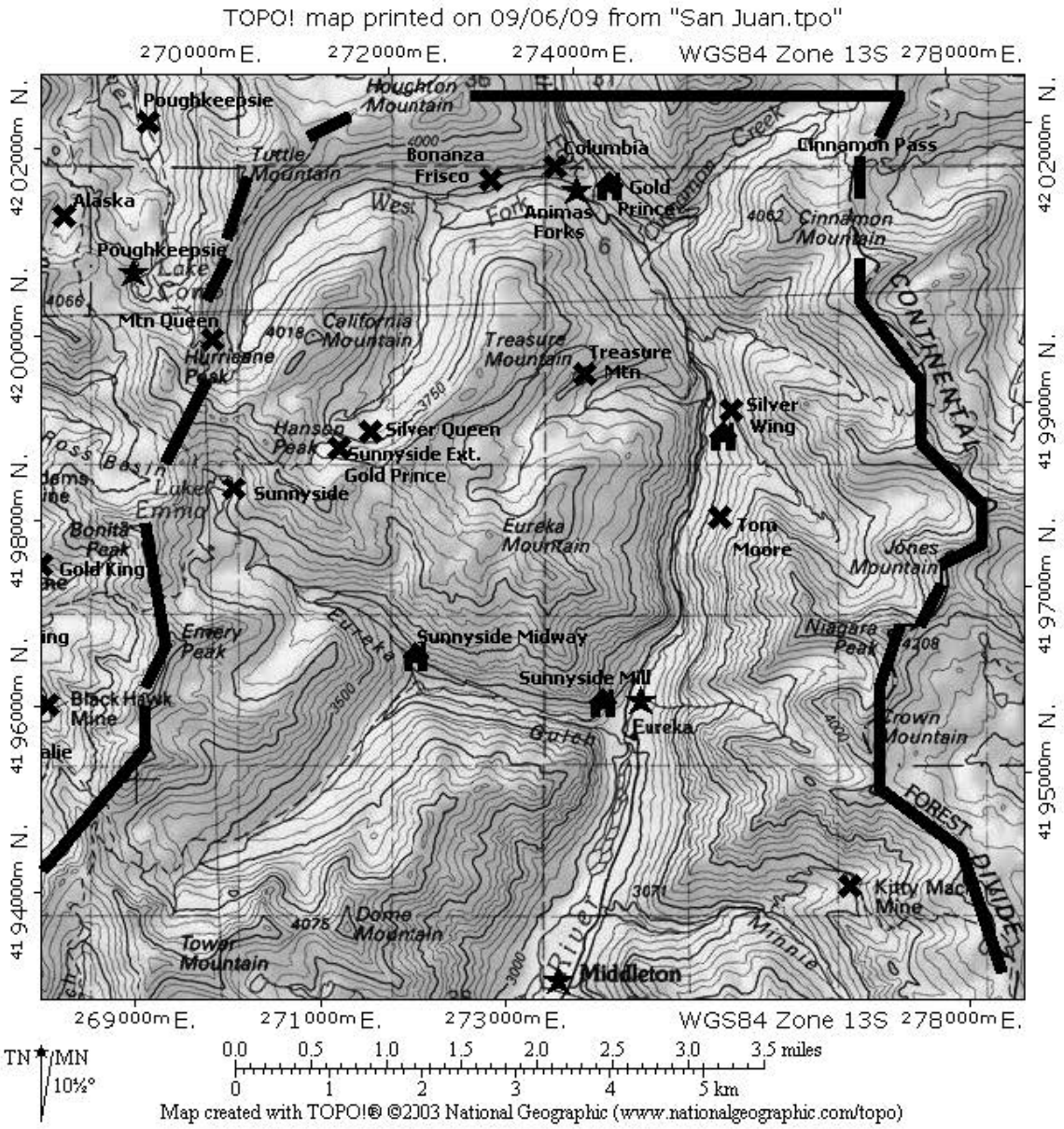


Figure E 3: The map depicts the principal mines, mills, and boundaries of the Eureka Mining District's northern portion. The settlements are Middleton at bottom, Eureka above, and Animas Forks at top.

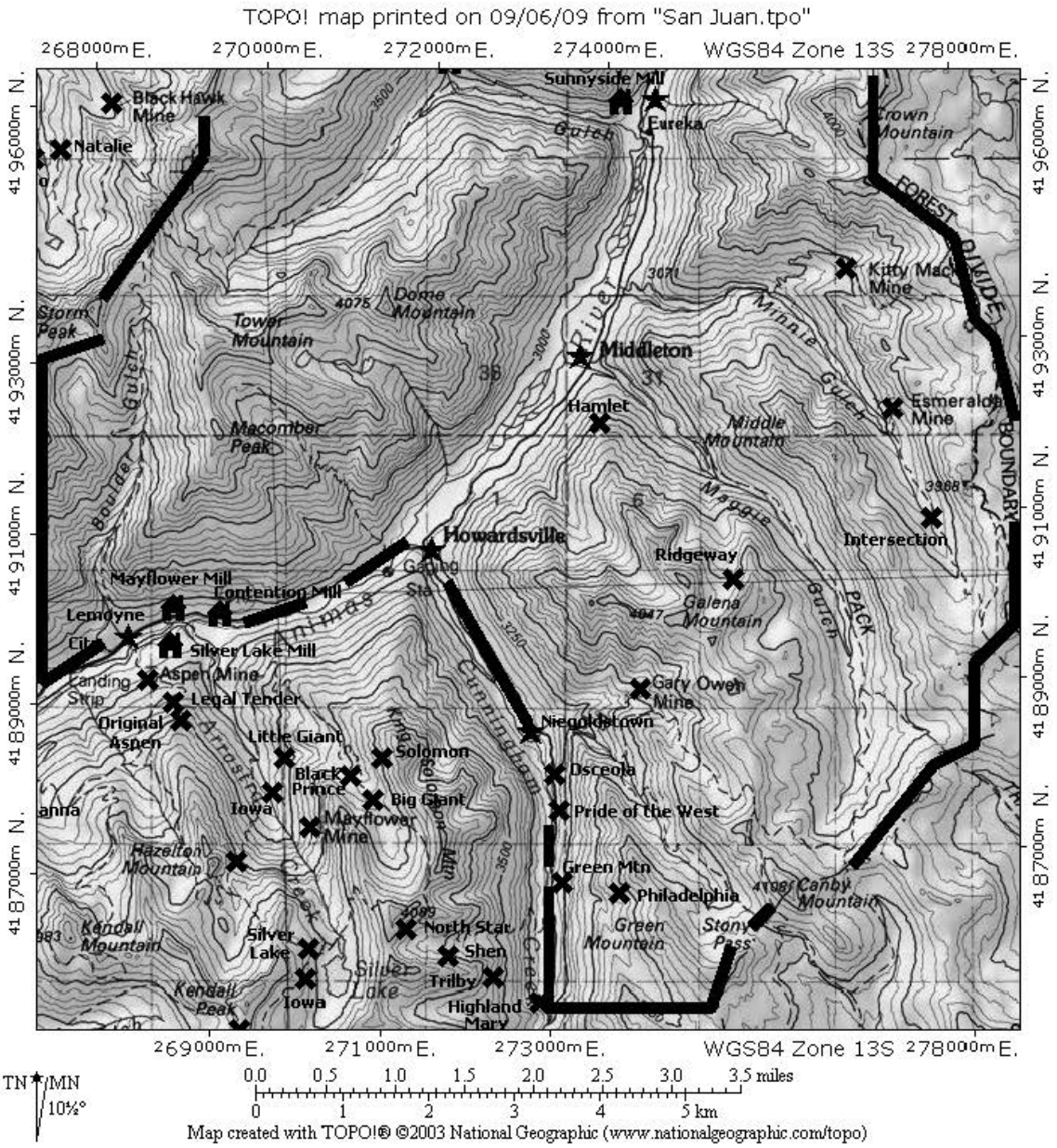


Figure E 4: The map depicts the principal mines, mills, and boundaries of the Eureka Mining District's southern portion. The Las Animas Mining District extends southwest.

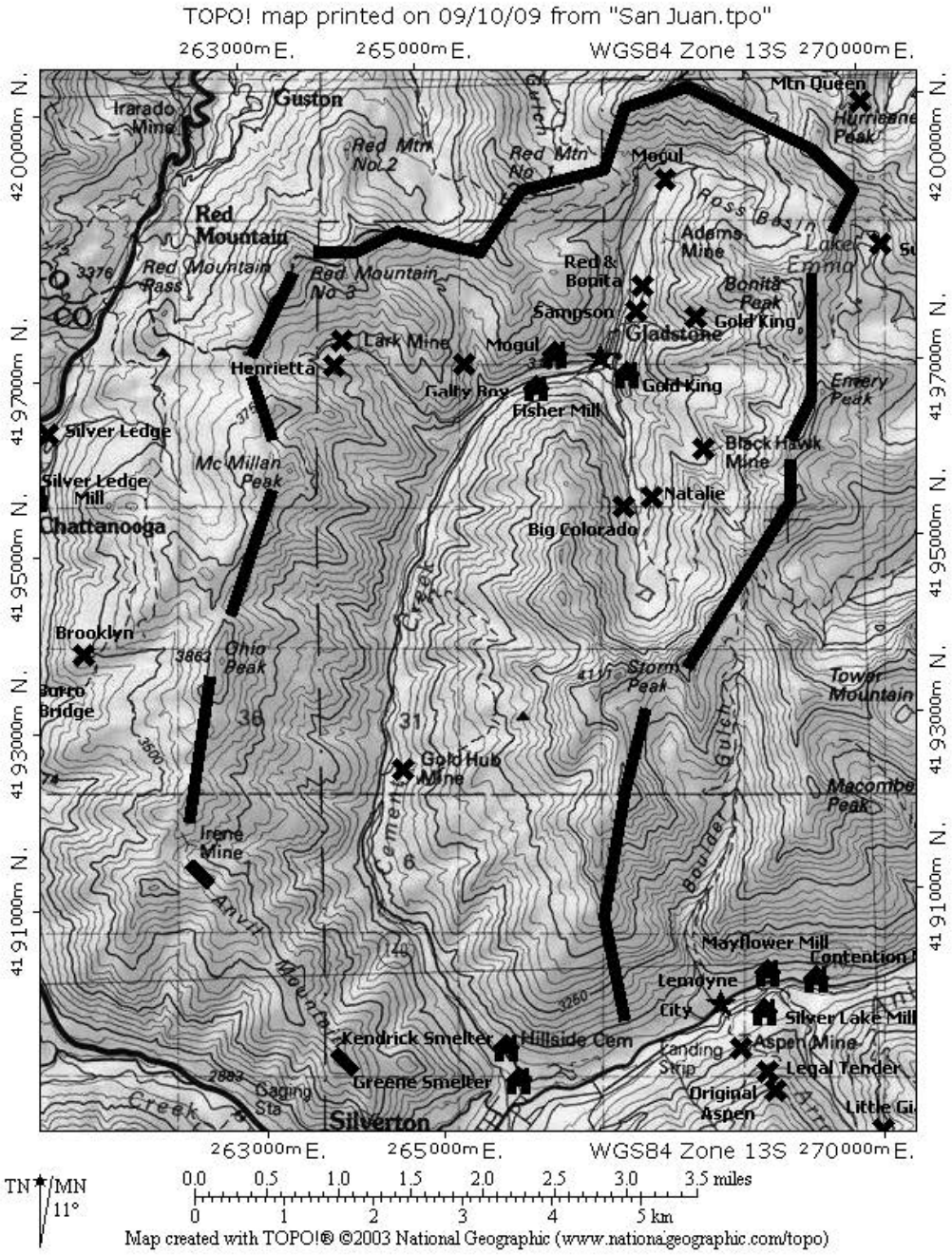


Figure E 5: The map illustrates the principal mines, mills, and boundaries of the Cement Creek sub-district.

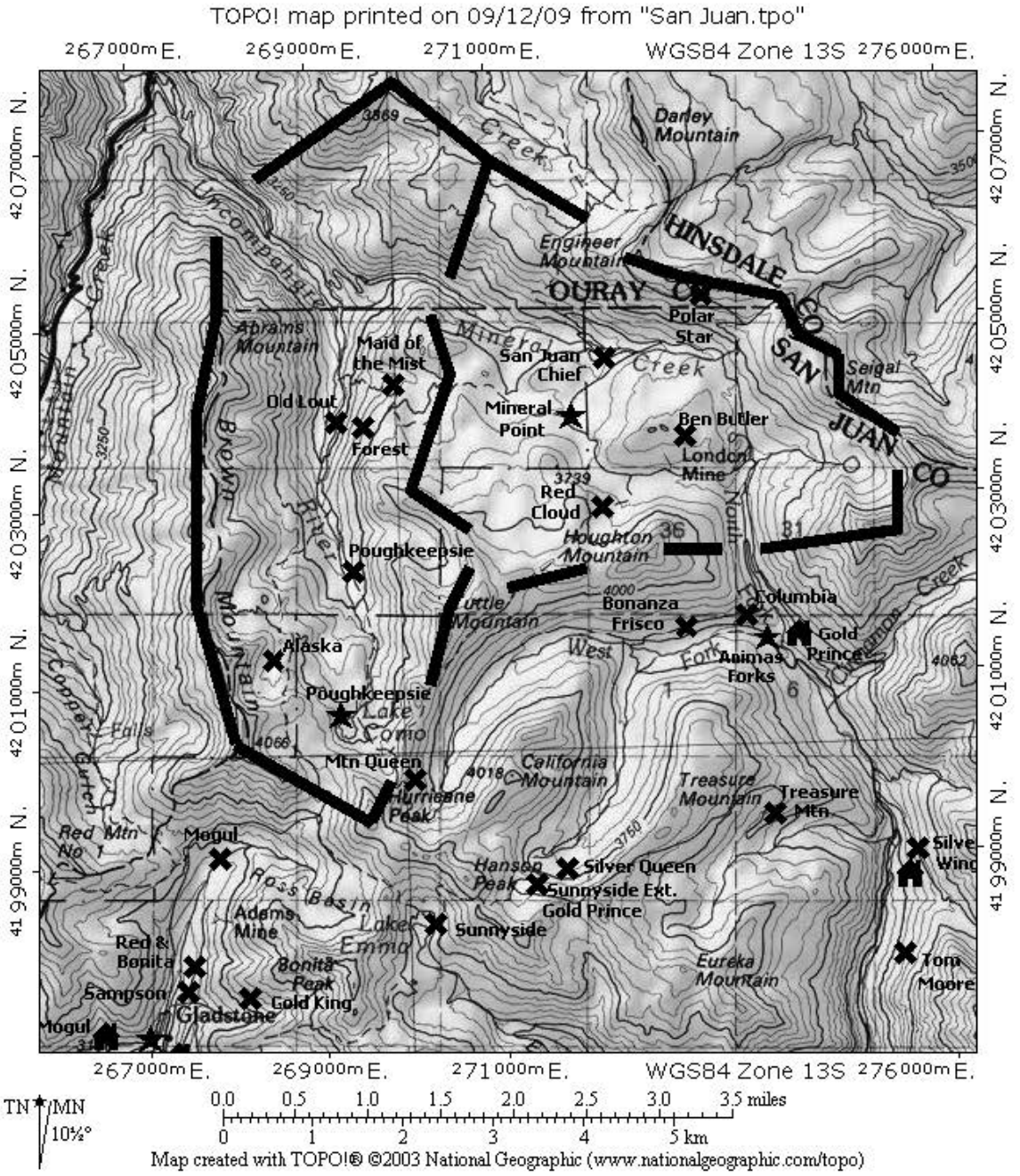


Figure E 6: The map depicts the principal mines of the Poughkeepsie Mining District, left, and Mineral Point Mining District, right. The Eureka district extends south, and the Red Mountain valley is west.

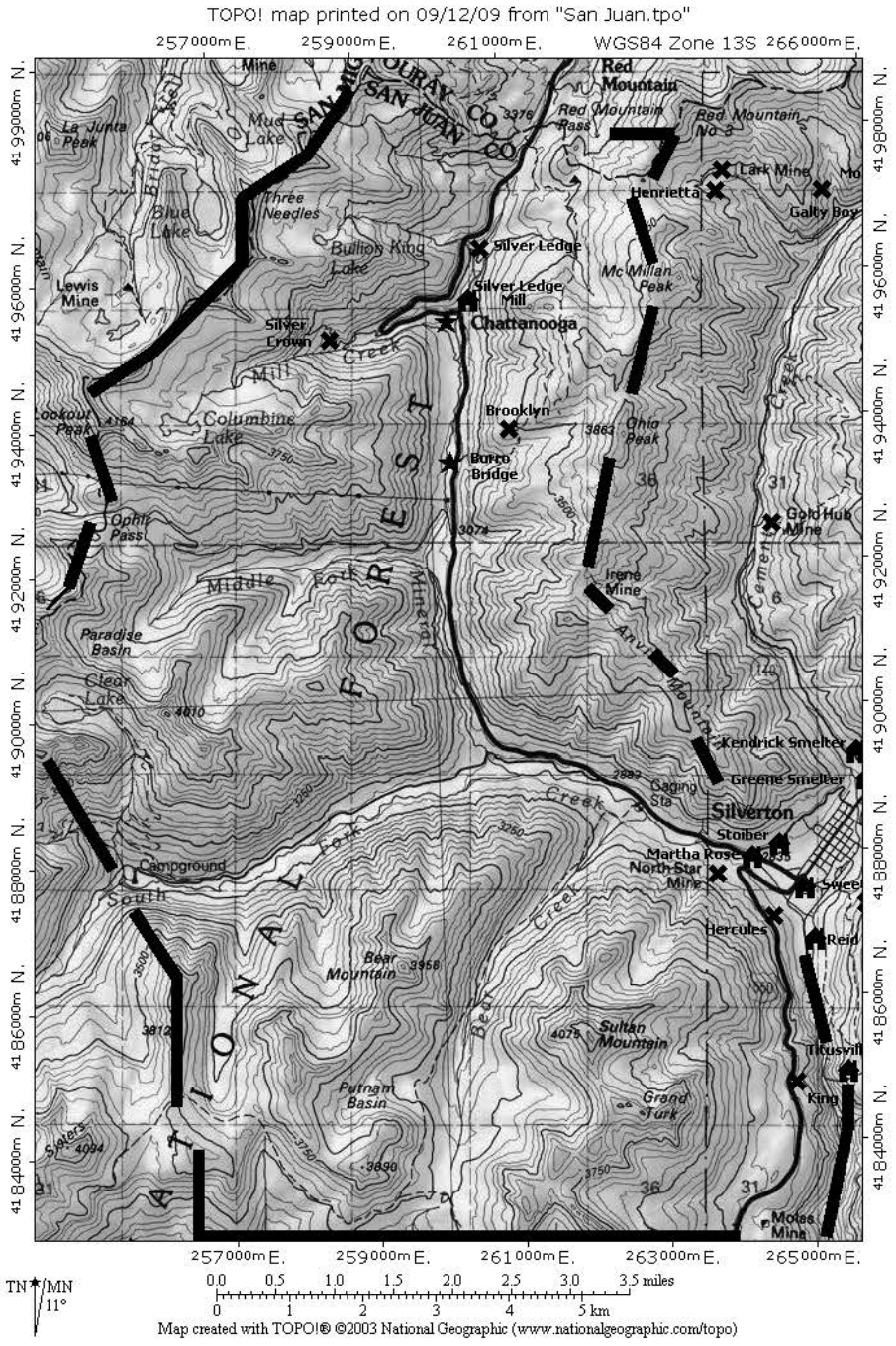


Figure E 7: The map depicts the principal mines, mills, and boundaries of the Mineral Creek Mining District.

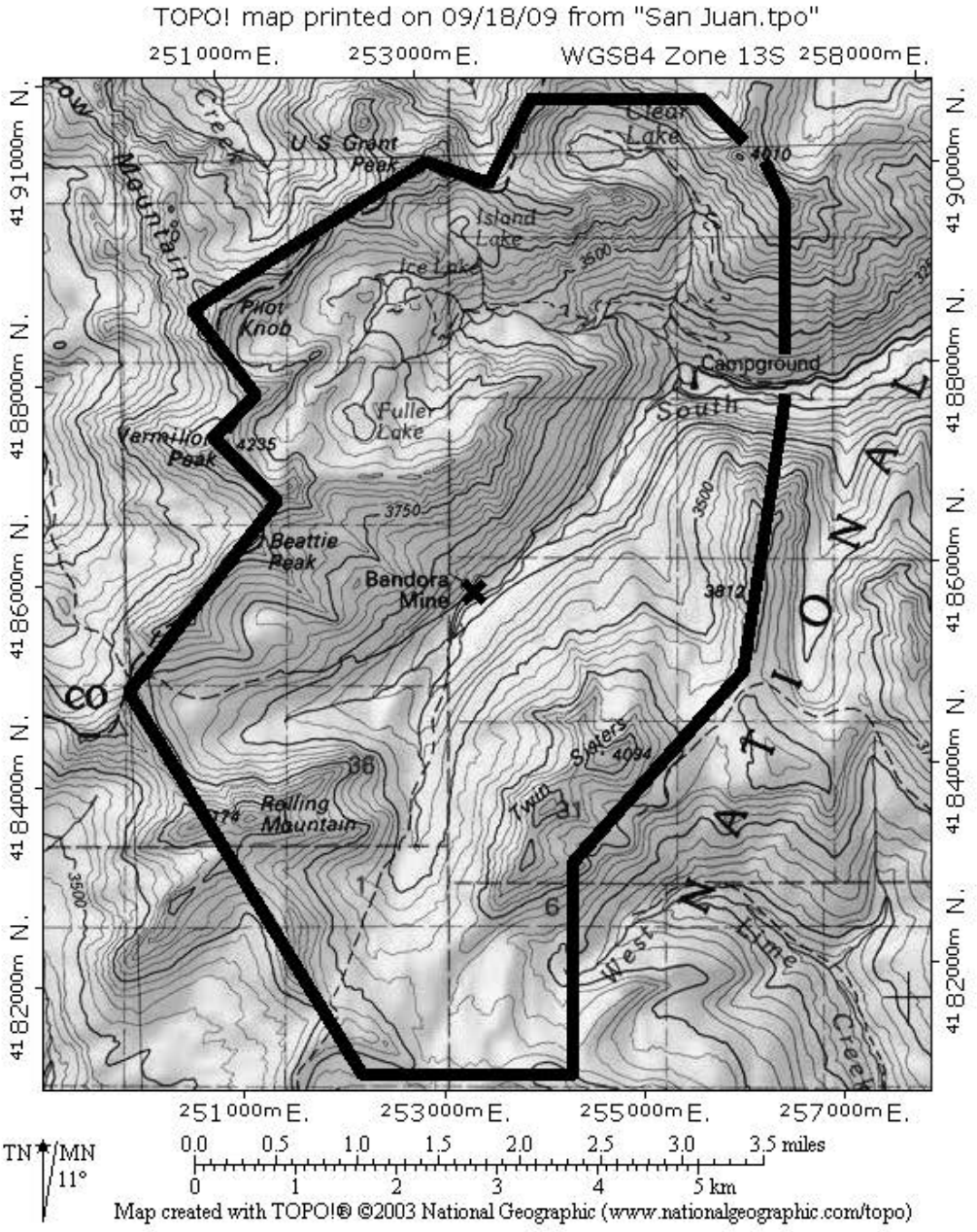


Figure E 8: The boundaries generalize the Ice Lake Mining District. The district's eastern portion overlaps the western edge of the Mineral Creek district.

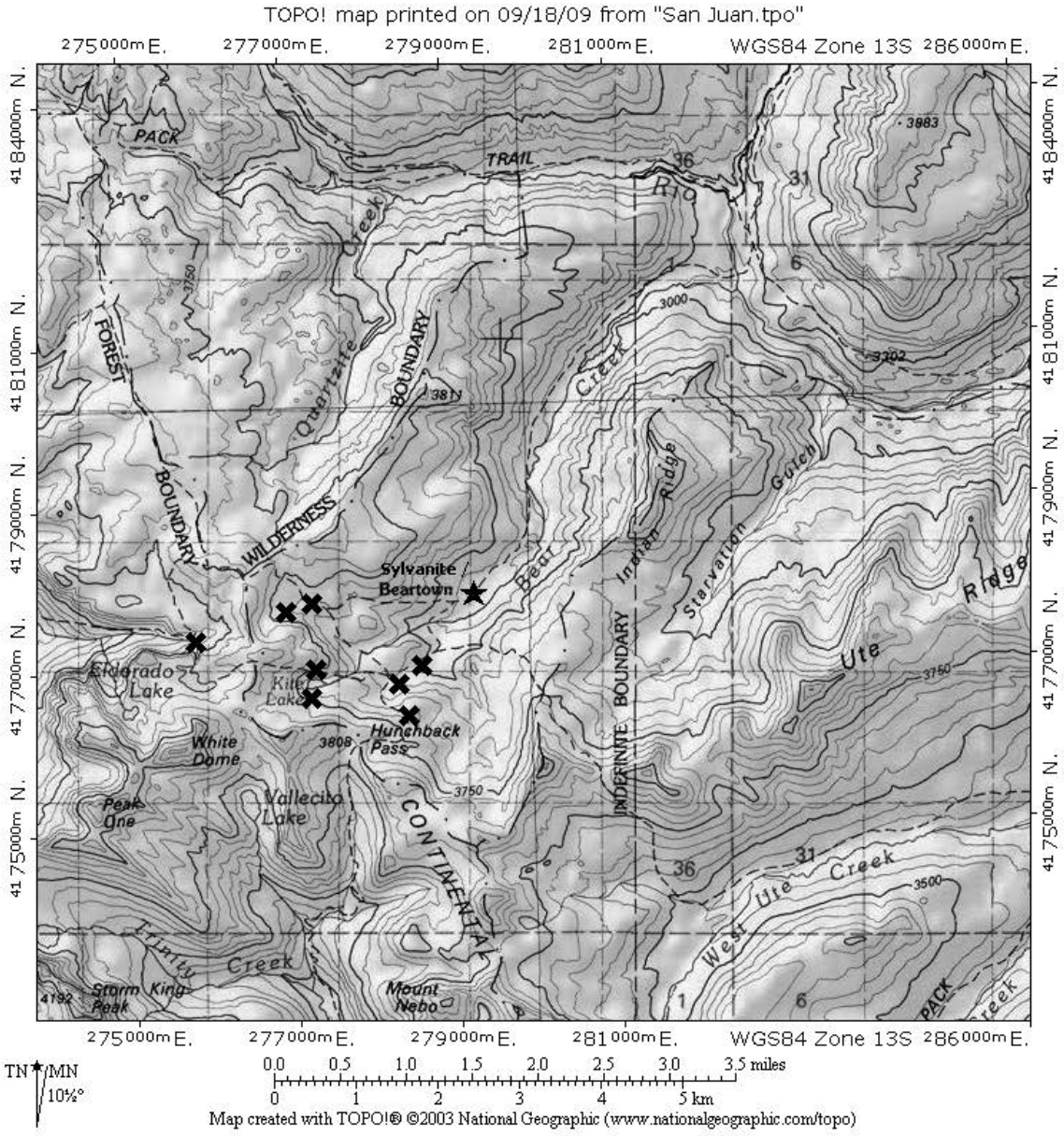


Figure E 9: The Bear Creek Mining District encompassed the collection of mines southwest of Beartown. The district's exact boundaries are uncertain and are therefore not shown. The Rio Grande River valley traverses upper right and, historically, provided easy access to the town of Creede in Mineral County.

Section E 1: The Gold Rush, 1860-1861

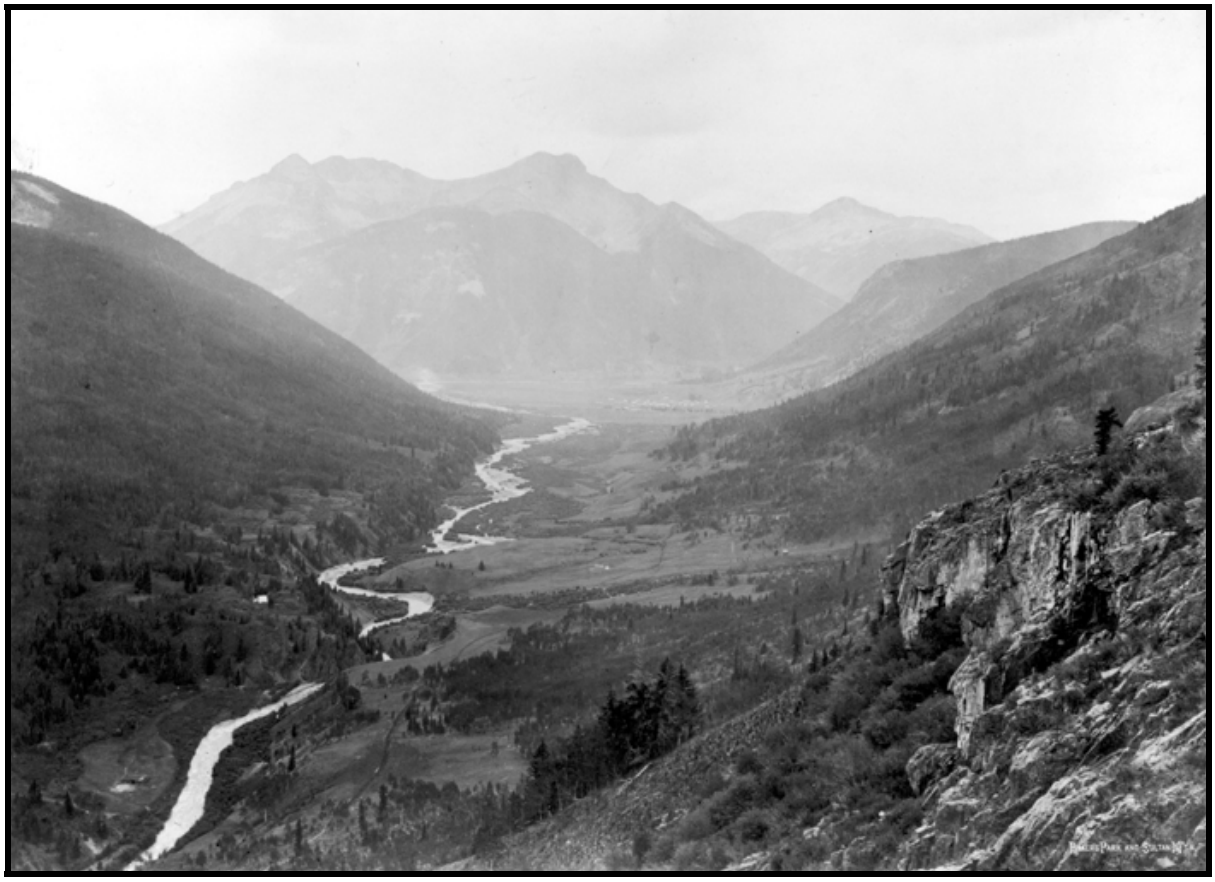


Figure E 10: Baker's Park was a prospectors' paradise, at least between May and October when the ground was thawed. The area offered enough drainages, rock outcrops, and peaks to keep prospectors busy for decades. William Henry Jackson took the southwesterly view in 1875. Source: U.S. Geological Survey, Jackson, W.H. 1689.

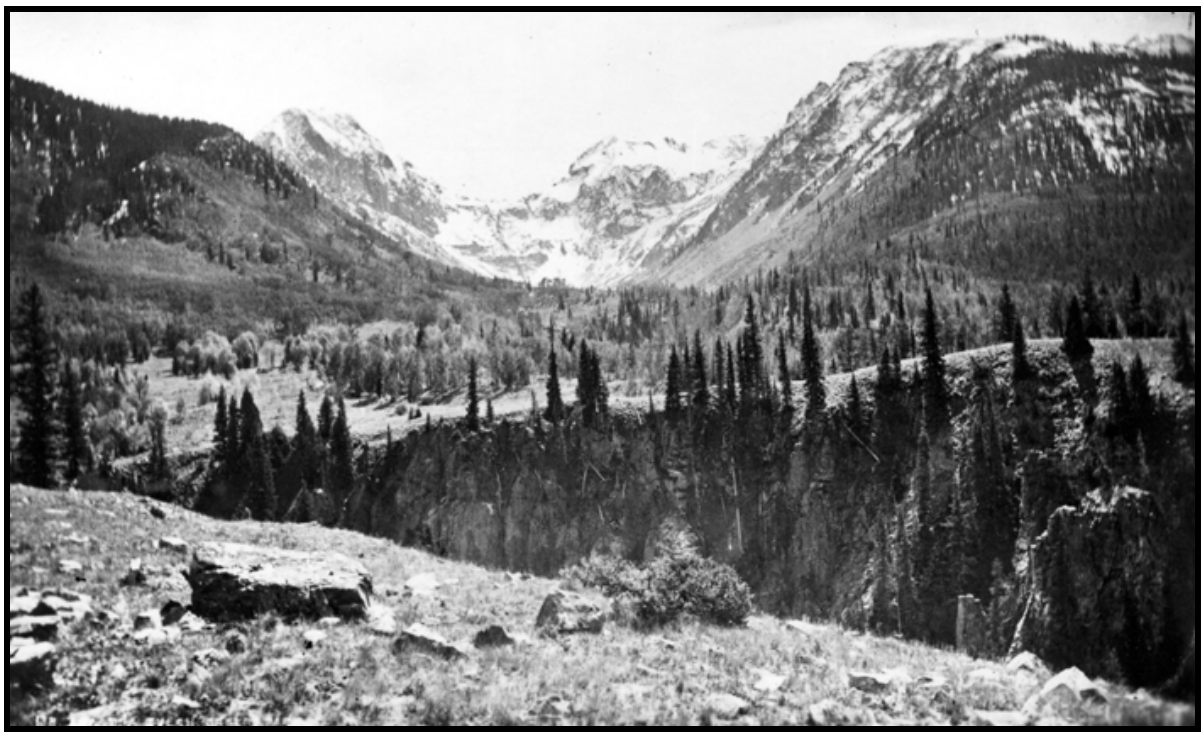


Figure E 11: Arrastra Gulch, originally known as Mason Gulch, seemed like an unlikely place to find gold, but the Baker Party found economical placer deposits on the floor in 1860. The French party traced leftover gold flakes to the Little Giant lode in 1870, which became the first hardrock mine in the San Juans. The Little Giant was located on the left side of the gulch behind the forested slope. Silver Lake Basin lies behind the imposing headwall, and William Henry Jackson captured the south view in September, when lower regions still enjoyed the warmth of summer. Source: U.S. Geological Survey, Jackson, W.H. 482.

Section E 1: Settlement and Establishment of Industry, 1875-1881

Figure E 12: William Henry Jackson took this northeast view of Howardsville in 1874. Howardsville was the county's most important town for several years, and it epitomized the county's formally organized settlements. The business district is at center and a few residences are scattered around. Source: Denver Public Library, Western History Collection, WHJ 1582.

Figure E 13: The south view depicts Eureka during the late 1870s. The town was the commercial center of the Eureka Mining District's southern portion. The town has been formally laid out in a grid of lots and blocks. Source: Denver Public Library, Western History Collection, C-131.

Figure E 14: The Greene Smelter, the county's first functional ore treatment facility, was fundamental to the success of the mining industry. In this late 1870s view, the facility is in full blast. Source: Denver Public Library, Western History Collection, X 61438.

Figure E 15: South overview of Silverton in 1877. By this time, Silverton assumed the role as the county's principal center of commerce, communication, and ore treatment. The Greene Smelter stands at bottom, the Animas River courses beyond town, Kendall Mountain towers on the left, and Sultan Mountain looms at right. Source: Denver Public Library, Western History Collection, X 11384.

Section E 1: Early 1880s Boom: 1882 – 1885

Figure E 16: The New York & San Juan Smelter, also known as the Durango Smelter, offered competitive rates and provided high returns, which rendered marginal grades of ore economical to produce. The facility also undercut Silverton's local smelting industry. Source: Denver Public Library, Western History Collection, Z 4858.

Figure E 17: Although this north view of the North Star Mine's tunnel house was taken around 1900, the building changed little from when engineer Eben Olcott erected it in 1881. The building housed the mine's tunnel portal, blacksmith shop, ore sorting station, and living quarters under one cramped and drafty roof. Source: Denver Public Library, Western History Collection, X 62714.

Figure E 18: For decades, most mining companies relied on pack trains such as this one in Silverton to carry ore down from the mines and haul supplies up. Shipping materials by pack train was costly and consumed much of a mining operation's profits, which provided incentive for the development of a network of wagon roads. Source: Denver Public Library, Western History Collection, X 1769.

Figure E 19: During the early 1880s, a boom in the Red Mountain Mining District, Ouray County, gave rise to Chattanooga. The town was not only gateway to the new district, but also center to a small collection of mines in San Juan County's northwest portion. Source: Denver Public Library, Western History Collection, c-156.

Figure E 20: During the early 1880s, Animas Forks was the eastern gateway into San Juan County, and a commercial and residential center for mines in the northern portion of the Eureka Mining District. The southern view depicts the main street. Source: Denver Public Library, Western History Collection, WHJ-758.

Figure E 21: For much of the county's history, Eureka was the commercial center for the Eureka district's southern portion. In the north view, the two-story building is Henry Helmboldt's mercantile. Helmboldt also ran one of the county's largest meat suppliers. Source: Denver Public Library, Western History Collection, X-6948.

Section E 1: The Value of Silver is Restored: 1890 – 1893

Figure E 22: Otto Mears opened the Standard Smelter in Durango in 1892 primarily to treat pyretic ore from the Red Mountain district in Ouray County. The smelter also accepted similar ore from San Juan County, providing competition for the Durango Smelter. Source: Denver Public Library, Western History Collection, X-61433.

Figure E 23: This northwest view depicts Edward Stoiber's Silver Lake Mine in 1890 or 1891. Stoiber recently finished the mill, center, a boardinghouse adjacent and right, and two shaft houses at upper left. The long chute at left delivered ore from a mid-level tunnel. The skiff floats on Silver Lake, which was a glacial tarn in an austere basin above treeline. The man on the bow is probably Edward Stoiber, and he is accompanied by engineers. Source: Colorado Historical Society, CHS X 7880.

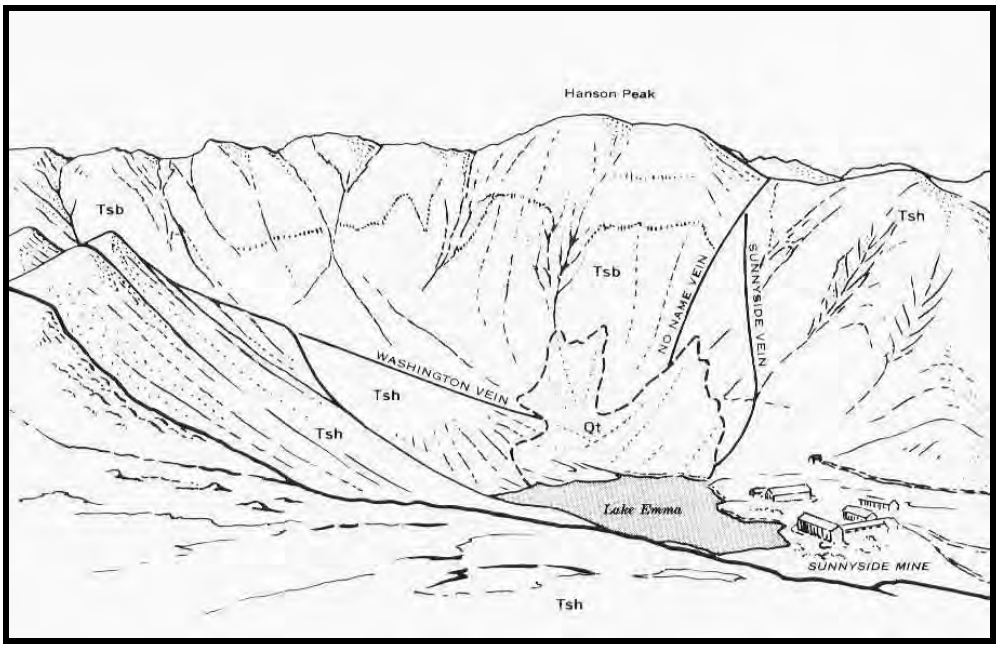


Figure E 24: The line drawing is a north view of Lake Emma, the Sunnyside Mine, and the principal veins that interested owner John H. Terry. Over time, Terry acquired rights to the veins and developed the Sunnyside into one of the county's most important producers. Source, Burbank, 1947:57.

Figure E 25: The North Star Mine, at the base of Sultan Mountain, was among the county's most important producers during the early 1890s. The operation was one of three major mines on the west edge of Silverton. Source: Denver Public Library, Western History Collection, X-62266.

Section E 1: The Silver Crash: 1894 – 1897

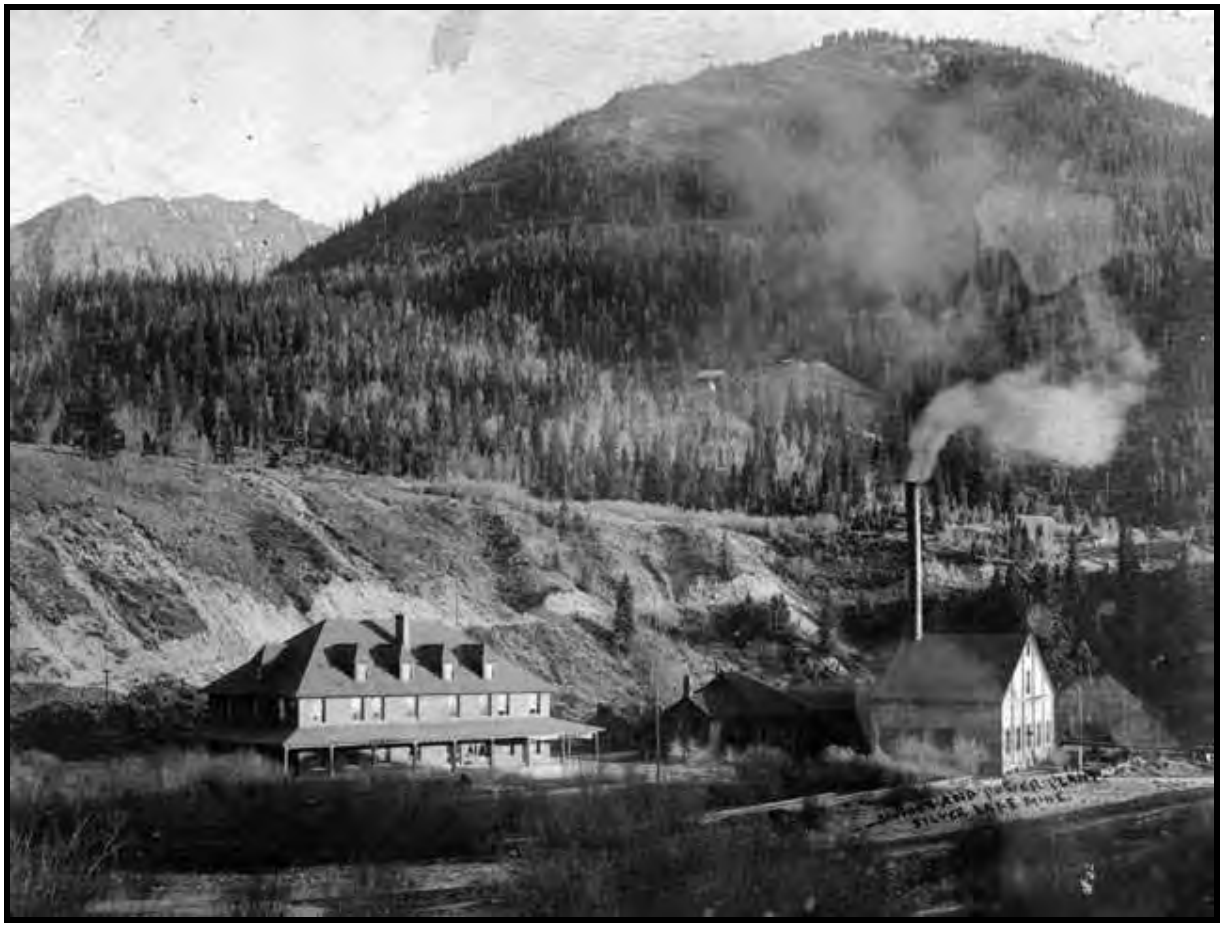


Figure E 26: In 1895, Edward Stoiber built Waldheim as the nerve center for his Silver Lake Mines Company. The buildings at right are what some engineers claimed was the most advanced private AC current powerhouse of its time, and Stoiber's mansion at left was among the largest in the San Juans. Although AC current technology was still in an experimental state, Stoiber chose AC because, unlike DC current, it could be transmitted up to the Silver Lake and Iowa mines in Silver Lake Basin. Source: Denver Public Library, Western History Collection, X-62272.

Figure E 27: The south view depicts the Iowa Mine in 1898 during a rare calm day in Silver Lake Basin. At this time, the Iowa ranked among the county's most important mines. The buildings at left were a compressor house and tram terminal, and the long structure at the upper right enclosed shops and the portal of the Iowa Tunnel. Source: Denver Public Library, Western History Collection, X 62274.

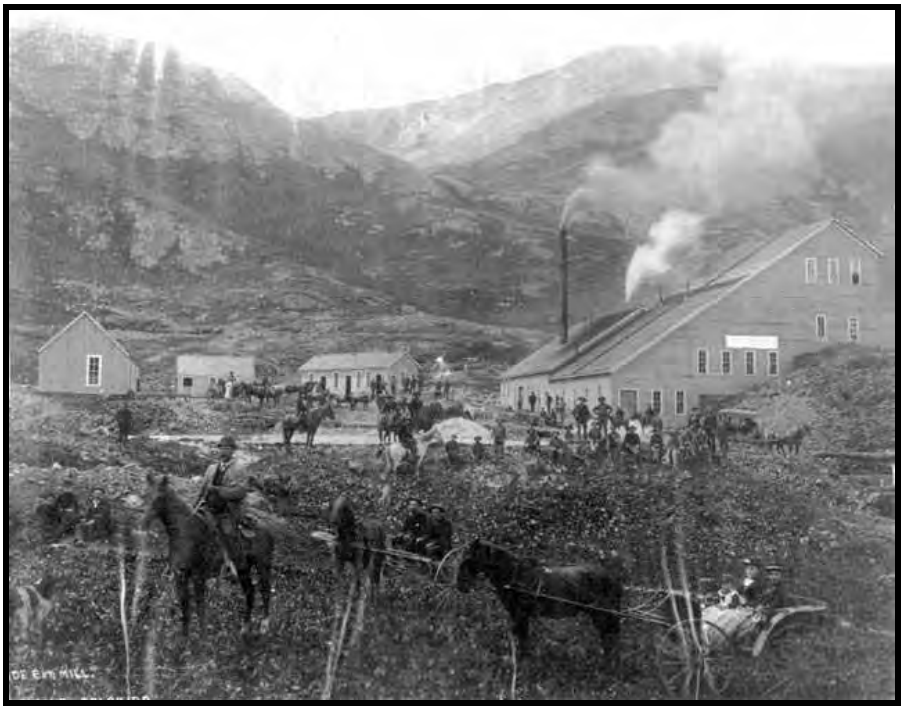


Figure E 28: In this southwest view of the Sunnyside Extension Mine, the main tunnel is at left and the mill built in 1890 stands at right. The operation was above treeline at the head of Placer Gulch. Source: Denver Public Library, Western History Collection, X 62199.

Section E 1: The Great Mining Revival: 1898 – 1910

Figure E 29: By the late 1890s, Edward and Gustavus Stoiber transformed Silver Lake Basin into an industrial landscape. The Silver Lake Mine is right of center, the Iowa Mine is on the mountainside behind, and the roofs of boardinghouses for a workforce in the hundreds are prominent. The edifice near center was a five-story boardinghouse with steam heat, hot showers, and toilets, which was rare for the era. Source: Denver Public Library, Western History Collection, X 62273.

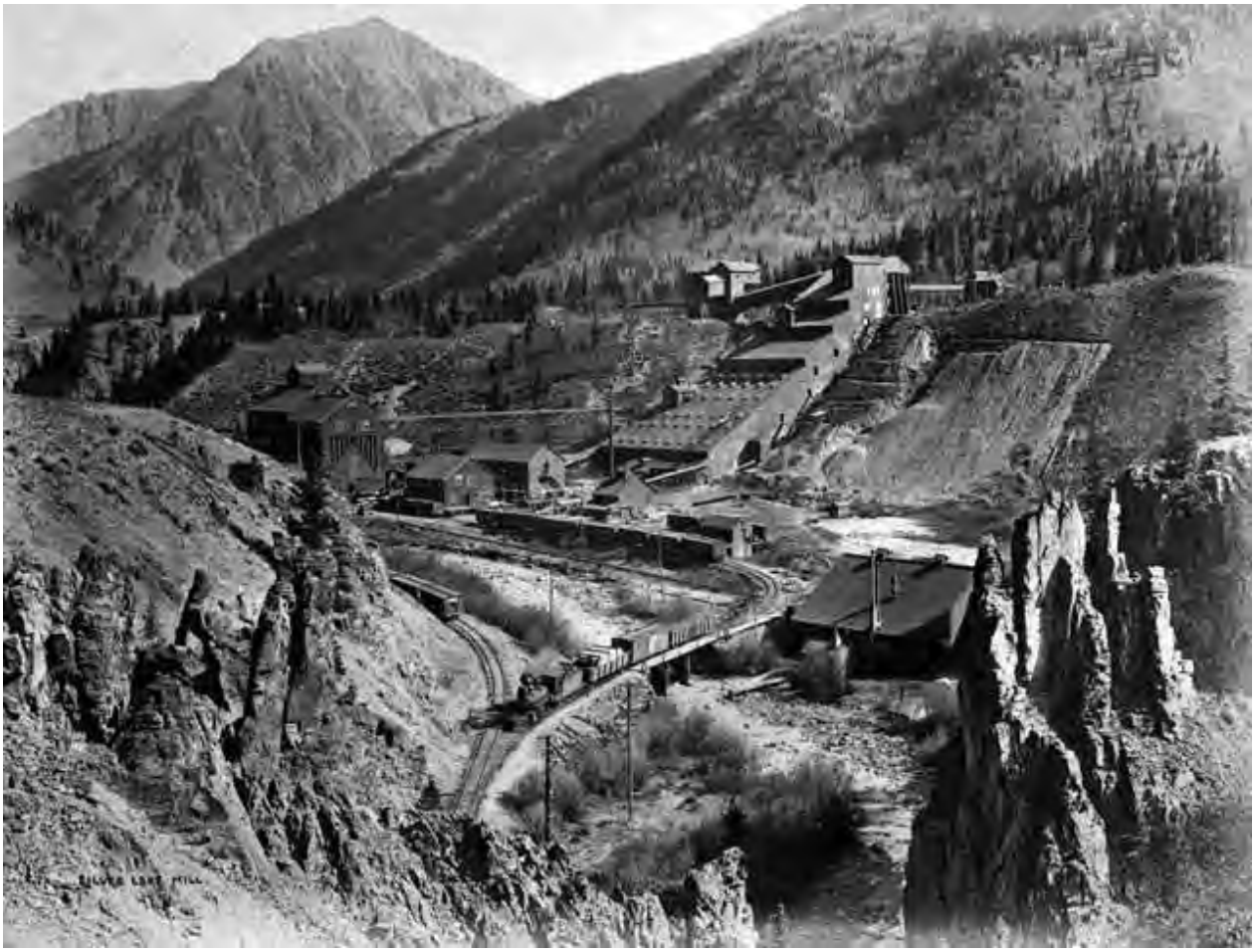


Figure E 30: Edward Stoiber designed the sprawling Silver Lake Mill, built on the Animas River in 1900. Because Stoiber was one of Otto Mears' best customers and invested in Mears' Silverton Northern Railroad, Mears provided the mill with direct rail service. At far left stands the ore bins and tram terminal of a loading station erected during the 1890s, prior to the mill. The small building with tall smokestack at photo-center was an electrical powerhouse, and the complex building to the left of the mill's head was a new tram terminal that received and crushed ore. Note how the mill building fans out to accommodate the increased number of concentration machines for each processing stage. The facility had a capacity of 1,000 tons of ore per day and ranked among the state's largest. In later years, the mill played an important role in the county because it accepted custom ores from independent mines. Source: Denver Public Library, Western History Collection, X 62275.

Figure E 31: The Iowa Mill was not as complex as the Silver Lake facility, but it was vital to the mines in Silver Lake Basin. The south view depicts the Iowa Mill, Arrastra Gulch's imposing headwall, and the confusion of tram towers in the gulch around 1900. The towers in the left background descended from the Iowa and Silver Lake mines, located above and beyond the headwall, and the tower at right carried the Unity Tunnel tramway. The cupola on top of the mill was a terminal for yet another tramway that carried finished concentrates down to a station on the Animas River. Source: Denver Public Library, Western History Collection, Z 2560.

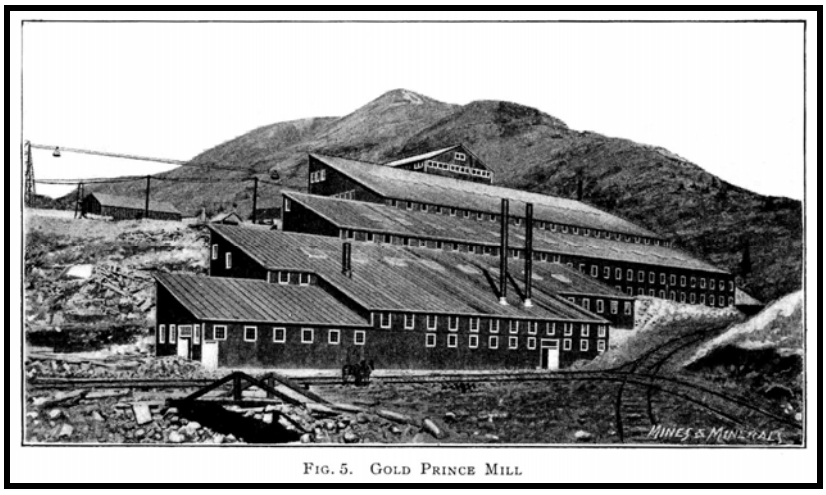


FIG. 5. GOLD PRINCE MILL

Figure E 32: In 1904, the Gold Prince Mines Company erected one of Colorado's largest and most advanced mills at Animas Forks. The mill featured structural innovations and could treat 500 tons of ore per day. Although the process was based on science, the mill was unable to recover enough metals to remain economical. As a result of this and bankruptcy of its owners, the mill was a costly failure. Source: *Mining Reporter* 54:386-389.

Figure E 33: During the early 1900s, the Little Dora complex was a component of the Hercules Consolidated Mining Company, which also operated the Hercules Mine and Mill, not shown. The complex includes the Little Dora Mill, shops, and tunnel above the mill. The operation was on the west outskirts of Silverton and one of the most successful in the Mineral Creek district. Source: Denver Public Library, Western History Collection, X 62191.

Figure E 34: Primarily through Denver mining investor Mary B. Murrell, the Gold Tunnel & Railway Company brought the Highland Mary Mine into its first meaningful production and built this mill in 1902. The large waste rock dump came out of the Innis Tunnel, located at right. The head of Cunningham Gulch rises in the background, and the roof of Edward Innis old Whitehouse can be seen at the end of the water pipe. Source: Denver Public Library, Western History Collection, X 62209.

Section E 1: World War I Revival: 1915 – 1920

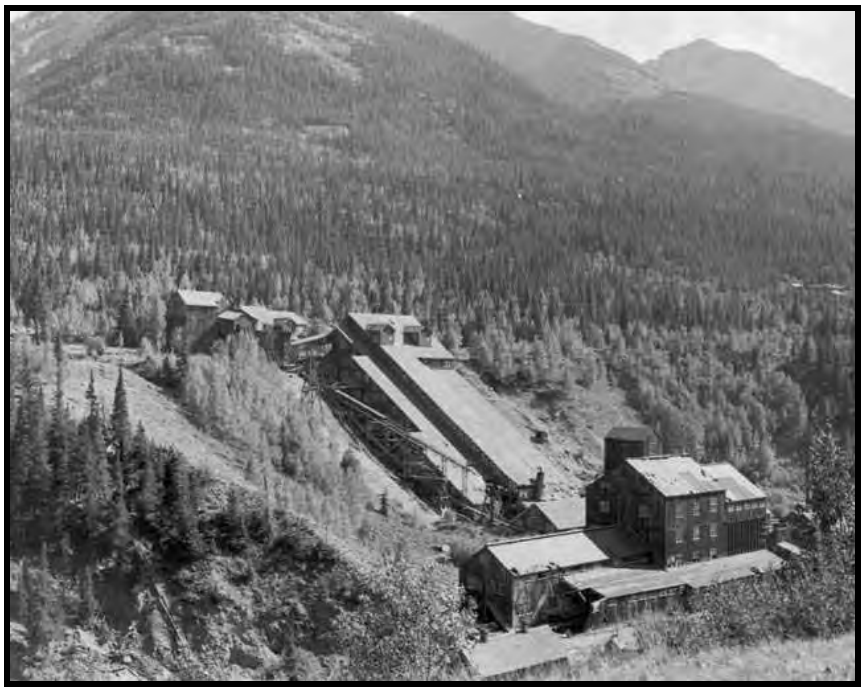


Figure E 35: When the Silver Lake Mill burned in 1906, the American Smelting & Refining Company built a replacement. The fire spared the 1898 ore storage structure at lower right, visible in Figure E 30. The new mill was smaller than Edward Stoiber's 1900 version. The Silver Lake Mine no longer provided ore by the mid-1910s, forcing the mill to run custom payrock from local companies. The mill played an important role in this capacity. Source: Denver Public Library, Western History Collection, X 62198.

Figure E 36: Peter Orella's tram terminal at the Big Giant Mine still stands. Miners input payrock into the structure from the trestle at left. A second tramway carried North Star Mill tailings down from Little Giant Basin and entered the double doorway in the cupola. The tram mechanism was located in the large room at the structure's bottom. Source: Author.

Section E 1: Great Depression Era Revival: 1933 – 1939

Figure E 37: By the early 1930s, the Highland Mary Mill appeared worn and battered. The structure, erected over the ruins of the original mining operation, was typical of such facilities during the Great Depression. And yet, the Highland Mary and similar mines were important for their economic contributions and employment. Source: Denver Public Library, Western History Collection, X 62206.

Figure E 38: The Mayflower Mine, at the base of the cliff at center, was the leading mine in San Juan County from the late 1920s until closure in 1954. The surface facilities included a five-story boardinghouse, the upper terminal for a tramway, and shops. The tramway carried ore down to the Mayflower Mill on the Animas River. The operation was the county's economic cornerstone and largest employer. Source: Denver Public Library, Western History Collection, X 62245.

Section E 2: Mining and Milling Methods, Technology, and Equipment

The Mine Shop

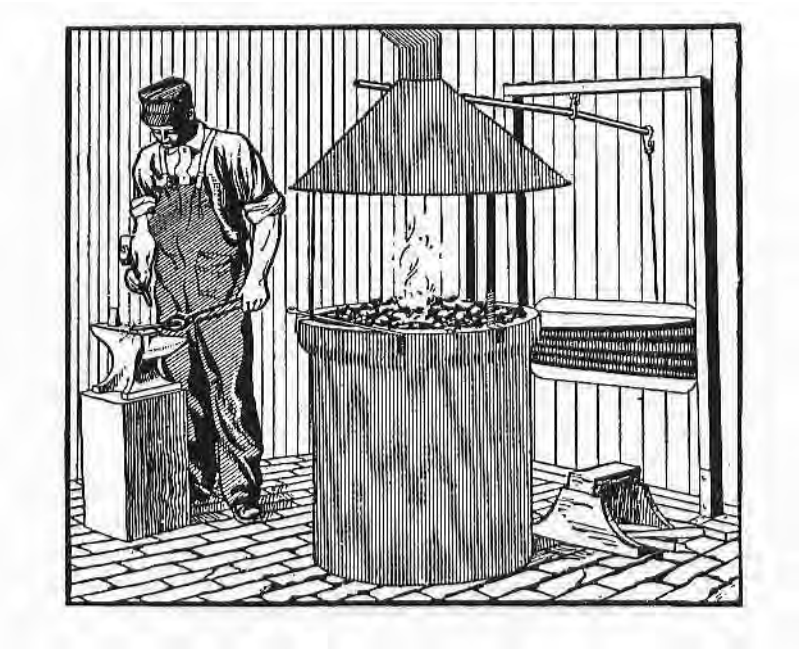


Figure E 39: The illustrated shop is representative of those at prospects and small mines. Such shops usually consisted of little more than a forge, an anvil, and hand-tools, which restricted work to drill-steel sharpening and the manufacture of light hardware. Source: Drew, 1910:1.

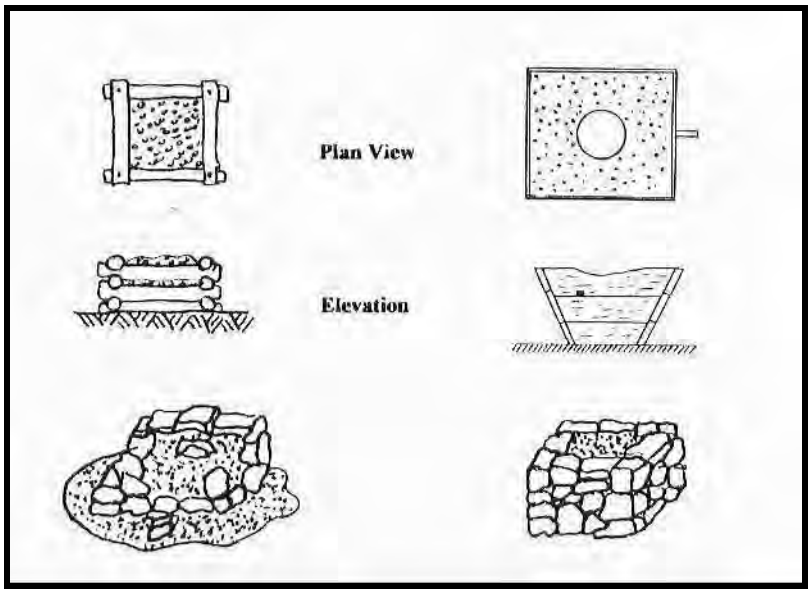


Figure E 40: Above are examples of the common forges used in blacksmith shops. At upper left is a gravel-filled log forge, at right is a wood box forge, and at lower right is a dry-laid rock forge. Over time, rock forges decay and collapse, and manifest as the remnant at lower left. Source: Eric Twitty.

Mine Ventilation

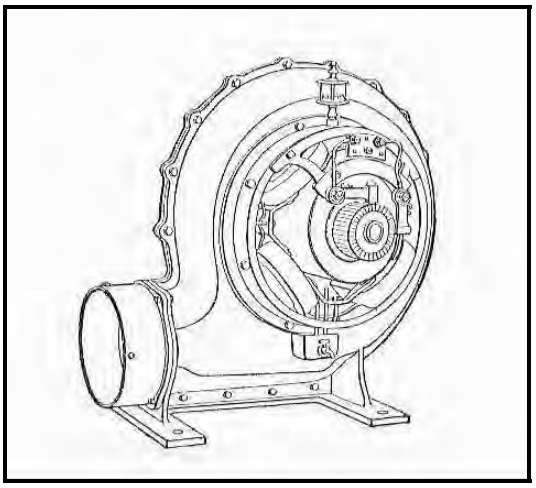


Figure E 41: At right is a common ventilation blower used to force fresh air underground. Ducting was fastened to the nozzle, and a belt turned the machine. Source: International Text Book Company, 1899, A41:146.

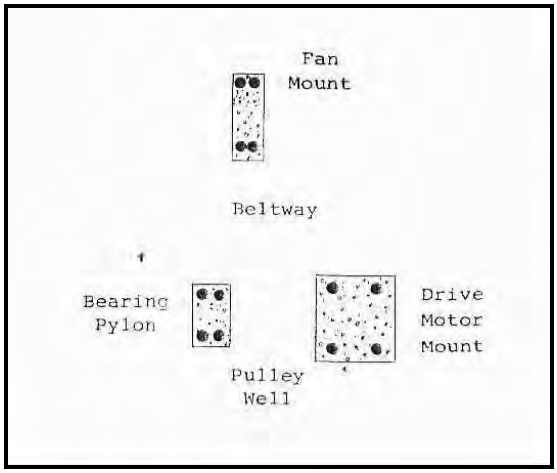


Figure E 42: The plan view at left depicts a typical concrete foundation for a ventilation blower and its drive motor. Source: Eric Twitty.

Shaft Form and Hoisting Vehicles

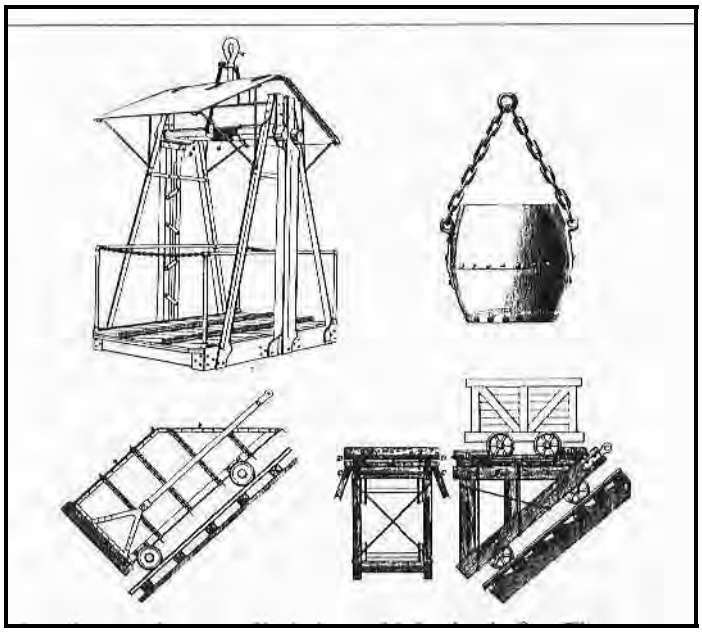


Figure E 43: Mining companies employed several types of hoisting vehicles in shafts. The cage at upper left, popular from the 1870s through the 1930s, ran on guide rails and carried miners or an ore car. The sinking bucket at upper right required no rails and was common among small operations. The skip at lower left was popular in both vertical and inclined shafts by the 1900s. It ran on rails and required guides in the headframe to empty. At lower right is a vehicle for inclined shafts that became obsolete by the 1900s. Source: Twitty: 2002:151.

Figure E 44: When intact, shafts often are divided into several compartments for hoisting and egress. The collars are usually timbered to retain loose material, and are flush with the surrounding ground. Intact examples are rare and important engineering resources. Source: Eric Twitty.

Hoists

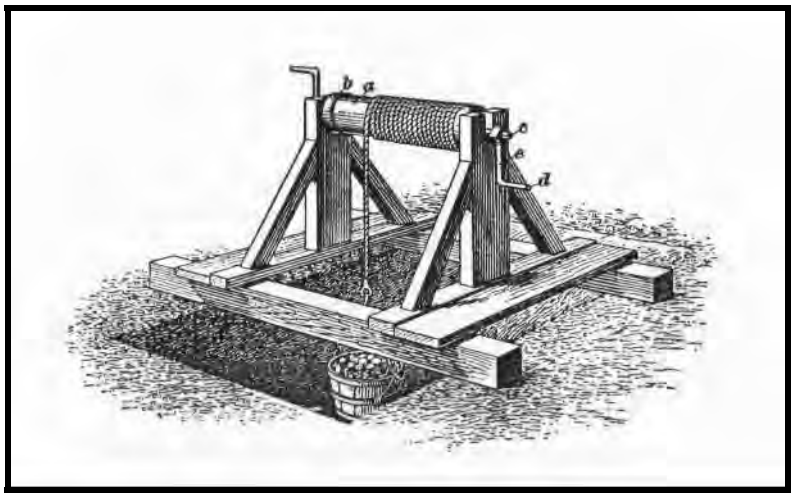


Figure E 45: The windlass was an institution among prospectors, and nearly all shafts less than 100 feet deep were equipped with this simple, inexpensive, and portable type of hoist. Source: Twitty, 2002:145.

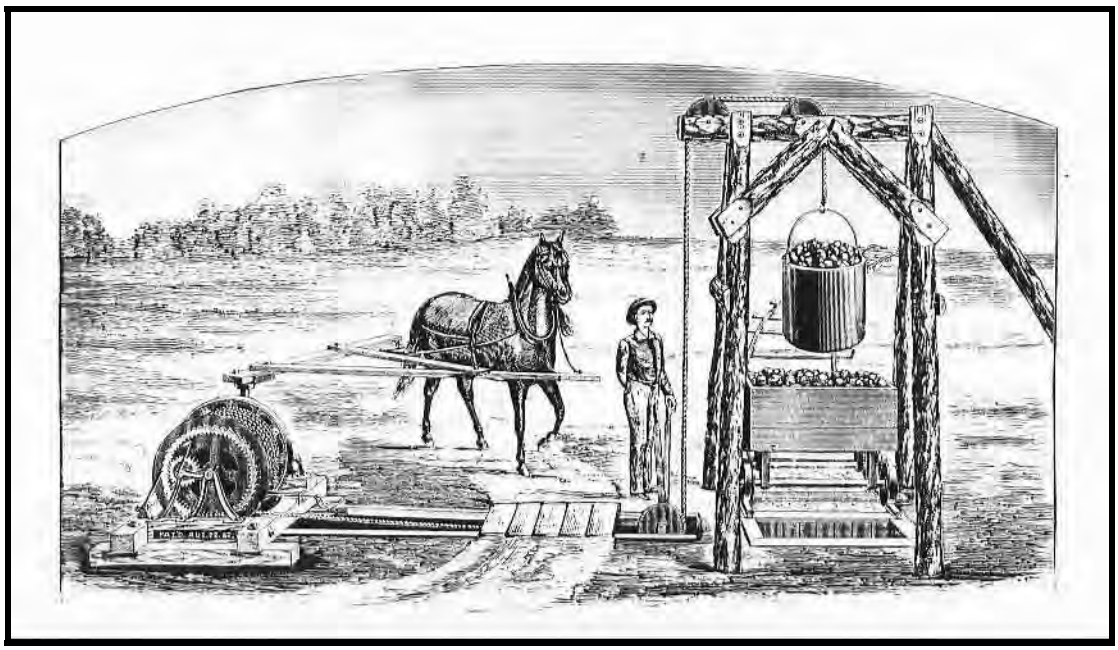


Figure E 46: Horse whims were the most primitive type of mechanical hoist, and were a favorite among prospectors because of their simplicity and portability. The unit shown is a geared whim, which was popular from the 1880s through the 1910s. The hoist operator controlled a brake and clutch via levers mounted to the shaft collar. The control linkages and hoist cable passed through the trench. Source: Ingersoll Rock Drill Company, 1887:60.

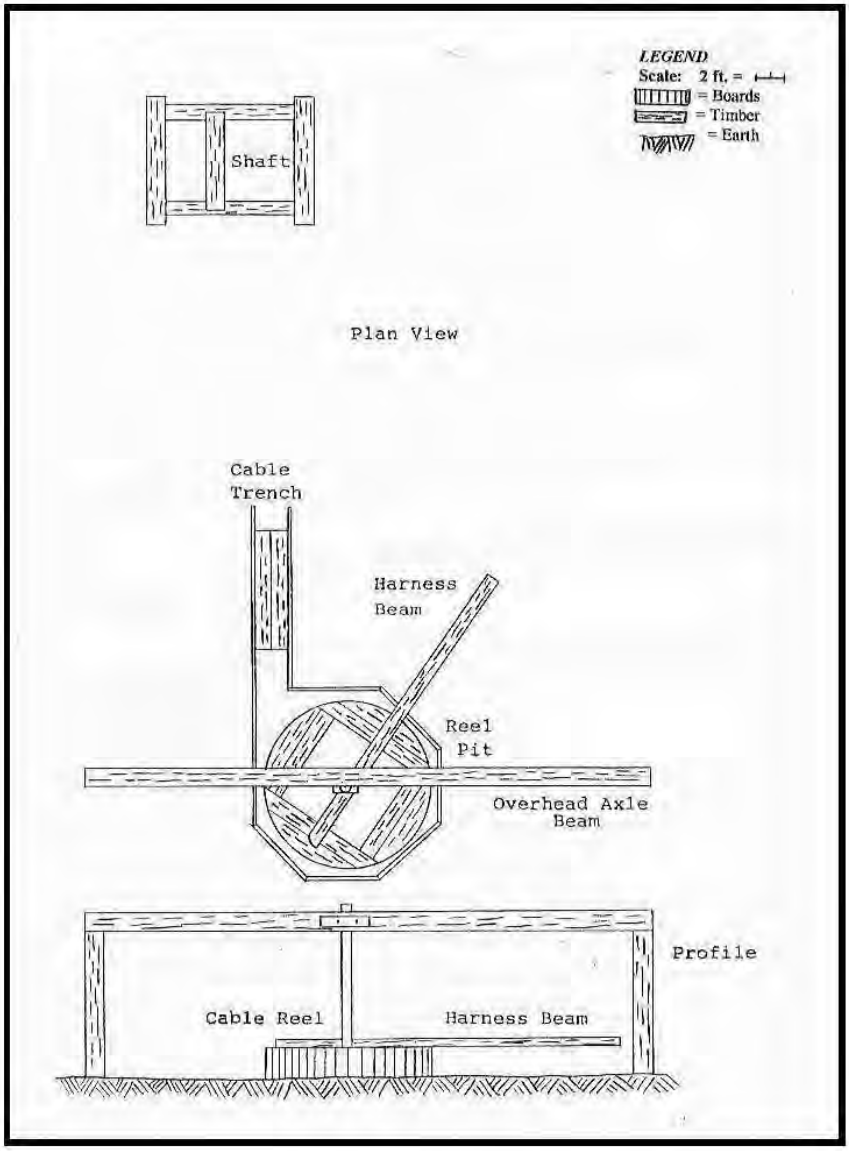


Figure E 47: The plan view, top, and elevation, bottom, depict a horizontal reel horse whim, which was a universal prospecting hoist prior to the 1880s. The reel was mounted to an axle on a timber footer buried in the floor of a plank-lined pit. Usually, only the pit and cable trench remain at prospect shaft sites today. Source: Eric Twitty.

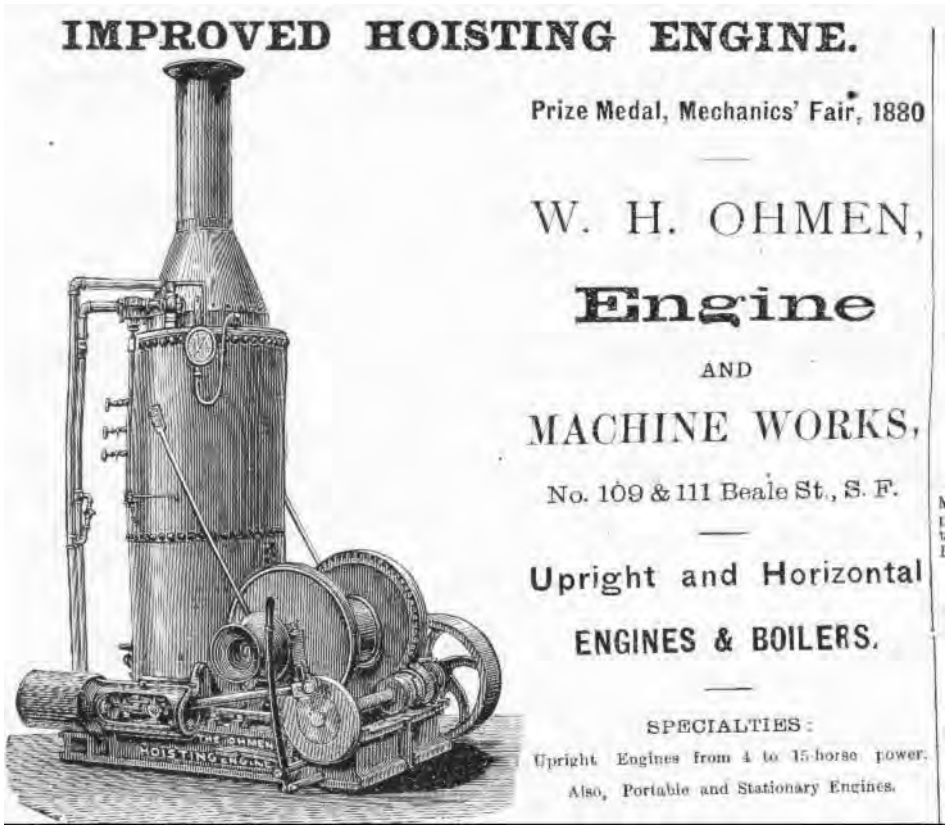


Figure E 48: Donkey hoists were popular for deep prospecting after the 1880s because they were self-contained and required little site preparation other than a flat area. Source: *Mining & Scientific Press* 1881.

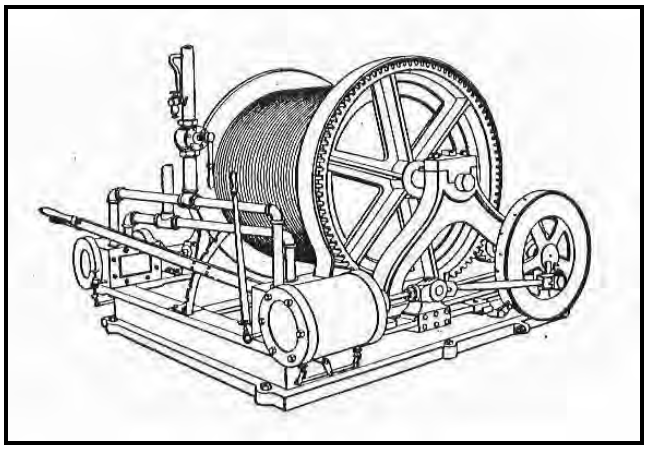


Figure E 49: Single-drum geared steam hoists were the most common power type between the 1870s and 1910s. Gasoline and electric models became popular afterward. Source: International Text Book Company, 1906, A50:8.

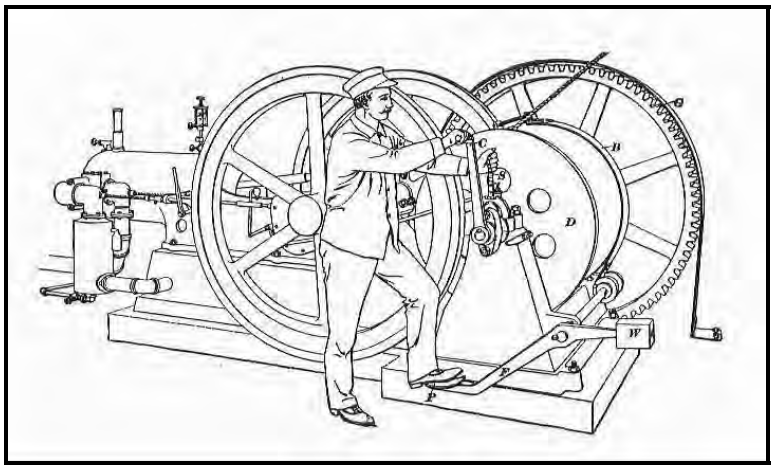


Figure E 50: This type of gasoline hoist was employed for deep prospecting and minor ore production between around 1900 and 1930. A single-cylinder engine is at left, dual flywheels are at center, and the cable drum is at right. Source: International Textbook Company, 1906, A50:31.

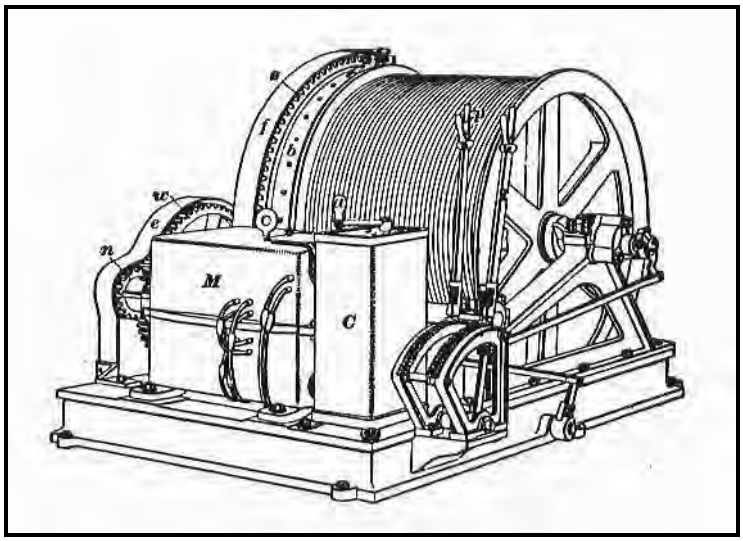


Figure E 51: The single-drum electric hoist grew in popularity during the 1910s where power was available. The motor is in the case in front, drive gearing is at left, and the upright box is a speed controller. Source: Twitty, 2002:224.

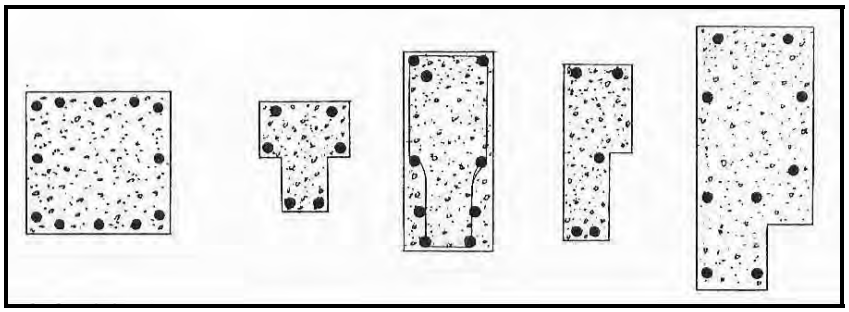


Figure E 52: Hoist foundation plan views. Single-drum steam and electric hoists were bolted to foundations like the one at left, and the other foundations were for various types of gasoline hoists. Source: Twitty, 2002:187, 241.

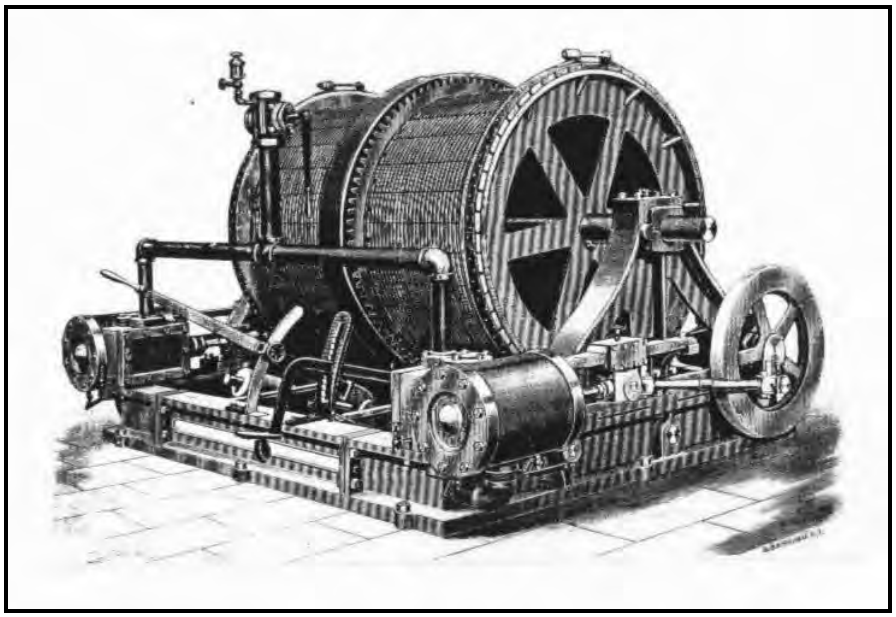


Figure E 53: Rear quarterview of a geared double-drum steam hoist. Double-drum hoists, hallmarks of significant ore production, achieved balanced hoisting with two vehicles. Source: Ingersoll Rock Drill Company, 1887:65.

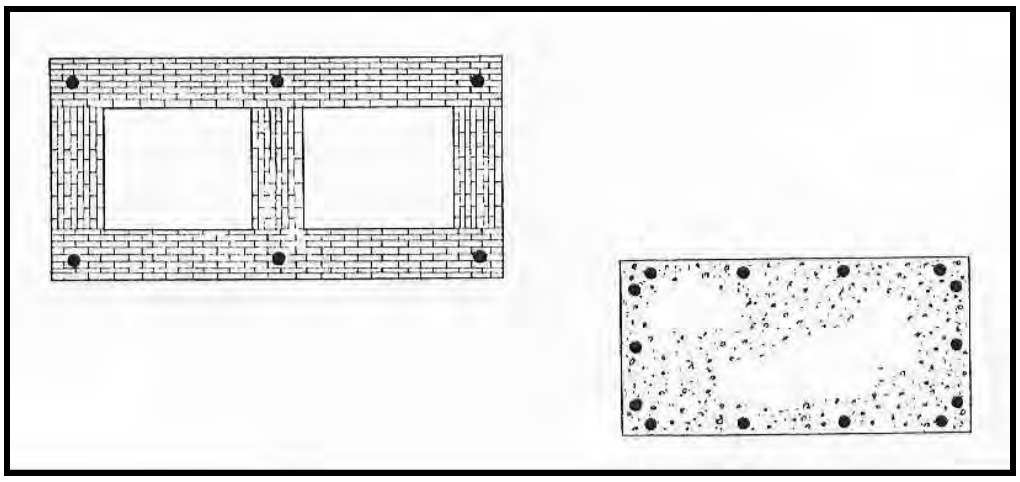


Figure E 54: The plan views depict foundations for geared double-drum steam hoists. The foundation at left features wells for the hoist's cable drums. Source: Eric Twitty.

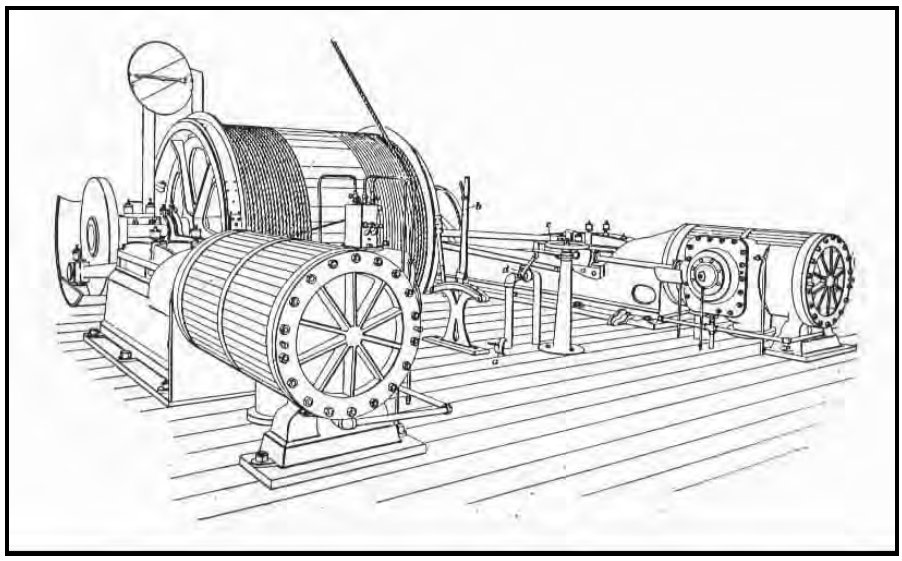


Figure E 55: Rear quarterview of a direct-drive single-drum steam hoist. Powerful steam cylinders flank the hoist's controls, and the drive-rods are directly coupled to the cable drum. Source: International Text Book Company, 1906, A50:16.

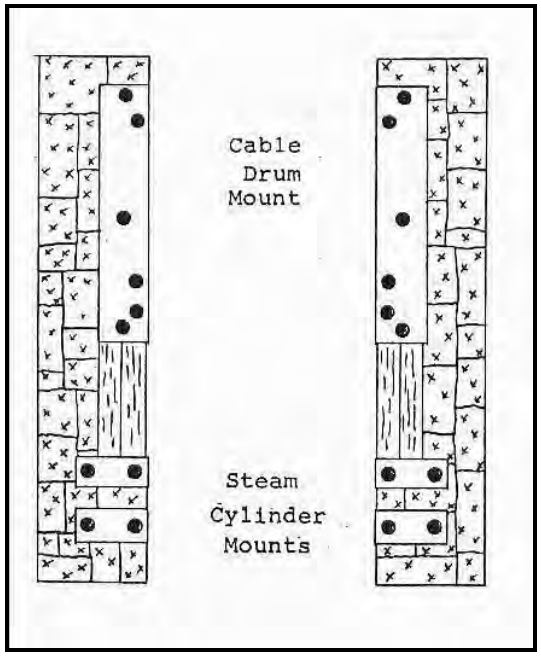


Figure E 56: The plan view depicts a typical foundation for a direct-drive single-drum steam hoist. Such foundations are usually less than 14 by 17 feet in area. Source: Eric Twitty.

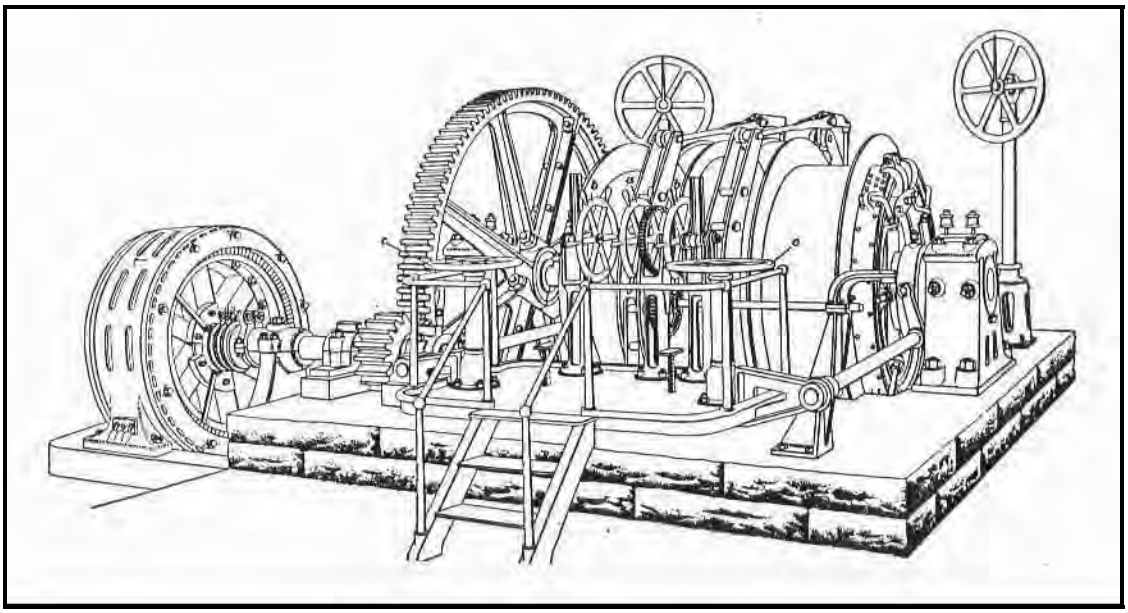


Figure E 57: Rear quarterview of a double-drum electric hoist. The motor at left drove the dual cable drums via the large bull gear. Such hoists facilitated heavy production, saw use after the 1910s, and were popular among well-capitalized companies by the 1930s. Note the foundation. Source: International Textbook Company, 1906, A50:40.

Steam Boilers

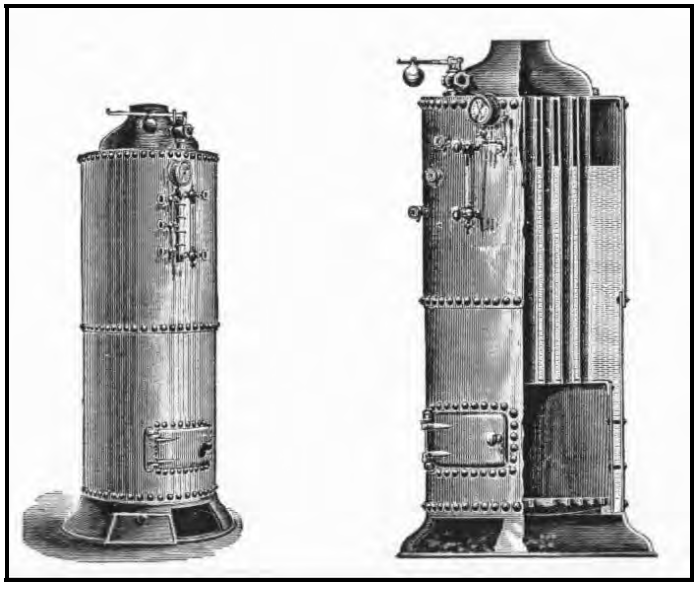


Figure E 58: Upright boilers were the least expensive and most portable type of boiler, but also inefficient. Flue gases rose from the firebox at bottom, through the flue tubes, and out a smokestack at top. Note the water level sight tube, pressure gauge, and pressure valve. Source: Rand Drill Company, 1886:47.

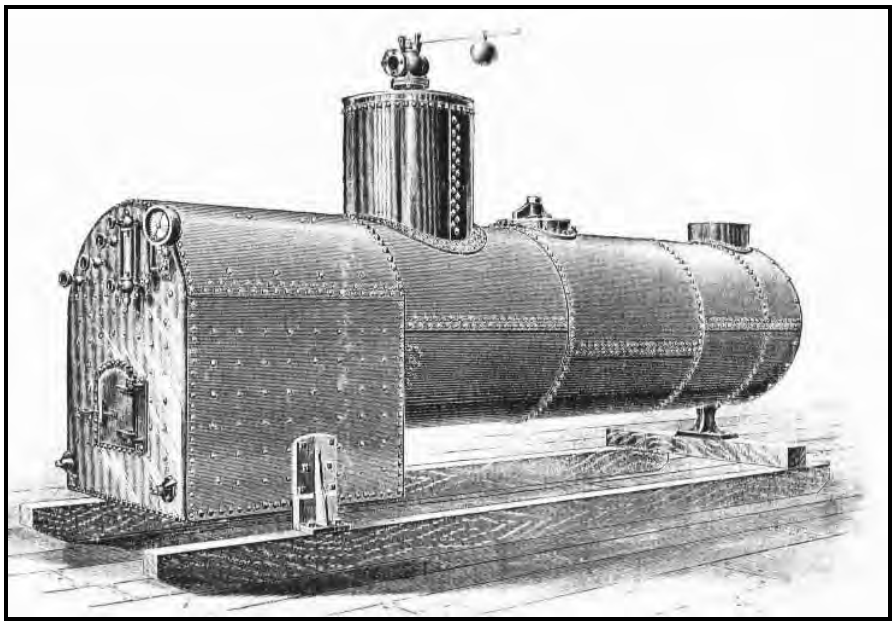


Figure E 59: The locomotive boiler was one of the most popular steam generators. Flue gases traveled from the firebox at left through flue tubes in the tank and out a smokestack at right. Source: Rand Drill Company, 1886:45.

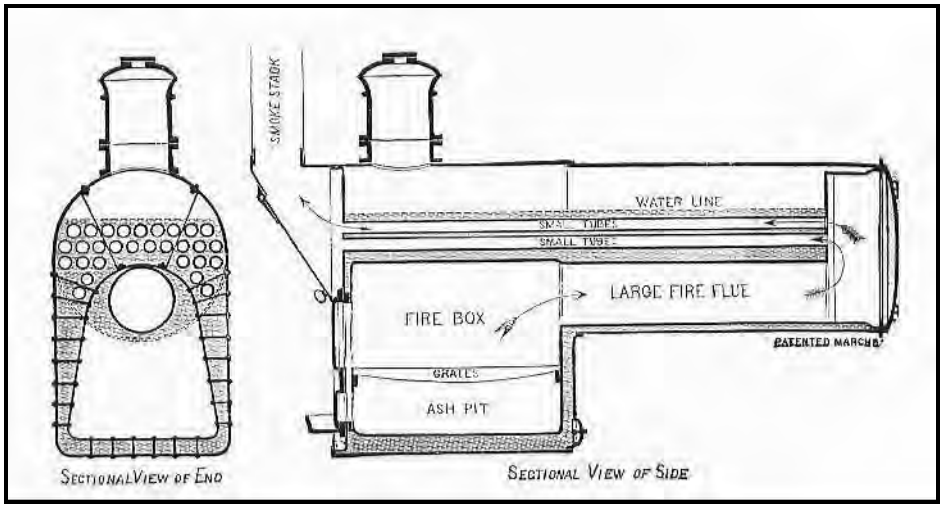


Figure E 60: The Pennsylvania boiler was portable, stood on skids, and provided greater fuel economy than the locomotive type. Note the path traveled by the flue gases, which prolonged contact with the boiler surfaces. Source: Rand Drill Company, 1886:46.

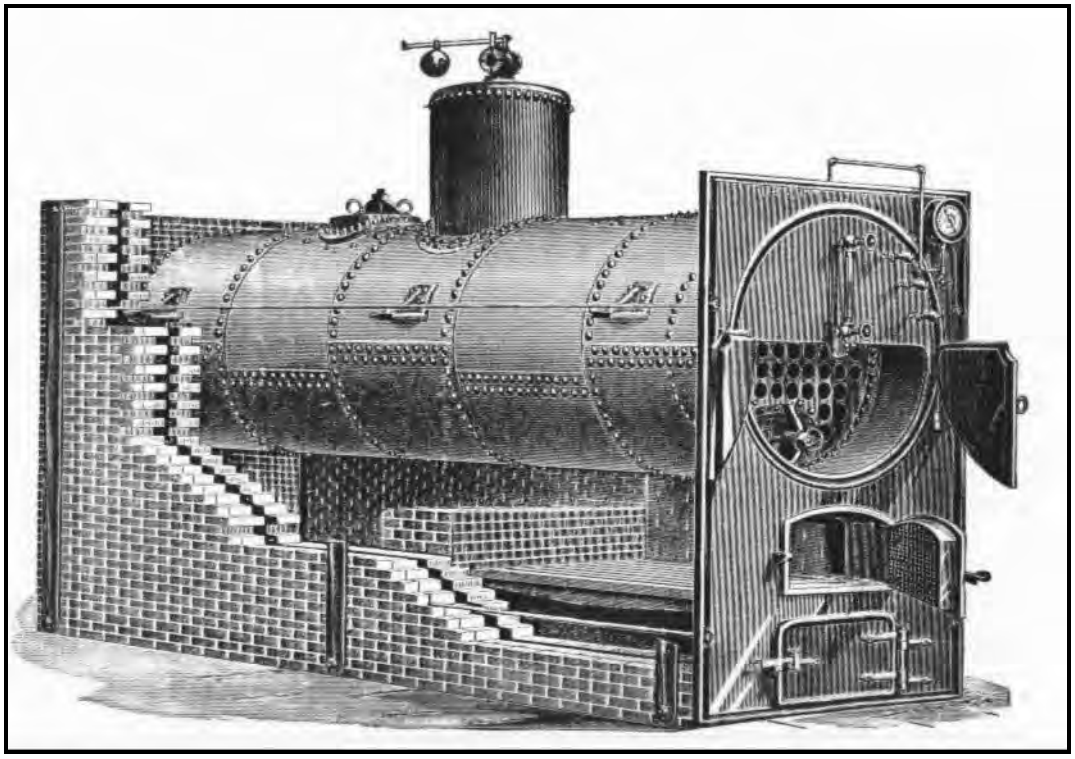


Figure E 61: The return-tube boiler was the most popular industrial steam generator prior to the widespread embrace of electricity. The unit consisted of an iron shell, a masonry setting, and a cast iron façade. Flue gases traveled from the firebox behind the façade and under the shell. The gases rose into a smoke chamber at rear, reversed direction and returned through the flue tubes perforating the shell, and escaped out a smokestack over the façade. The top doors permitted workers to swab out the flue tubes. Source: Rand Drill Company, 1886:44.

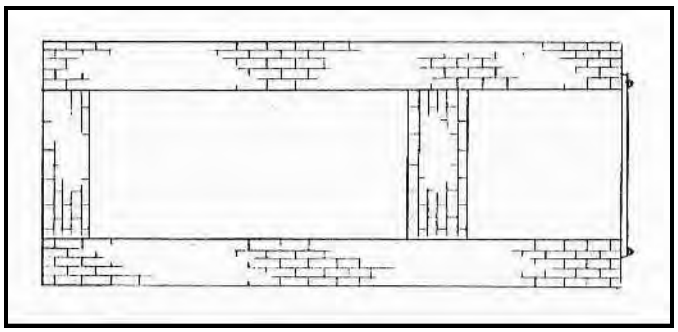


Figure E 62: Few return-tube boilers currently remain intact and have been reduced to setting remnants and foundations, such as the one in the plan view. Source: Twitty, 2002:145.

Headframes

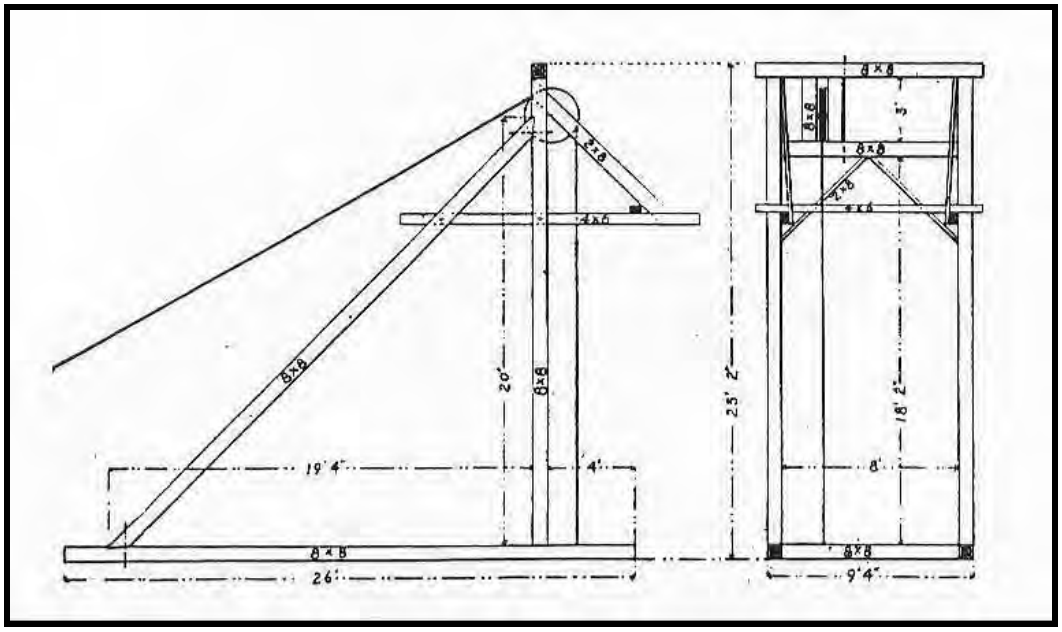


Figure E 63: The two-post gallows headframe was the most common type for prospect shafts. Sinking-class versions were less than 25 feet high and stood on timber footers. Source: *Engineering & Mining Journal* 3/7/03 p366.

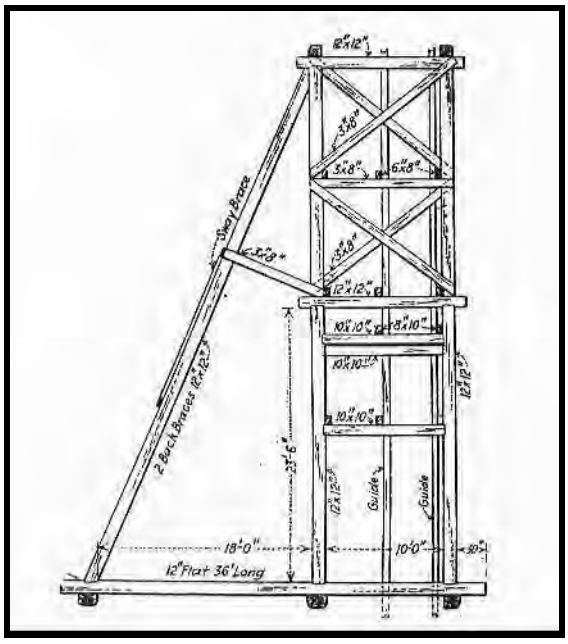


Figure E 64: The headframe at left is a four-post derrick type. Production-class headframes such as the one illustrated tend to be higher than 25 feet. Source: *Engineering & Mining Journal* 12/28/17 p1216.

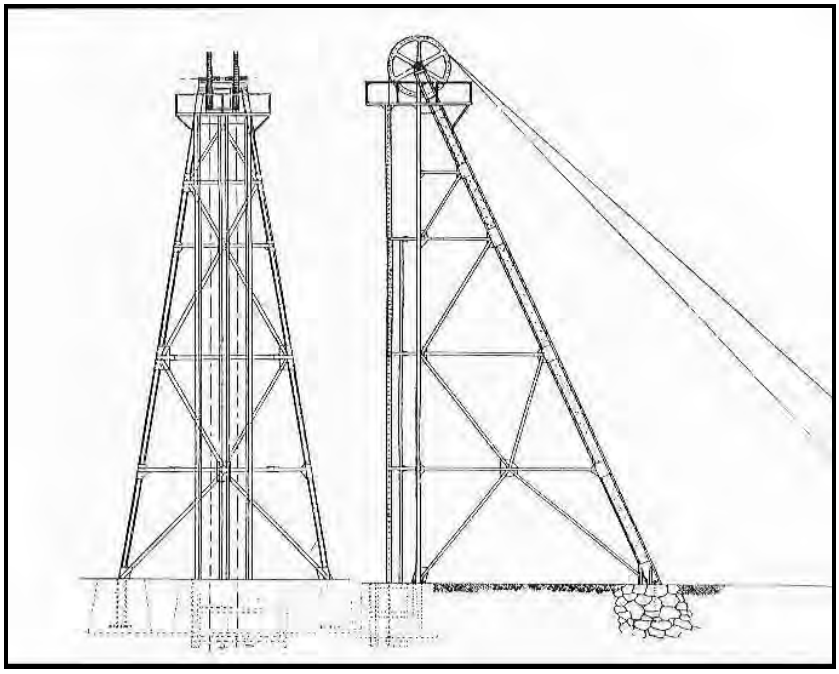


Figure E 65: The illustrated headframe is a production-class two-post gallows structure known as a Montana type. These headframes were usually tall, well-built, and stood over deep shafts. Source: Twitty, 2002:233.

Air Compressors

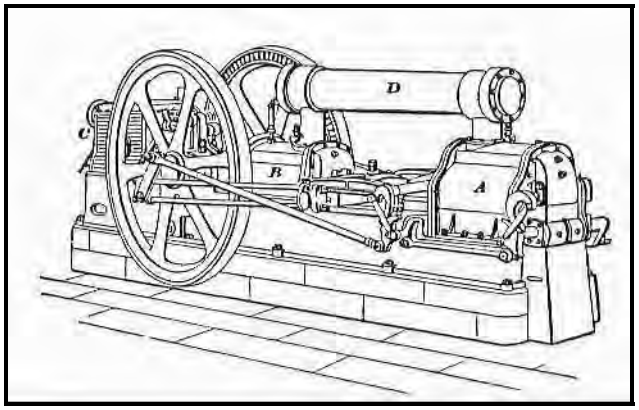


Figure E 66: The line drawing depicts a straight-line steam compressor that provided two stages of compression. One compression cylinder is at right, another is at center, and the steam drive cylinder is at left. The flywheels imparted momentum to the machine. Source: International Textbook Company, 1899, A20:32.

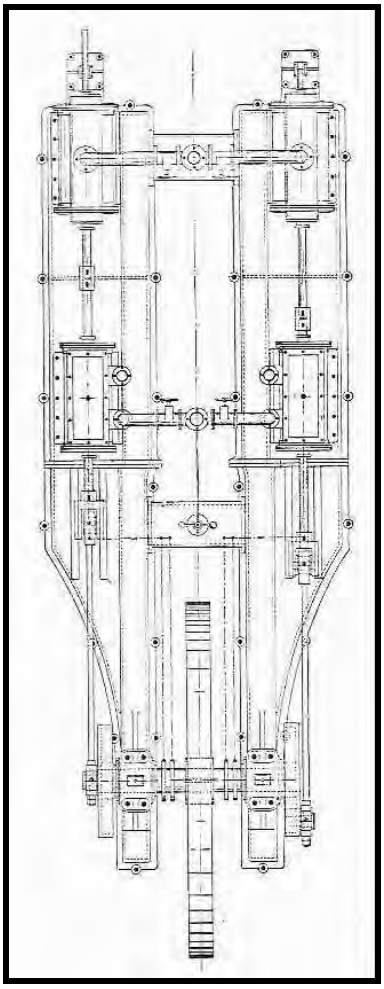


Figure E 67: The plan view shows a typical pre-1910 duplex steam compressor. The compression cylinders are at top, the steam drive cylinders are at center, and the flywheel is at bottom. Source: Ingersoll Rock Drill Company, 1887:34.

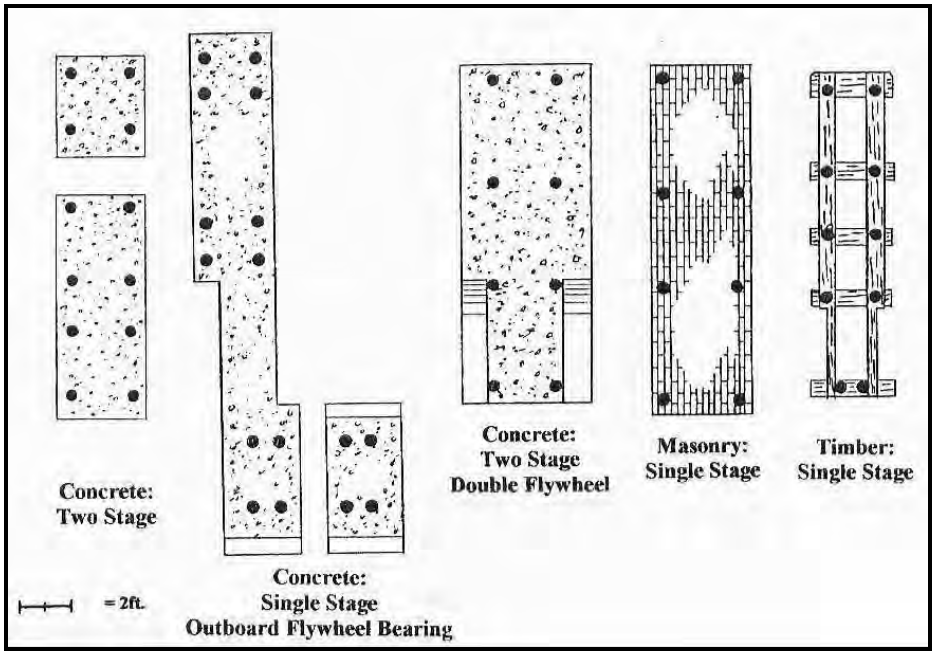


Figure E 68: The plan view depicts foundations for straight-line compressors. Source: Eric Twitty.

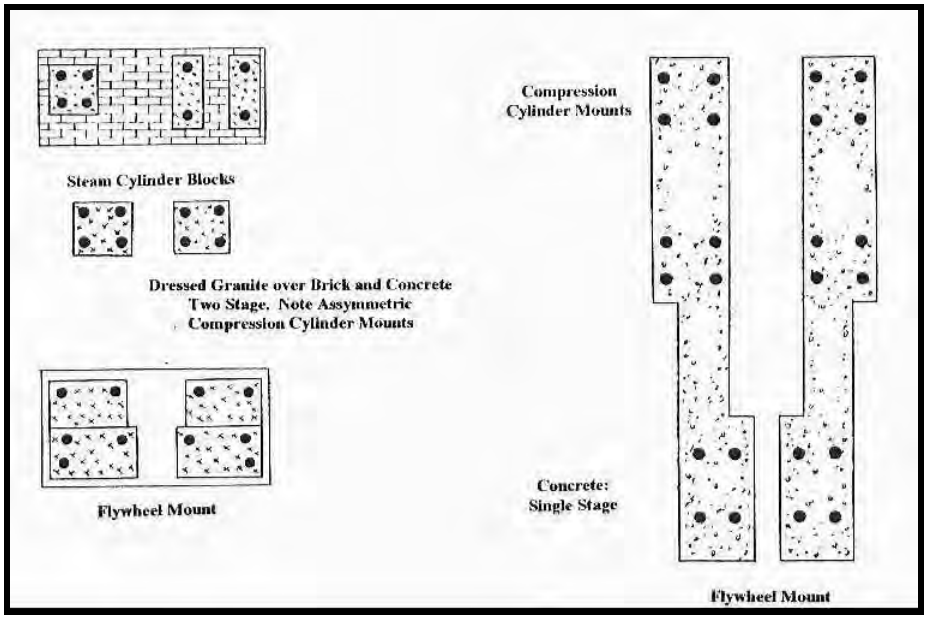


Figure E 69: The plan views portray two common foundations for duplex steam compressors. The foundation at right was for a machine like the one in Figure E 67, and the foundation at left anchored a compressor with compound action. Source: Eric Twitty.

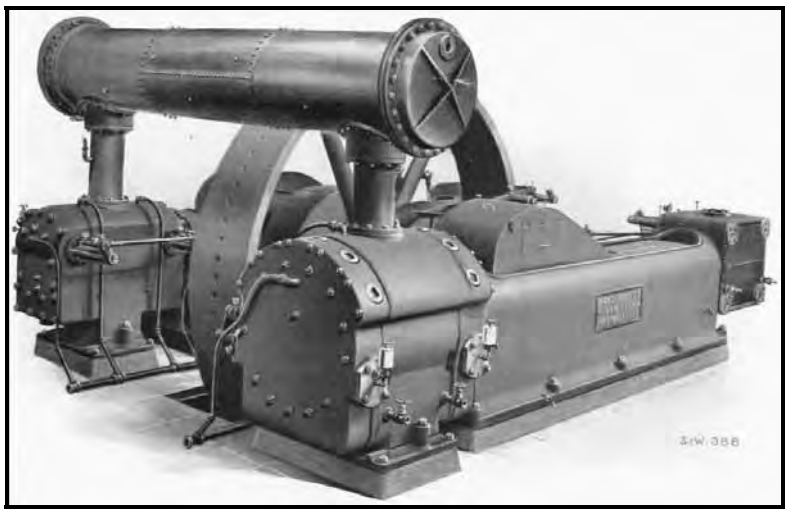


Figure E 70: During the 1890s, the above form of duplex compressor became popular. Originally, these machines were powered by steam, and by the 1900s, some were also belted to motors where electricity was available. Source: Rand Drill Company, 1904:12.

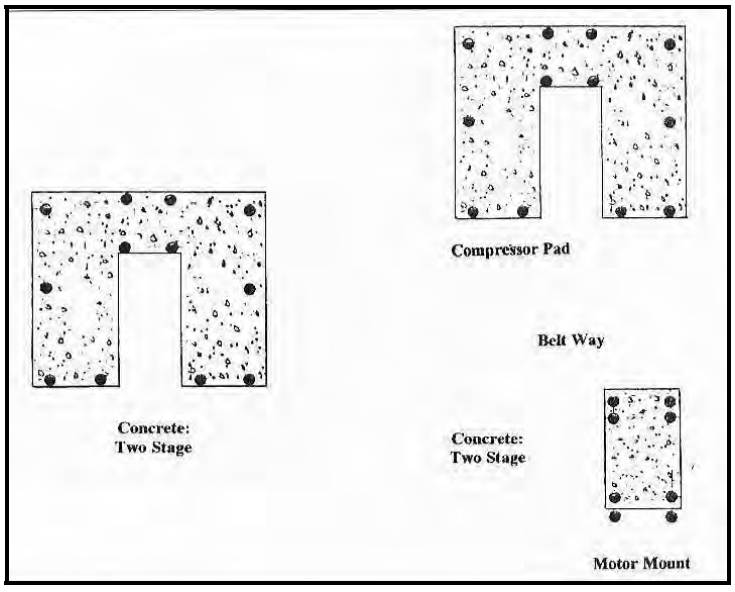


Figure E 71: Compact duplex compressors were mounted to foundations like those in the above plan view. The foundation at left anchored a steam-powered unit, and the one at right was for a belted version, which became popular by the 1910s. Source: Twitty, 2002:109.

Figure E 72: The V-cylinder compressor, similar to a large engine, became one of the most popular compressor types during the 1930s. Note the foundation. Source: Eric Twitty.

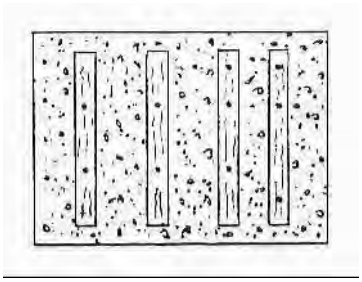


Figure E 73: The illustration at left is a plan view for a V-cylinder compressor foundation (see Figure E 72). Timber footers are embedded in a concrete rectangle around 3 by 4 feet in area. Source: Eric Twitty.

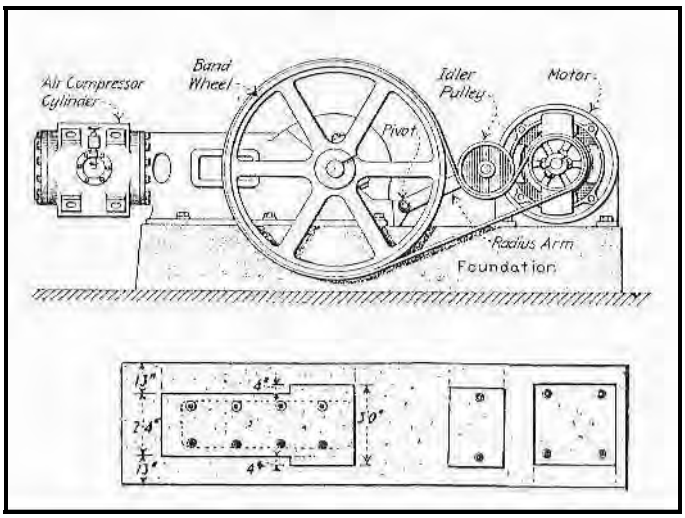


Figure E 74: The profile illustrates the type of small, belted compressor popular between the 1910s and 1940s. The plan view shows the foundation, which features mounts for the compressor and motor. Source: Eric Twitty.

Architecture

Figure E 75: The buildings at the North Star Mine, on Sultan Mountain in 1885, are typical of vernacular architecture specific to the mining industry. The building at left is a tunnel house enclosing a blacksmith shop, and the building at right is an ore sorting house. The buildings were probably custom-designed on-site by a company official for function and economy, rather than for appearance. The steep roofs are an adaptation to the heavy snows of San Juan County. The log cribbing was a structure designed to be filled with waste rock for a larger level area on the steep mountainside. Source: Denver Public Library, Western History Collection, X4570.

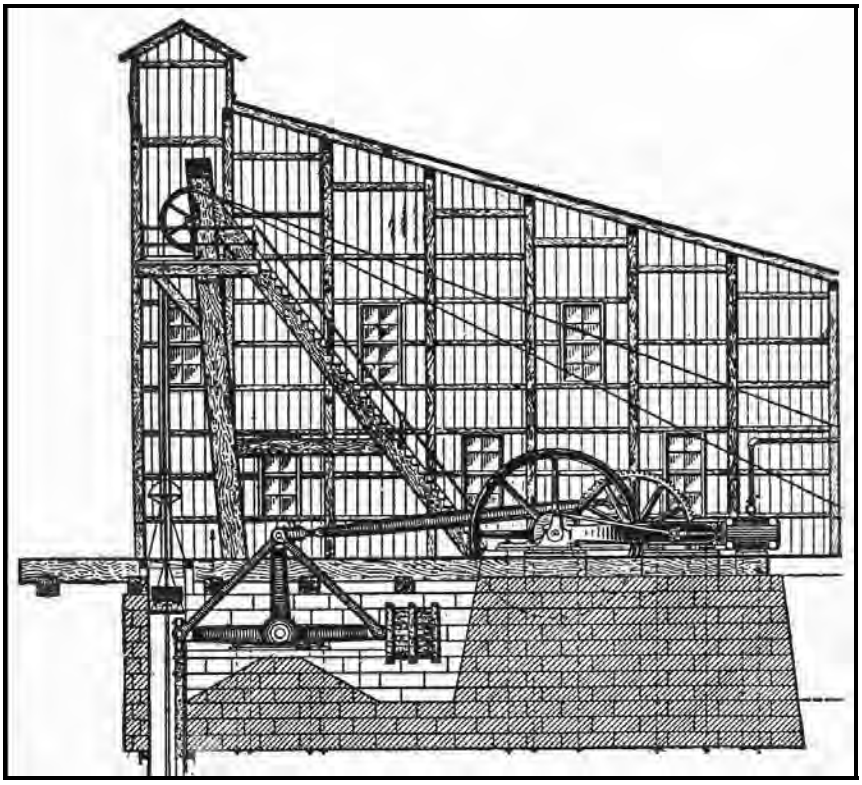


Figure E 76: Shaft houses enclosed the shaft collar, headframe, hoist, power system, and usually the blacksmith shop. The shaft house in the profile also features a Cornish pump and steam engine, rarely used in San Juan County. Source: International Textbook Company, 1899, A43:3.

Figure E 77: After shaft houses were outlawed during the 1910s, mining companies erected hoist houses to enclose critical facilities. In this example dating to the 1930s, the left roofline features an angled cupola for the hoist cable, which ascended to a headframe left and out of view. Source: Eric Twitty.

Aerial Tramways

Figure E 78: Aerial tramways played a significant role in the success of mining in San Juan County. They allowed many companies to overcome difficult terrain and ship high volumes of ore from remote locations. Without tramways, transportation costs would have been too high. The photo illustrates the Bleichert system that descended from the Iowa Mine to the mill, background. In the Bleichert system, the buckets coasted over a stationary track cable fixed to the tower top, and were pulled by a second, lower traction cable. Note the cross-member and rollers for the traction cable. The tower is a pyramid type, the most common in the county. Source: Denver Public Library, Western History Collection, X-62249

Figure E 79: The Bleichert tramway was a distinct system in many regards. Its buckets could be detached from the traction cable once in the terminal and moved at leisure. This increased efficiency and capacity, and decreased spillage. During the 1930s, Mayflower Mill workers receive a full bucket. The bracket suspended at upper center automatically released the bucket from the cable. Source: Denver Public Library, Western History Collection, X-62255.

Figure E 80: The through-type was the second most popular tower design in San Juan County. The structure was stout, resisted horizontal stresses, and even withstood minor avalanches. Intact towers such as this on the Gold Prince system are rare and important engineered structures. Source: Eric Twitty.

Figure E 81: Terminals for both Bleichert and Hallidie tram systems featured sheave wheels for the traction cable. A heavy frame braced the wheel against the pull of the cable. These vital components contribute integrity to a tramway resource when present. Source: Eric Twitty.

Figure E 82: Small-scale system aspects, such as these factory-made cable cradles, are important details. They are rare, meaningful for interpretation, and contribute integrity. Source: Eric Twitty.

Ore Beneficiation: Smelting, Ore Concentration, and Amalgamation

Smelters

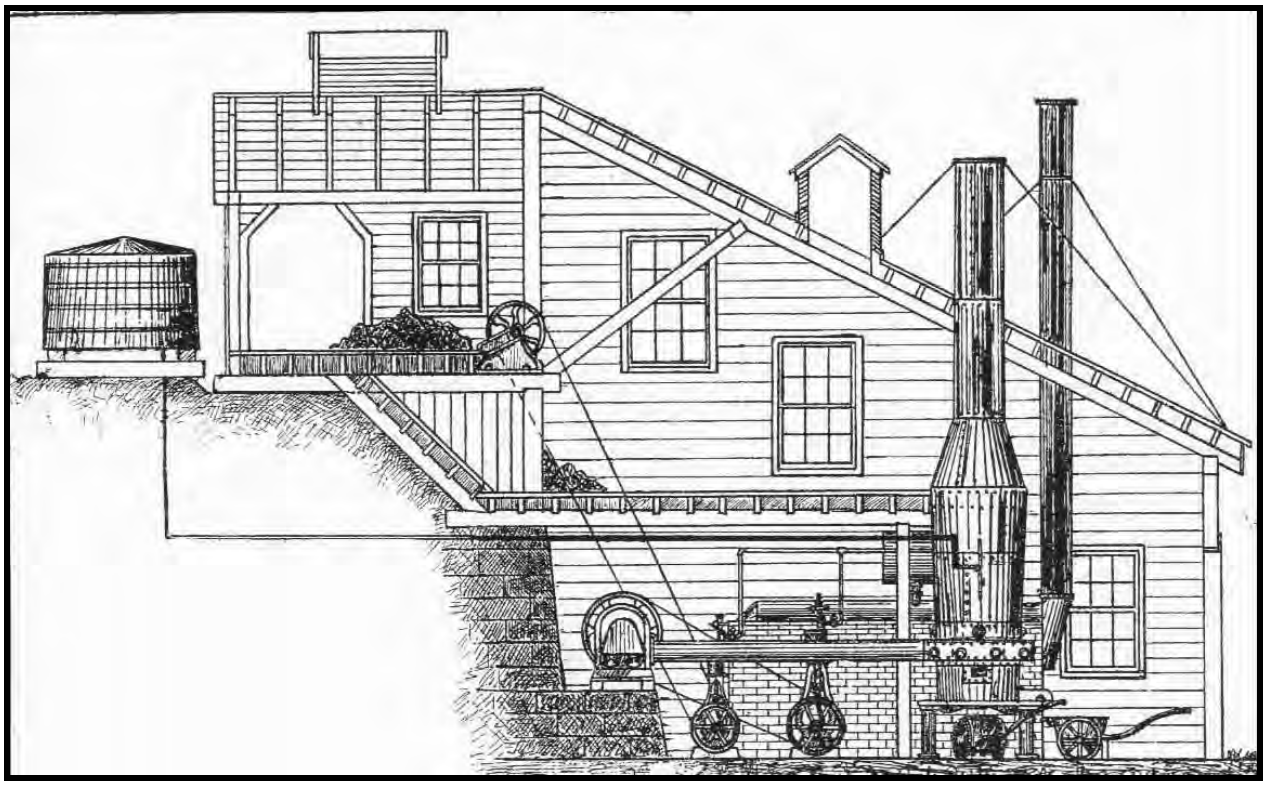


Figure E 83: The profile illustrates a small and simple smelter. Workers sorted crude ore at top left and then fed the material into a crusher marked by the upper wheel, which is a belt pulley. The resultant cobbles and gravel accumulated on the floor at center, and workers periodically fed the material into the furnace at lower right. The type of furnace, free-standing and pre-fabricated, was common by the 1870s. Note the blower system in front of the brickwork at bottom, which forced air into the furnace for great heat. In many cases, smelters also had concentration machinery to process complex ore in7 advance. Source: *Mining & Scientific Press* 4/28/83, p281.

Concentration Mills

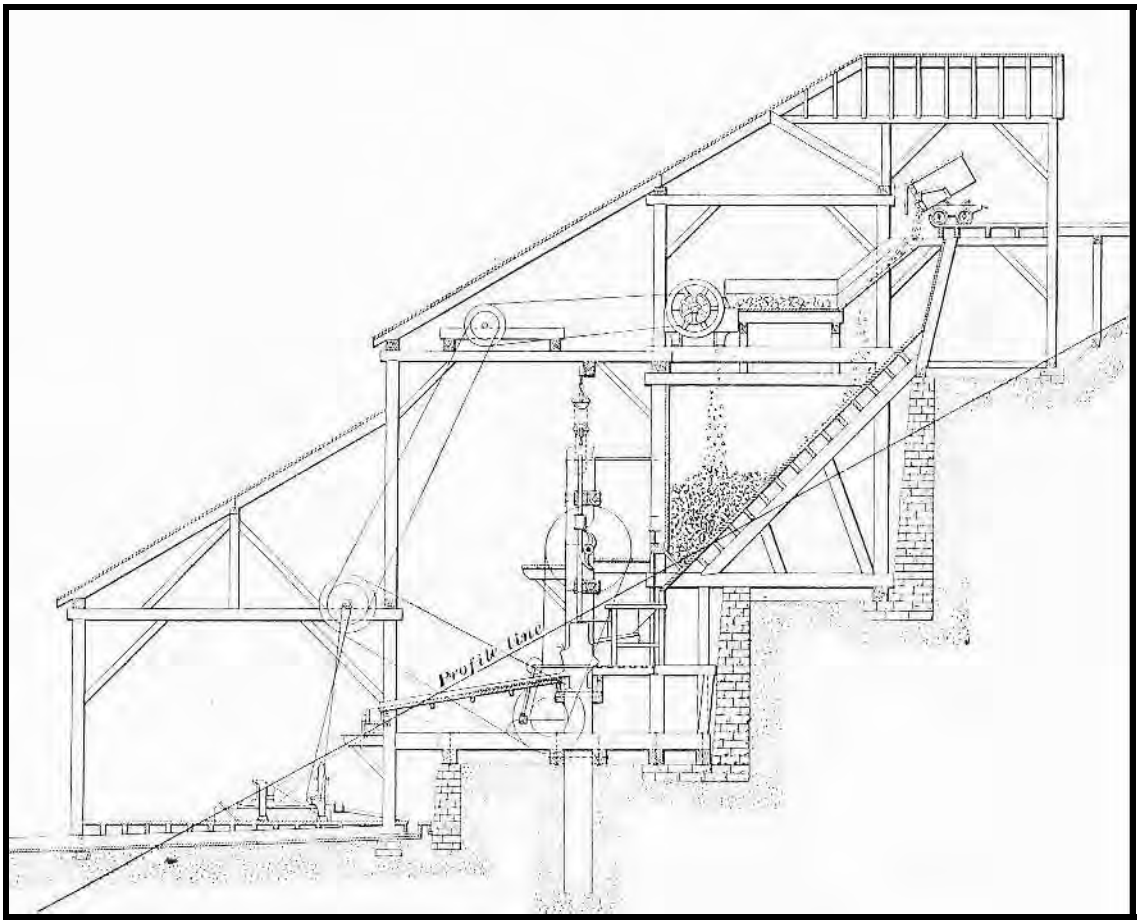


Figure E 84: The profile illustrates both the stairstep configuration of a typical concentration mill and the process flow path. Workers dumped ore onto a screen at top, and fine material passed through while course cobbles were diverted into a crusher. A stamp battery at center then pulverized the ore into a slurry, which passed over amalgamating tables that extracted free-gold and silver. The slurry then descended to concentration machinery on the lower platform. That machinery separated out the gold and silver that refused to amalgamate. Source: International Textbook Company, 1899, A43:214.

Crushing Machinery

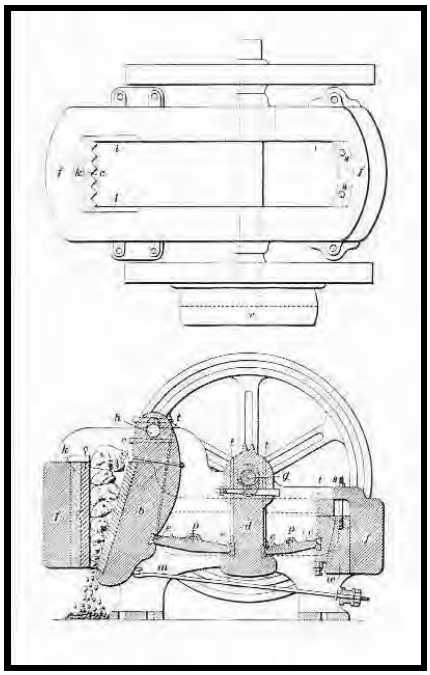


Figure E 85: The plan view, top, and profile, bottom, illustrate a jaw crusher, which provided initial crushing at most mills. Source: International Textbook Company, 1899, A43:2.

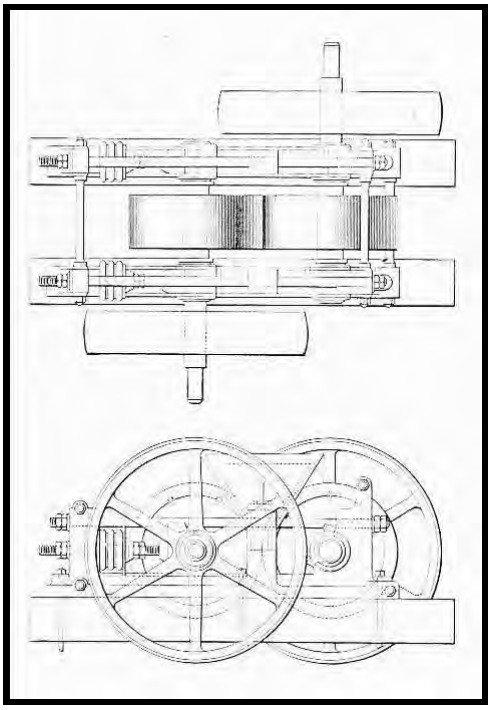


Figure E 86: The plan view, top, and profile, bottom, illustrate a device known as a crushing rolls, which was popular for secondary and tertiary crushing. Source: International Textbook Company, 1899, A43:12.

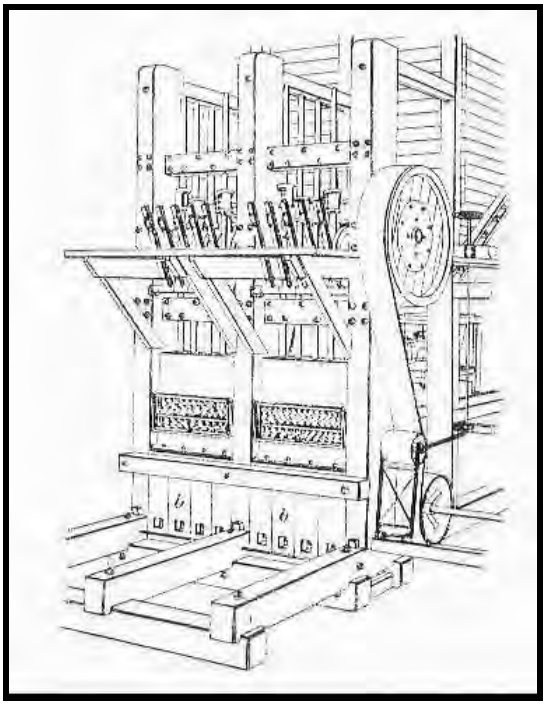


Figure E 87: The quarterview illustrates the front of a stamp battery, which provided secondary crushing at some mills. Stamp rods are visible between the timber posts, and their heavy iron shoes pounded ore in the battery boxes below. The battery boxes are bolted to pedestals of upright timbers, which are often the only remnants of stamp batteries today. Source: International Textbook Company, 1899, A43:27.

Figure E 88: When a stamp battery was dismantled, the pedestals for the cast iron battery boxes were often left in place. The pedestals consist of timbers on-end and feature anchor bolts on top, and each is around 2 feet wide, 3 feet high, and 5 feet long. Source: Eric Twitty.

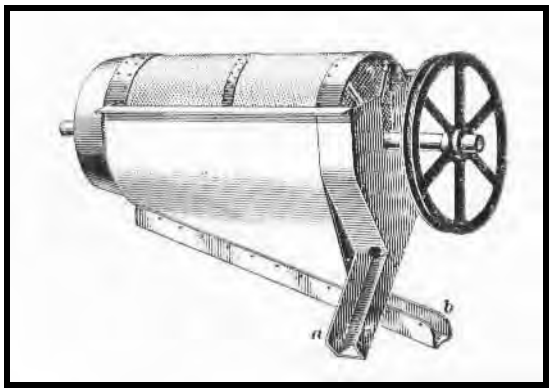


Figure E 89: Most mills relied on trommel screens to sort crushed rock between processing stages. Source: International Textbook Company, 1899, A43:12.

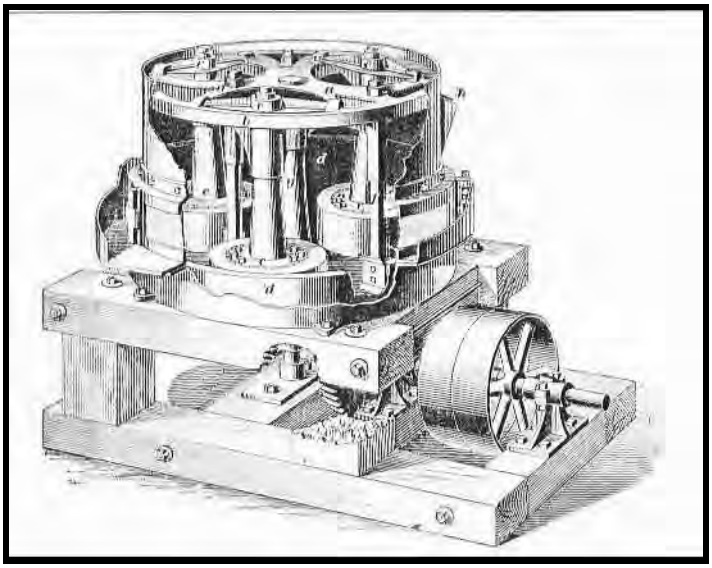


Figure E 90: The Huntington mill saw two applications. At concentration facilities, it provided secondary and tertiary crushing, and at amalgamation mills, the device simultaneously ground and amalgamated gold and silver ores. The driveshaft at right turned a capstan in the mill's pan, which caused the rollers to grind screened ore against the cast iron walls. Note the timber foundation. Source: International Textbook Company, 1899, Z43:47.

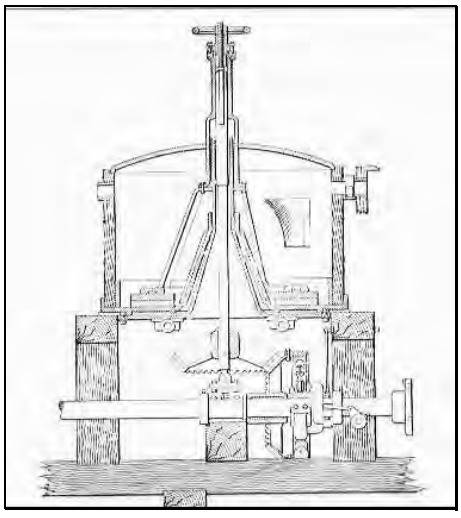


Figure E 91: The profile depicts a grinding pan, used for tertiary crushing and sometimes to amalgamate gold ore. Heavy shoes on a central axle rotated around the cast iron floor and ground ore. They were largely ineffective on complex ore. Source: International Textbook Company, 1899, A43:172.

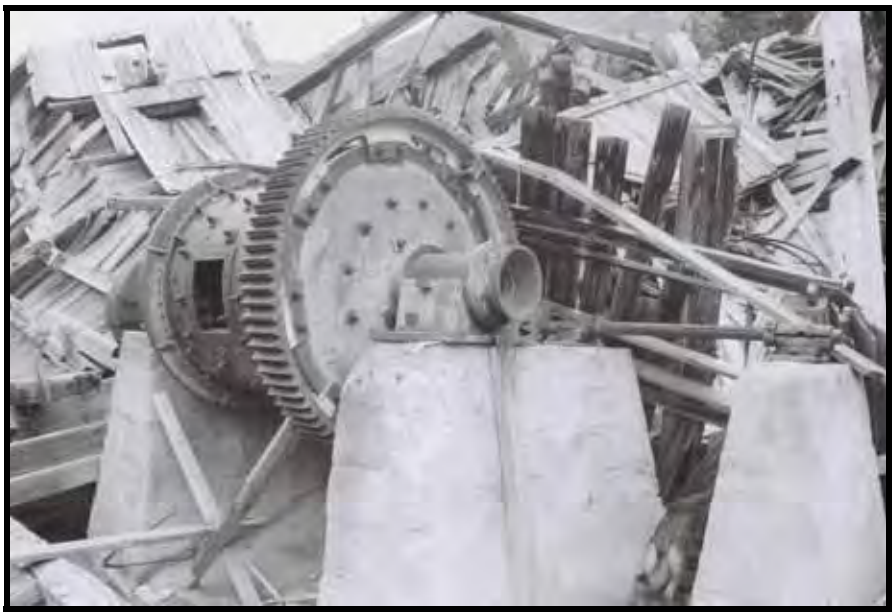
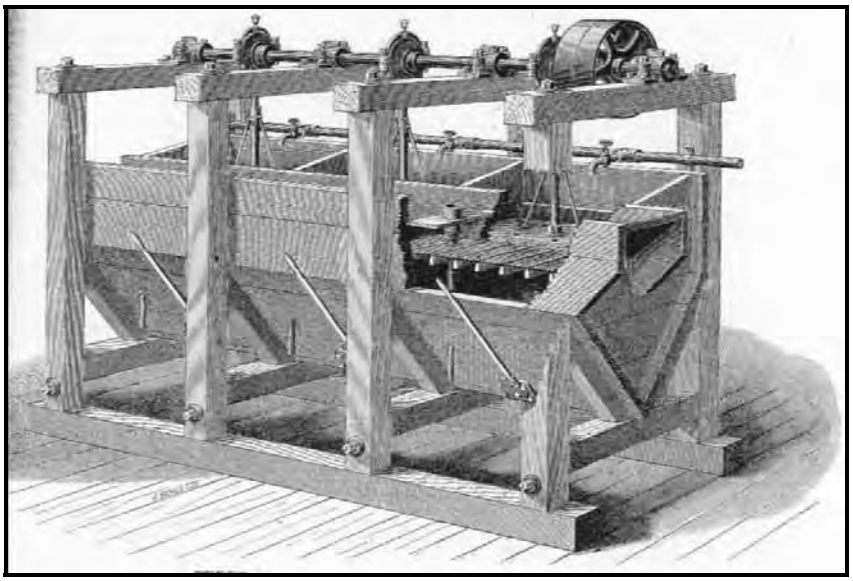


Figure E 92: Ball mills became popular for fine grinding by the 1910s. As the entire cylinder slowly rotated, tumbling steel balls in the chamber ground screened ore to a slurry. A hatch covered the opening.. Note the concrete foundation, distinct in footprint. Source: Eric Twitty.

Concentration Machinery

Figure E 93: The jig was an effective and popular concentration device from the 1870s through the 1900s. The crank at top moved screen plungers up and down in the slurry-filled cells. The agitating action classified ore particles by size or weight, depending on the application. Source: *Mining & Scientific Press* 8/9/90, p83.



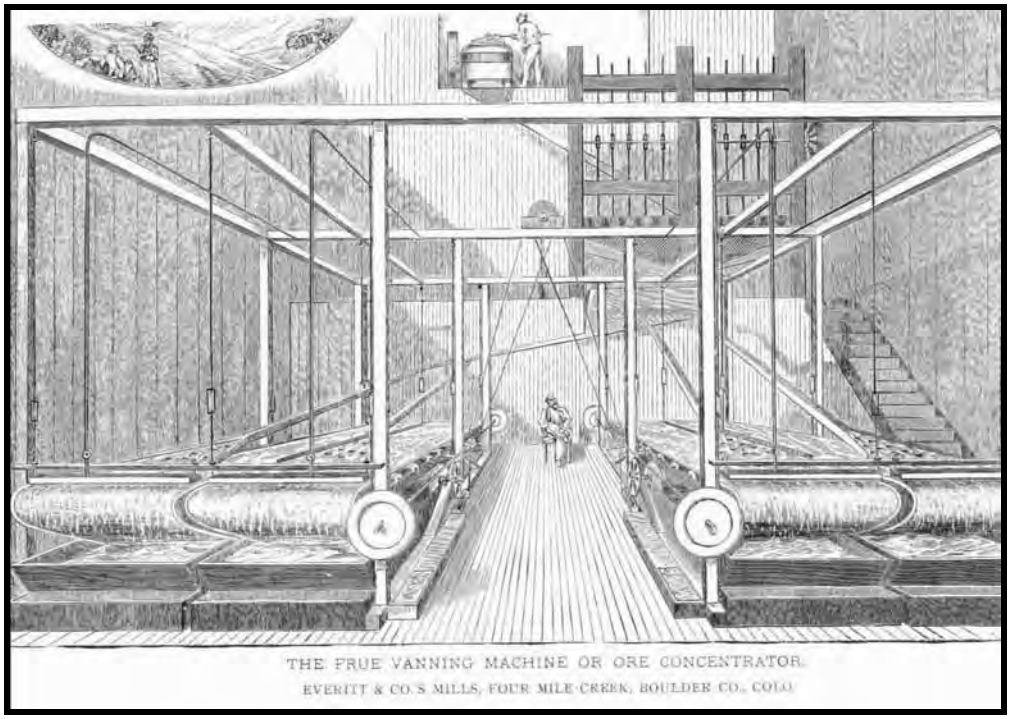


Figure E 94: Frue vanners were used with some success to concentrate complex silver ore prior to 1900, although the drawing is of the Everett Mill in Boulder County. As the vanner vibrated, finely ground ore settled against its broad rubber belt while water jets and a scraper removed light waste material. Note the stamp battery at upper right. Source: *Engineering & Mining Journal* 11/24/77, p387.

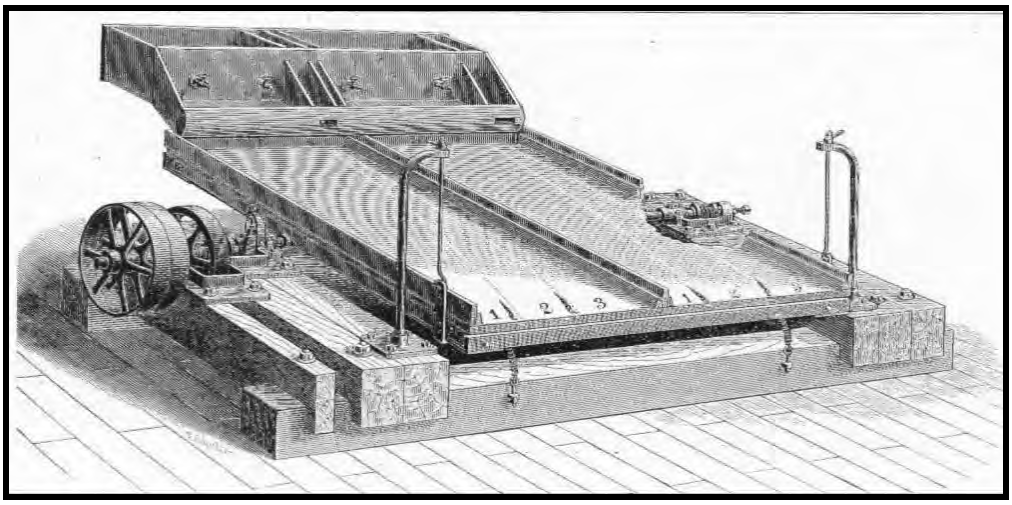


Figure E 95: Known as both a percussion table and a bumping table, this 1880s apparatus used vibratory action to concentrate finely ground silver ores. Source: *Mining & Scientific Press* 8/9/90, p83.

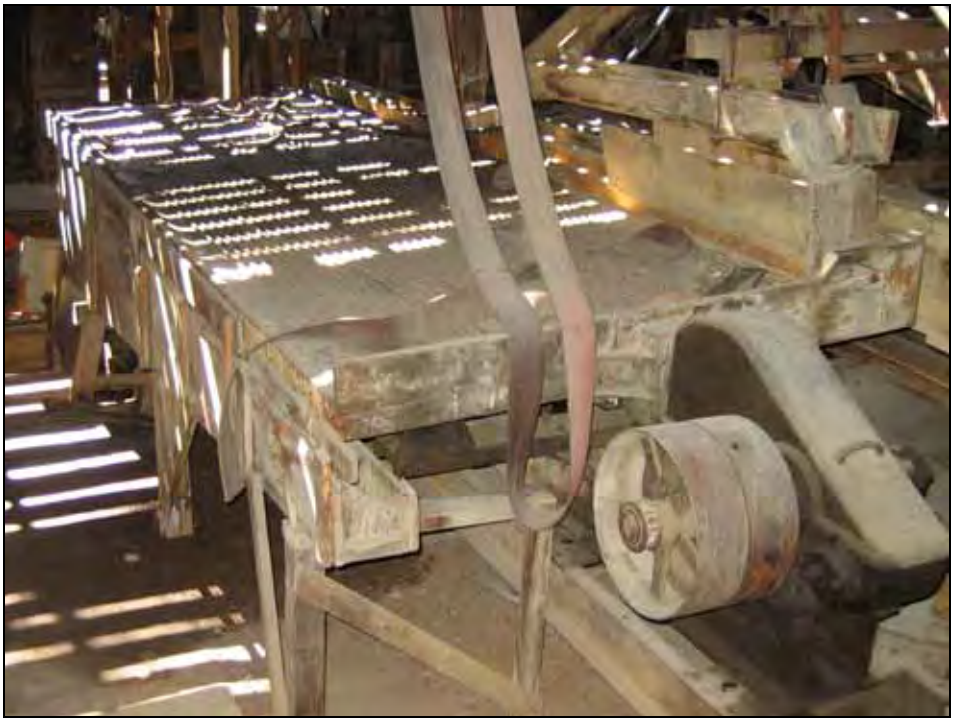


Figure E 96: Following its introduction around 1898, the vibrating table was one of the most popular and effective concentration appliances throughout the Rocky Mountain west. An eccentric cam under the guard at right imparted a vibrating motion to the tabletop, and the vigorous action caused heavy metalliferous material to settle against the riffles. Water currents washed the light waste off. Source: Carol Beam, Boulder County Parks and Open Space.

Figure E 97: Vibrating tables like the one in Figure E 96 above were anchored to foundations of three concrete or timber footers, often 5 feet wide and 15 feet long. Source: Eric Twitty.

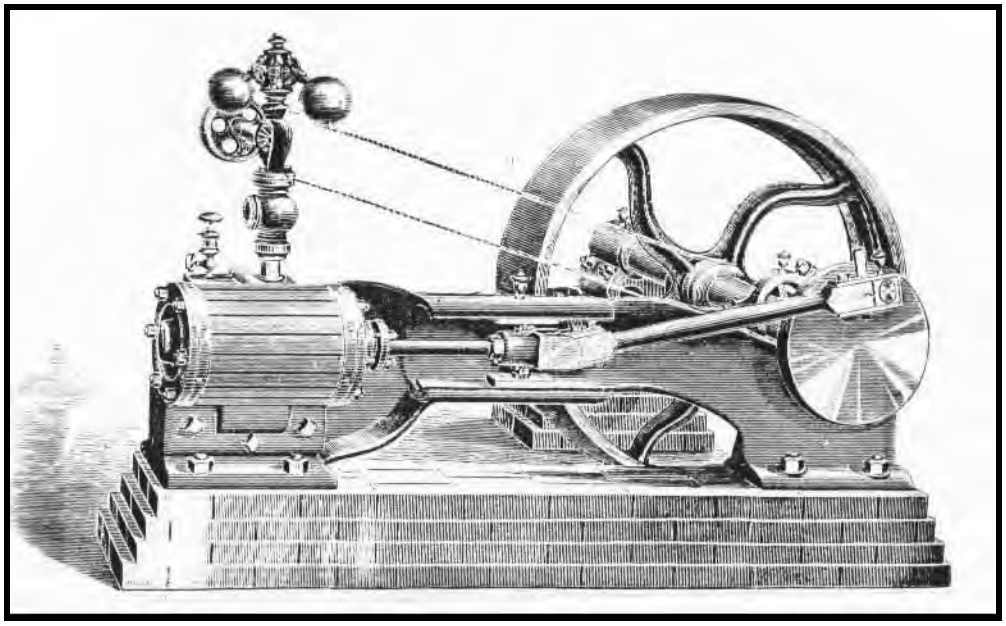


Figure E 98: Until electricity became available during the 1890s, horizontal steam engines powered nearly all concentration mills. A drive belt passed around the flywheel to a mill's system of driveshafts. Note the masonry foundation. Source: Ingersoll Rockdrill Company, 1887:53.

Figure E 99: By the 1890s, mining companies increasingly used electric motors to power their mills, provided electricity was available. This motor drove an air compressor at the Kittimac Mine. Source: Eric Twitty.

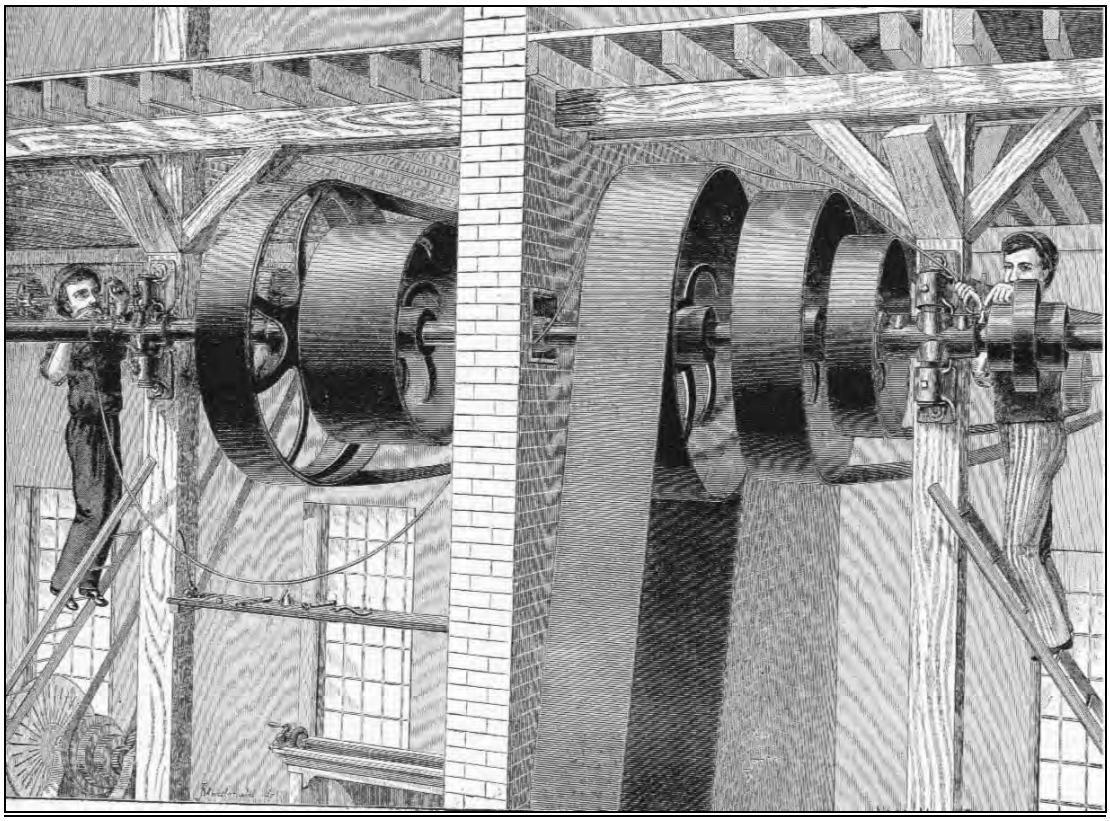


Figure E 100: A system of overhead driveshafts and belts was the most common means of transferring motion from a mill's engine to its various appliances. Source: *Mining & Scientific Press* 9/1/83, p129.

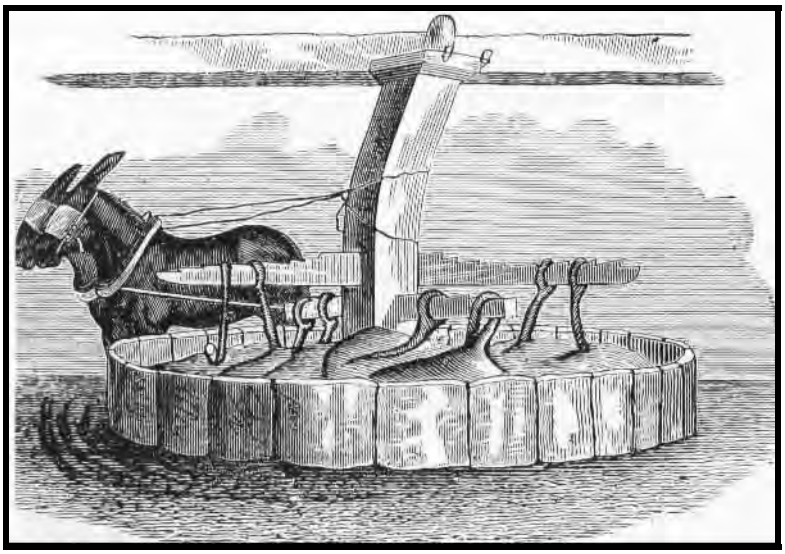


Figure E 101: The ages-old arrastra was used during the earliest years of mining in San Juan County to treat gold ore. The operator shoveled ore into the interior, added mercury, and waited for the rotating muller stones to grind the material into sand and slurry. As the ore fractured, mercury amalgamated with the gold. Because arrastras were simple and inexpensive, they were favored by prospectors. Source: *Mining & Scientific Press* 5/26/83.

Section F: Property Types and Registration Requirements

Property Type: Placer Mine

Figure F 1: The unidentified placer mine in San Juan County is a typical hydraulic operation. Miners use nozzles known as monitors to direct high-pressure water jets against gold-bearing gravel, liquefying the material. Water carried by a ditch then washed the gravel through a sluice, not visible, on the drainage floor. A flume at upper left traverses the mountainside and directs water into a penstock, the curved pipeline descending along the left edge of the photo. The penstock delivered the water, under great pressure, to the monitors. The buildings housed support facilities. The high cut-banks, infrastructure, and buildings are typical for hydraulic mining from the 1880s through the 1930s. Source: Denver Public Library, Western History Collection, X-60083.

Property Type: Hardrock Prospect

Figure F 2: By the early 1880s, the Belcher Mine recently joined the county's ore producers. In its primitive state, however, the mine resembled a deep prospect in many ways. The operation was small and simple, the underground workings were shallow, and the waste rock dump therefore small. In addition, the surface improvements were minimal, the structures few and crude, and access provided only by a packtrail. Although no buildings are evident, a blacksmith shop was probably nearby. Source: Denver Public Library, Western History Collection, C-77.

Property Type: Mine

Figure F 3: The unidentified 1930s operation in Cunningham Gulch illustrates a small, tunnel mine. The tunnel is well-developed, and the miners cached timbers and supplies on both sides of a rail line. The building at right is a blacksmith shop and probably houses an air compressor. The building, battered and clad with tarpaper, is characteristic of 1930s vernacular architecture at mines. Source: Denver Public Library, Western History Collection, X6195.

Figure F 4: The Sunnyside Mine, pictured in 1917, exemplifies the scale that some large mines attained in San Juan County. The mine, located above treeline on Lake Emma, had several tunnels, a complex surface plant, and massive boardinghouses for the crew. The surface plant included support facilities, machinery, a mill in the right background, and pump station on the lake. Although the plant evolved organically over time in response to need, it appears that the company engineer formally designed the buildings. Source: Denver Public Library, Western History Collection, X-62224.

Figure F 5: Although the Silver Ledge Mine, above Chattanooga, was idle and dilapidated by 1920, it represents a well-developed shaft operation. The surface plant consists of multiple buildings added over time, and they are vernacular in design and construction. A shaft house stands at center, a shop is to its left, and the partially collapsed building may be a tram terminal. Source: Denver Public Library, Western History Collection, X-62196.

Mining Settlement and Residence

Property Type: Prospector's Camp

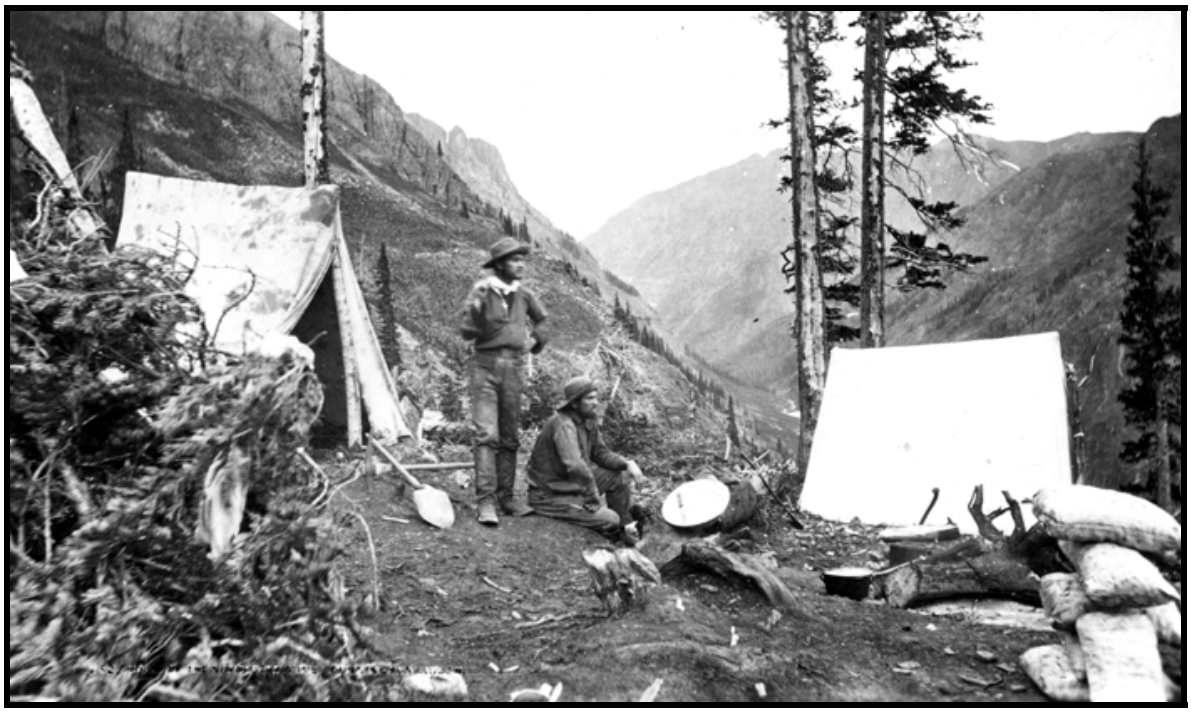


Figure F 6: A party of prospectors camps high on the west side of Cunningham Gulch, near the Highland Mary Mine in 1875. Archaeological features represent such sites today. Earthen platforms might represent the tents, the fire ring at right could be evident and overgrown, and a scatter of cans often extends downslope. Note the sacks of ore samples at right. Courtesy of U.S. Geological Survey, Jackson, W.H. 566.

Property Type: Workers' Housing

Figure F 7: Boardinghouses were the most common type of workers' housing in San Juan County. They ranged from the small and simple building at the Iowa Mine, top, to a large and well-built boardinghouse at the San Juan Chief, bottom. Most housing was vernacular in design and construction, influenced by available financial and material resources, perceptions of need, and skill. Mining companies adapted known building forms and methods of construction to the environment of the San Juans. Source: Eric Twitty.

Property Type: Unincorporated Settlement

Figure F 8: Unincorporated settlements were rarely planned in advance and instead grew organically in response to a local housing need. Gladstone, pictured around 1900, was a community of employees at the nearby Gold King, Mogul, and Fisher mills. Like most unincorporated settlements, Gladstone consisted of residences scattered around a core of basic businesses, including a mercantile, saloon, and hotel, along a main road. Source: Denver Public Library, Western History Collection, X-7513.

Jack E Clark - DOB: 1948 - Silverton, CO

Born
1948

Individual Details for Jack Clark

General Information

Full Report	View Full Report for Jack
First/Last Name	Jack Clark
Middle Name	E
Registration Date	September 29, 2004
Registration Status	Active
Phone Number	

Addresses

Residential Address	3815 CR 2 SILVERTON CO 81433

Mailing Address	PO BOX 767 SILVERTON CO UNITED STATES OF AMERICA 81433

How did we obtain this information?
Please see our FAQ to learn how we gather and display this information.

District Information

County	San Juan
Precinct	3065956001
Precinct Code	3065956001 **Split:** 4
Congressional District	Congressional 3
State Representative District	State House 59
State Senate District	State Senate 6

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Please see the Colorado Secretary of State website for more information. This website has no affiliation with the State of Colorado.
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Barbara J Clark - DOB: 1950 - Silverton, CO

Born
1950

Individual Details for Barbara Clark

General Information

Full Report	View Full Report for Barbara
First/Last Name	Barbara Clark
Middle Name	J
Registration Date	September 29, 2004
Registration Status	Active
Phone Number	

Addresses

Residential Address	3815 CR 2 SILVERTON CO 81433

Mailing Address	PO BOX 767 SILVERTON CO UNITED STATES OF AMERICA 81433

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Superior History Society

SILVERTON STANDARD

VOLUME XX — SILVERTON, COLORADO, SATURDAY, MAY 9, 1908. — No. 25

MINE AND MILL SUPPLIES

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We have several hundred records for both Machines on hand and will get for you records in English, German, French, French-Canadian, Spanish, Italian, Hebrew, Swedish, Norwegian, Russian, Bohemian, and the "Gregorian" Records.

We have a very full line always on hand, and you may have the benefit of Mr. Grout's musical knowledge and experience to help you make a choice selection of such music as will best suit your taste.

We make a specialty of Grand Opera Records; these Records are made by the finest Artists in the Musical World, and are superior to any Records in existence.

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She Let Him Down Easy.

She touched him only for a ten-spot.

You may not be so lucky, if you go ahead and buy that bill of lumber that you're going to need, and don't stop and see us first.

Poorly-made, badly-kept, unseasoned lumber, costs just exactly as much as the best, sound dry stock. It just depends on where you buy. If you buy from us, you'll pay no more than you would elsewhere, you'll be dead sure to get the very best material manufactured. Let us quote you on that next bill.

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Henrietta to Resume, Extensive Ore Reserves

The Henrietta property of the San Juan Smelting and Refining company will, in a short time, again be in active operation. The management will be in the hands of Mrs. E. C. Drew of Monroe, La., representing a reorganization of the bondholders and stockholders of the company. In a very short time the first one hundred ton unit of the mill will be erected. The foundation of this structure was put in last fall and in the course of a few weeks the Colorado Iron Works, who have the contract for the erection of the mill, will begin active construction work.

The tramway on this property, by recent examination, is found to be in splendid condition, a very little time and money being required to put it into working order. This tramway has the reputation of being one of the very best in Colorado. It is a little over a mile in length from the No. 7 level to the terminal on the railroad, where the mill is being built. The capacity of the tram is 500 tons of ore daily.

As to the present condition of the mine recent examination shows it to be in excellent condition. In the No. 7 tunnel which is a cross-cut tunnel, the ore body is opened up for a distance of 775 feet and the breast of the tunnel is still in ore. The face of the drift and a short raise on the top of the timbers show this ore body to be fully eight feet in width. An expert examination by Prof. Sadtler, formerly of the State School of Mines determined the average value of this ore to be 15.47 per ton. This ore extends to the surface insuring stoping ground between three and four hundred feet in height. In the Number 7 tunnel a monster vein called the Surprise vein was cut about seven hundred feet from the portal of the tunnel. At the point where this was cut the ore is ten feet in width. Of this two feet is of a good smelting grade and eight feet is a high grade concentrating product with the principal values in copper, silver and lead. The Surprise vein is at the present time undeveloped. Besides this a separate and distinct vein four feet in width has been cut. This vein is highly impregnated with lead, but as yet had no development work done on it.

Number ten tunnel, three hundred feet below number seven, is now being driven into the hill. It has now reached a length of 522 feet and at a point seven hundred feet further on, it is confidently expected that the junction of the Surprise and Henrietta veins will be cut. It is very reasonable to expect that when this intersection is reached a decided improvement in the size and value of the ore body will be noticed. This tunnel will also cut at a greater depth the valuable lead vein mentioned as having been cut in number seven.

The ore bodies already opened up in the number seven tunnel will provide ample ore to run the mill for months to come and the development of the Surprise and the big lead vein of this tunnel will give a much greater supply of ore to draw from, but more than this and of greater importance, when these splendid bodies are cut in the number ten tunnel, immense ore reserves will be assured for the future. Good ore reserves are also shown higher up the mountain in tunnels number one, two and three.

From every point of view the Henrietta property has a bright outlook for the future. The mill will be easily accessible being on the Gladstone railroad, thus simplefying the problem of marketing the product. Connecting the mine and the mill is a tramway second in efficiency to none in the state. The mine already has large bodies of ore blocked out and future development work, already commenced, will put it in a position to become one of the largest producers of San Juan county. The locality of the property is also in its favor It is on the San Juan side of a ridge on the other side of which and in similar formation are the famous Yankee Girl and Guston mines which have poured fourth their millions to swell the total of the production of the Golden San Juan.

The business standing of E C. Drew, who is now in charge, guarantees a conservative and business-like management. Mr. Drew has large lumber interests in the state of Louisiana and his reputation as a business man of energetic accomplishment is already established in his home state. San Juan county always extends a welcome to men of push as he is, and wishes them the greatest success in their enterprises.

MINING AND PERSONAL

Alfred Harrison, the mining engineer, returned a week ago Thursday from a business trip to New York City.

Joe Hinkley is now at work on his lease at the Detroit-Colorado dump. He is, as we are informed, making good money out of the venture.

C. E. Robin came in Friday from his California fruit farm to attend the recent meeting of the Iowa company. His stay will probably be of about two weeks' duration.

Five mules belonging to the pack train of Alfred Ayres went over the trail coming down from the Shenandoah-Dives lease. The animals were loaded with ore. Three of the valuable animals were killed.

George Pratt left for Lake City Thursday going over the range. On his way over he stopped at the Isolde to determine how soon the snow condition of that altitude would permit a resumption of work on the property.

W. F. Canavan, manager of the Bonniegirl Mining and Milling company, whose property is located in the La Plata mountains, was in Silverton for a few days this week. The Bonniegirl has a fifty stamp mill on its property and arrangements are now being made for the trial run.

The Shenandoah-Dives lease is shipping ore almost daily now by means of jack trains. This property is in fine shape and the production of high grade grey copper ore will, according to present indications, net the owners a handsome fortune from the present season's output of that splendid property.

Theo. Ivens, manager of the Eureka Exploration company, came in Monday after several weeks spent in Sioux City. It is hoped that a great deal of work will be done this season on the Silver Wing, which we consider one of the best properties in the camp considering its present development.

On May 1st the Stony Pass Mining company under the management of A. W. Hall of Dexter, Maine, resumed operations in the Mammoth tunnel. This is a cross cut tunnel started below the terminal of the Henrietta tram. It is now in a distance of 2,200 feet and it will be driven some 2,000 feet further before cutting the Henrietta vein at an enormous depth.

J. G. McNulty, constructing engineer of the Kittimac mill, was an arrival the first of the week and will spend most of his time on the ground while he is here. The work of excavation is being pushed as rapidly as possible and after that the work of erection of the mill and installation of the machinery will go forward so that it may be in active operation during the present season.

Joe Maple started up Monday to begin work on his Tower mountain properties, the Bonanza King, the Bonanza Queen and the Elsie. Mr. Maple has been working on these properties for a good many years. At the present time he is driving a drift on a cross lead and has good ore in the workings. This drift will give him a great depth on the ore when completed.

DEMOCRATIC CONVENTION

A convention of duly elected delegates of the Democratic party of San Juan County was held in the court house in Silverton on Monday, May 4th, to elect delegates to the state convention to be held in Glenwood Springs on June 15. Wm. Palmquist was elected chairman of the convention and F. J. Bawden was secretary. The men selected to represent San Juan county at the state convention are Dr. John S. Fox, Thos. Colmer, John T. Joyce, Thos. Annear, Wm. Lonergan, Wm. Palmquist, Patsy Fitzsimmons and N. A. Ballou. The following resolutions were introduced and unanimously adopted by the convention:

We the Democratic party of San Juan county in convention assembled recognizing the broad statesmanship and matchless eloquence of William Jennings Bryan in the cause of humanity, do hereby instruct our delegation to the state convention at Glenwood Springs, to vote and support only such delegates to the national convention as are for the nomination of Mr. Bryan for president and to vote and use all honorable means to have the delegation to the national convention instructed for Mr. Bryan.

Whereas, The San Juan district and San Juan county in particular have always been loyal to the cause of Democracy and year after year has proven such loyalty by the substantial majorities for the candidates upon the Democratic tickets for state, district and county offices and by reason thereof are justly entitled to representation in the national Democratic convention, therefore be it

Resolved, That the delegates selected by this convention to attend the state Democratic convention at Glenwood Springs, be, and they are hereby instructed to use all honorable means to secure the election of Hon. Thomas Annear as one of the delegates from the State of Colorado to attend the National Democratic convention to be held in Denver on July 7th, 1908.

When you think of indigestion think of Kodol, for it is without doubt the only preparation that completely digest all classes of food. And that is what you need when you have indigestion or stomach trouble—something that will act promptly but thoroughly; something that will get right at the trouble and do the very work itself for the stomach by digesting the food that you eat and that is Kodol. It is pleasant to take. It is sold by S. D. Cunningham.

RED MOUNTAIN NOTES

From the Ouray Herald.

The Yankee Girl leasers are doing good work and making money. They have already extracted and piled up ready for the opening of the railroad over 400 tons of high grade ore that is conservatively estimated to be worth better than $50 per ton. The ore is being taken from one of the famous Yankee Girl ore shoots and shows the future possibilities of this magnificent old producer that has enriched the world by millions of dollars. Aside from the work being done on the Yankee Girl, very little is going on at any of the other Red Mountain Railway, Mining & S. Co.'s properties, pending the arrival of General Manager George Crawford and the opening of the railroad about June 1. Mr. Crawford lately wrote from Detroit that he expected to be in Ouray about May 10 and that he would be prepared to resume work om the same large scale as heretofore. The Yankee Girl, Genessee and other properties of the company are in condition to commence shipping as soon as the railroad is opened, and it is confidently expected that the Gold Lion will be able to make shipments this season. The Gold Lion tunnel will open up the Mountain Lion Vein at great depth enabling the economical mining of known ore bodies from which in recent years a considerable tonnage has been mined of good grade ore. Altogether, the Red Mountain Co. has some exceptionally valuable property and owns territory enough to insure active mining operations at a profit to the stockholders for many years.

Yesterday, an important strike was made in the Alexandria mine, which is one of the Crawford syndicate group of claims, located about half a mile east of the Yankee Girl, on Red Mountain No. 2. The Alexandria has been worked since last summer under lease by Lonergan, Stratton & Davey who made several shipments last season of good grade lead-silver ore. They have been looking for the main shoot and yesterday broke into a streak of 2½ feet of 70 per cent lead-copper ore which promises to carry good silver and gold values. From development at various points adjacent to the new strike, it is believed that a large ore body has been discovered, and that a big tonnage producer will be the result of the development the leasers have so persistently and faithfully pursued.

Word has been received from George Crawford of the Gold Lion and Joker properties that he will be here in a short time, May 25 at latest. This will mean the opening up of all the properties in which he is interested. Three months development work, it is stated, will place all the mines on a producing basis. The Gold Lion has been shipping from the upper workings steadily, but more development work will be done and in a short time ore will be down and in a short time ore will be taken out of of the lower levels as well. The coming of Mr. Crawford will be looked forward to with interest by all who are interested in the development of this district

THE IOWA MEETING

A director's meeting of the Iowa Gold Mining and Milling company was scheduled to be held on Monday, May 4th, but it was postponed until Wednesday afternoon. C. E. Robin of California, Mrs. Laura M. Stoiber and Mr. E. D. De Soto of Denver were here to attend the meeting on that day. It will be remembered that a snow slide last winter did a great deal of damage to the mill. It was estimated that the cost would be somewhere between $6,000 and $10,000 to put everything in proper shape again. After a full discussion of the situation pro and con it was decided not to take any immediate steps toward reopening the property. Some of the directors were in favor of resuming work at once as there was an abundance of good ore in the property and this could be extracted at substantial profit at the present time. The majority, however, considering the unsatisfactory state of the metal market, thought it wise not to go to the immediate expense of repairing the damage to the mill and otherwise getting the property in shape for resumption.

M. W. Emery.

August Fast last Saturday received the sad news that M. W. Emery, the father of Mrs. Fast, had passed away at his home in Boston on the first day of May. Mr. Emery at the time of his death was seventy-six years of age and it was supposed that the chief cause of his decease was general debility resulting from old age. At the time the news was received, Mrs. Fast was in Denver on her way to join her baby in Chicago.

Mr. Emery was a Silverton pioneer. In early days he was largely interested in mining in this camp. He came across the plains in 1849, settling in California at that time and afterwards coming to Colorado and to the Silverton district. He was at the time of his death an active member of the California Pioneer's association in Boston. For two terms he held the office of county clerk of San Juan county. Sixteen years ago he left here for Boston where he has since made his home. Many warm friends hear the news of his death with sorrow.

War With Japan

could not possibly make so many cripples as rheumatism does every year. And yet there is no reason why this disease should cripple any one, if all sufferers will rub the affected parts night and morning with Ballard's Snow Liniment. Cures all aches and pains. Sold by S. D. Cunningham.

THE MINERS' UNION HOSPITAL

By a vote of 1062 to 97 it was decided by the Silverton Miner's Union to erect a hospital at a cost not to exceed $35,000. A committee is now at work trying to select a suitable site for the erection of this building. Ground will be broken soon. This institution will be a credit to this town and county and a great and lasting benefit to the miners in this camp. It was in response to the demands of the men in the hills that this enprise was taken up. When it is completed Silverton will have the finest hospital on the western slope.

SHIPMENTS FOR APRIL

The tonnage for April from the Silverton camp run about the same as that for the month before, and was better than that for April, 1907. The following are the shipments as obtained from the records:

CONCENTRATES.

Gold King	1825
Silver Lake	1775
Sunnyside	250
Old Hundred	75
Hamlet	75
Total	4,000

CRUDE ORE

Highland Mary	50

This record indicates that 16,000 to 17,000 tons of ore were mined in the camp during April. The May record will probably be much better as the Hamlet will be running full swing and the Hercules Consolidated with an enlarged capacity will be running three shifts in the mill. The trails are getting in better shape and we can expect largely increased shipments of crude ore especially from the Shenandoah-Dives lease which is now marketing ore mined through the winter.

THE THIRD FIRE.

At 10:30 o clock Tuesday morning the fire alarm sounded for the third time within a week, thus giving credence to the old superstitution that when there is one fire, there are two more to follow. The fire was at the residence of Mrs. Higgins on Greene street and was discovered by Alva Patterson, whose home is just across the alley. By the time the fire boys reached the scene the blaze was put out, thus avoiding the necessity of turning on the water. The damage was slight, probably being under $100. If the blaze had been discovered five minutes later, however, the loss would have probably been very severe if not total.

DeWitt's Little Early Risers are small, safe, sure and gentle little pills. Sold by S. D Cunningham.

SILVERTON STANDARD.

J. T. JOYCE, Editor and Publisher.

Entered at the Silverton, Colo., postoffice for transmission through the mails as second class matter.

OFFICIAL ... CITY AND COUNTY

SATURDAY, MAY 9, 1908.

Tom Annear for Delegate to the National Convention

The choice of San Juan county for delegate to the National Democratic convention to be held in Denver, July 7, 1908, was emphasized in the county convention held Monday night last. That body instructed its delegates selected to attend the state convention at Glenwood Springs to advocate the election of the Hon. Thos. Annear as a delegate to the National convention. San Juan's claims to representation on the Colorado delegation were fully set forth. Thomas Annear is a strong man recognized throughout this state as an honest, able and fearless champion of Democracy. We think that no man more worthy of the honor could have been selected and we feel confident that the state convention will see fit to recognize the claims personally as well as those of this section of the state by naming him as delegate to the Denver convention.

District Court.

The spring term of the District court will begin in Silverton on Monday, May 11, with Judge C. A. Pike of Durango; Jas. A. Pulliam, district attorney, and E. V. Hollingsworth, clerk.

There is a long list of cases on the civil docket, but owing to various causes many of them will either be dismissed or not brought to trial at this term of court.

On the criminal docket are the following cases:

The People vs. Wm. Steel; keeping gambling house.

The People vs. W. K. Bryden; keeping gambling house.

The People vs. Ed. Washington; keeping gambling house.

The People vs. Vota & DeHeines; keeping gambling house.

The People vs. F. W. Koehler; keeping gambling house.

The People vs. Wm. Luke; keeping gambling house.

The People vs. J. H. Slattery; keeping gambling house.

The People vs. Henry Sherman; keeping gambling house.

The People vs. John Orella; keeping gambling house.

The People vs. Harris & Braunsworth; keeping gambling house.

The People vs. Wade Howell; assault to kill.

The People vs. C. W. Leaver; non-support.

The People vs. Jennie Miller; keeping bawdy house.

The People vs. Tony Centra; larceny (two cases).

The People vs. Chas. Schultz; assault with deadly weapon.

The People vs. Jas. Guido; arson.

Several other criminal cases will in all probability be tried upon informations filed in open court.

Aspen Resume Operations.

We are reliably informed that the Aspen mine is to resume operations at once and perhaps before this goes to press a few men will be at work on that property. The work to be done at the present time will be largely in the line of development. Production will necessarily have to be limited on account of the fact that the Silver Lake is using most of the Apen unit of the mill at the present time. The force of men will be increased from time to time as it is needed. The Aspen is a splendid property with large ore reserves and it will be the work of Superintendent Moritz Stockder to put the mine in the best condition possible.

Bishop Knight's Visit.

The missionery bishop of western Colorado, Bishop Knight, held services at St. John's Episcopal church last Friday night, after which the ordinance of confirmation was administered. A large and appreciative audience was out to greet him. After the church services a reception for the bishop was held at the home of Mr. and Mrs. E. W. Hunt. A good time was enjoyed by all the large crowd present. Dainty refreshments were served by St. Margaret's guild. This reception was without doubt one of the most successful and thoroughly enjoyed social functions ever held in the town of Silverton.

University of Colorado.

The new shop building of the college of engineering at the university of Colorado was dedicated last Saturday. The program consisted of music, remarks by President James H. Baker, Regent Charles R. Dudley, Dean Milo S. Ketchum, and Harry Curtis for the engineering students. Hon. Regis Chauvenet, former president of the State School of Mines, gave the principal address of the day. The inspection of the shops followed. They are now in full operation and on account of their modern equipment and facilities are considered the best of their kind in the west.

"The Chaperone," the first comic opera over produced entirely by a student body in Colorado was given in Boulder last Saturday evening. The words and lyrics were written by Byron B. Boyd, the music by Ralph C. Smith, both students in the University of Colorado. The cast of fifty was composed wholly of university people. The play was in three acts, principally of local interest, and included seventeen songs. The production proved so successful that it will undoubtedly be repeated.

The University of Missouri defeated the University of Colorado in debating on the evening of April 23. The question discussed was "Resolved, that all elective state, county, district, and municipal officers should be nominated by direct primaries held under state regulation." Colorado upheld the affirmative while Missouri defended the negative. The latter contended chiefly that judicial officers should not be nominated according to the question. The debate was probably the most spirited and beneficial in which the State University ever contested. The chairman of the evening was Lieutenant-Governor Harper, and the judges were Hon. Ralph Talbot, Hon. Will B. Tibbets, and L. Ward Bannister, all of Denver.

A Happy Father

is soon turned to a sad one if he has to walk the floor every night with a crying baby. McGee's Baby Elixir will make the child well.—soothe its nerves, induce healthy, normal slumber. Best for disordered bowels and sour stomach—all teething babies need it. Pleasant to take, sure, and safe, contains no harmful drugs. Price 25 and 50 cents per bottle. Sold by S D Cunningham.

Eagle's Memorial Services.

Sunday, May 10th, at 2:30 p. m., the members of Silverton Aerie, Fraternal Order of Eagles, will hold their memorial services at Miners' Union hall. The services will be impressive. It is fitting that a time should be set apart to honor the dead and call them again to memory. The attendance of every member of the order is earnestly desired. The program for the day is as follows:

HYMN	CONGREGATION
OPENING ANNOUNCEMENT	WORTHY PRESIDENT
PRAYER (All Standing)	WORTHY CHAPLAIN
MUSICAL SELECTION	ORCHESTRA
TRIBUTE	PAST WORTHY PRESIDENT
MUSICAL SELECTION	SILVERTON QUARTETTE
ROLL CALL OF HONORED DEAD	SECRETARY
MUSICAL SELECTION	ORCHESTRA
ORATION	REV. F. E. CARTER
MUSICAL SELECTION	SILVERTON QUARTETTE
CLOSING EXERCISES	OFFICERS AND MEMBERS
NEARER MY GOD TO THEE	CONGREGATION

The audience is requested to rise and join in singing.

BENEDICTION	WORTHY CHAPLAIN

Notice.

All stock found running at large in the town of Silverton will be taken up and put in the city pound.

DAVID R. JONES,
Marshal.

The End of the World

should it come to-morrow would find fully 1-3 of the people suffering with rheumatism of either slight or serious nature. Nobody need suffer with rheumatism for Ballard's Snow Liniment drives away the trouble; relieves the pain instantly and leaves the user as well and supple as a two year old.

NOTICE OF SHERIFF'S SALE.

By virtue of a certain writ of execution, issued out of the District Court in and for the City and County of Denver, Colorado, and to me directed, wherein I am commanded to make the sum of $32.36 damages and $1.30 costs, with accruing costs, the amount of a certain judgment which The Mine & Smelter supply Company, plaintiff, lately recovered in said court against The Arpad Mining & Milling Company, defendant, out of the lands, tenements, goods and chattels of the said The Arpad Mining & Milling Company, I have duly levied upon the following described real estate and mining property, to-wit:

Fritz J., Paul Weiss, Emil H., Julia E., Gertrude, Irene, Arpad and Arenka, lode mining claims, all situate in the Animas Mining District, San Juan County, State of Colorado; also all the right, title and interest of said, The Arpad Mining & Milling Company, in the Sheba Lode Mining claim (U. S. Survey No. 13308) The May Lode mining claim and Rehoboam Lode Mining claim, including mill building, assay office and other buildings, situate on said premises and also the plant, machinery, tools and appliances in, on about said buildings and premises, and also all the right, title and interest of The Arpad Mining & Milling Company in that aerial tramway, consisting of towers, cables, buckets, terminal equipments, terminal machinery and other appurtenances running and extending from the North Star mine, situate on King Solomon mountain to the North Star mill, situate on the Animas river, about three miles northeasterly from the town of Silverton, together with all its right title and interest in and to all rights of way and all agreements of maintaining and operating said tramway over the lands situate on the line of said tramway, all in San Juan County, Colorado.

Now therefore, notice is hereby given that I will expose for sale at public auction, all of the right, title and interest of the above named The Arpad Mining & Milling Company in and to the above described property, on Monday, the 1st day of June, A. D. 1908, at the hour of nine o'clock a. m. on said day, at the Southerly front door of the County Court House, in the Town of Silverton, in the County of San Juan, State of Colorado.

Dated, Silverton, Colorado, this 7th day of May, A. D. 1908. WM. PALMQUIST, Sheriff.

First Pub. 5-9-08. Last Pub. 5-30-08.

Mr. Hunter's Escape From Trouble

By S. E. Kiser

By George!" said Howes Tunter, "I'm sick of this. I feel as if I never wanted to hear the words 'house' and 'rent' again. For the past three weeks you've talked nothing else. The minute I get home from the office you beat it. You have dragged me around the town on Saturday afternoons and Sundays during the past month, and whenever any of our friends have been in at night the same old subject has been thrashed over, so that, to tell the truth, Lucy, I'm nearly bughouse. I'm going out for a long walk. I want to get away from it."

"Very well, dear," his wife replied, "only be sure to get in before five o'clock, for you know Mr. Boardman is to call up then to ask whether we are going to keep the house or—"

"There it is again! Good-by. I'm off. I simply can't stand it. I've got to forget it for awhile or you'll have to get a keeper for me."

He started off, walking briskly, and had almost reached the end of the block when a man stopped him to ask:

"Do you happen to know of a good house anywhere around here that could be rented reasonably?"

"I am sorry that I do not," Hunter replied. "Seems to be a scarcity of houses of that kind this spring."

He hurried on, and was turning the corner when a young woman, fine looking and dressed in a most becoming style, met him.

"I beg your pardon," she said, "but I was told that there were some very attractive houses for rent in this vicinity. Could you tell me where to look for them? We want a house of about eight or nine rooms, thoroughly modern, that will rent for about $50 a month."

"Well," Hunter replied in his most courteous manner, "I am afraid I cannot be of much service to you in that direction. The fact is I have been looking for just such a house as you want, and have not been able to find one. I wish I knew of anything. I assure you that it would give me much pleasure to—"

"Thank you. House hunting is such a bore. I think we shall have to take a flat."

She showed no disposition to linger, and Hunter went on. He started to whistle for the purpose of forgetting about houses, and was beginning to think of other things when he met Mr. and Mrs. Benson.

"Hello, old men," said Benson. "Out house hunting? If you know of anything halfway decent, for heaven's sake tell us about it. We're about ready to take anything. I'm sick of the whole business."

"So am I," replied Hunter. "No, I don't know of a thing that you would want. I've just started out to walk around awhile for the purpose of getting the house-hunting subject out of my mind. I've been hearing nothing else for weeks. Good luck to you."

He turned off at a street which stretched away toward the edge of the town and presently a trolley car came in sight.

"I guess," he thought, "I'll ride out to where the fields begin," and when the car overtook him he got aboard. There was a vacant seat and he dropped into it, to hear the man who sat next to him say to a lady at his side:

"Now, that Farnsworth house strikes me as being about the best we can get for the money. Of course, it isn't exactly what we want, but we had better take what we can get. Houses are so scarce this spring that—"

"By George," Hunter said under his breath, "this is too much for me! Is there no chance to get away from it?"

Then he got up and went out to the rear platform. He had stood there about a minute when another man got aboard and tossed away his cigar, saying:

"I guess I'll stand outside, too. Do you happen to know of any good houses for rent out this way? I've looked about all over this town, and there doesn't seem to be a thing that fellow can get without paying two prices for it. I—"

"Excuse me," Hunter interrupted, "I'm getting off at the next corner. So I don't know of anything."

He started off toward the open fields that lay half a mile away, and as he walked for perhaps five minutes then a man who had apparently been waiting for a car turned to join him.

"Fine day," said the stranger. "Great place out here to build, isn't it? I've just been looking around, with the idea of picking out a nice spot and putting up a house on it. It seems to me this district must fill up in a few years with good houses, and I've got sick of the renting proposition. Can't get anything any more without paying twice what it's worth. I don't suppose you happen to know of any—"

But Hunter heard no more. He turned and with a wild, hunted look in his eyes, arrived at home half an hour later. Rushing into his den he poked his head out and called to his wife:

"I'm going to shut myself in here. Don't dare to disturb me! And, Lucy, for heaven's sake, if I should turn violent take me to a place where I'll receive kind treatment. Don't let me be penned up where they are likely to beat me or make me sit in cold water if I sometimes happen to seem unreasonable."—Chicago Record-Herald.

The trouble with most cough cures is that they constipate. Kennedy's Laxative cough syrup does not constipate, but on the other hand its laxative principles gently move the bowels. It is pleasant to take and it is especially recommended for children, as it tastes nearly as good as maple sugar. Sold by S. D. Cunningham.

In the school election held last Monday afternoon, Dr. Bailey, the only candidate for treasurer, received twenty-one votes, thus being re-elected for for another three-year term.

SAVORY,

clean and wholesome—moreover tender and juicy because carefully selected—are the meats which pass over our cutting blocks and counters. Watch our scales to see full weights ask our prices to get "a square deal" and taste and test our meats to appreciate the all 'round excellence of this popular meat store.

Consolidated Silverton Meat and Produce Company

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Transfer, - Baggage, - Coal.
Office at McElhaney's Barber Shop Phone 149 Silver

G. H. Malchus will soon take up his residence in the Helmboldt house which he recently purchased from C. T. Van Winkle, August Fast making the sale.

The Farmer's Wife

Is very careful about her churn. She scalds it thoroughly after using, and gives it a sun bath to sweeten it. She knows that if her churn is sour it will taint the butter that is made in it. The stomach is a churn. In the stomach and digestive and nutritive tracts are performed processes which are almost exactly like the churning of butter. Is it not apparent then that if this stomach-churn is foul it makes foul all which is put into it?

The evil of a foul stomach is not alone the bad taste in the mouth and the foul breath caused by it, but the corruption of the pure current of blood and the dissemination of disease throughout the body. Dr. Pierce's Golden Medical Discovery makes the sour and foul stomach sweet. It does for the stomach what the washing and sun bath do for the churn—absolutely removes every tainting or corrupting element. In this way it cures blotches, pimples, eruptions, scrofulous swellings, sores, or open eating ulcers and all humors or diseases arising from bad blood.

If you have bitter, nasty, foul taste in your mouth, coated tongue, foul breath, are weak and easily tired, feel depressed and despondent, have frequent headaches, dizzy attacks, gnawing or distress in stomach, constipated or irregular bowels, sour or bitter risings after eating and poor appetite, these symptoms, or any considerable number of them, indicate that you are suffering from biliousness, torpid or lazy liver with the usual accompanying indigestion, or dyspepsia and their attendant derangements.

The best agents known to medical science for the cure of the above symptoms and conditions, as attested by the writings of leading teachers and practitioners of all the several schools of medical practice, have been skillfully and harmoniously combined in Dr. Pierce's Golden Medical Discovery. That this is absolutely true will be readily proven to your satisfaction if you will but mail a postal card request to Dr. R. V. Pierce, Buffalo, N. Y., for a free copy of his booklet of extracts from the standard medical authorities, giving the names of all the ingredients entering into his world-famed medicines and showing what the most eminent medical men of the age say of them.

Our Principles

FIRST: A complete stock of the best material manufactured.

SECOND: To guarantee satisfaction.

THIRD: To have all work done by practical mechanics.

FOURTH: To charge reasonable prices.

FIFTH: To solicit inspection from the public.

SIXTH: Always to be found ready to accommodate all patrons at our own little shop on West 13th st.

Call Silver 19
Or visit our Show Rooms.

Geo. Sneer

Finney Jones
Civil Engineer
Cor. Reese and 15th,
SILVERTON, - - - COLORADO

FIRST-CLASS
Table Board
$1.00 PER DAY
AT THE
WINDSOR HOTEL
Our table is as good as money can make it. We serve the best there is in the market.
FRITZ MISFELDT, Propr.

The Palace Hotel
DURANGO, COLO.
First Door North of the Depot.
Newly furnished throughout. The best popular priced hotel in Southwestern Colorado.
Menu—Everything the market affords
Baggage handled free to and from the depot.
Under new management.
J. F. ENGLISH,
Proprietor.

BEN WRIGHT
GENERAL TRANSFER
AND
EXPRESS BUSINESS
Baggage to and from all trains. Call me up at
TELEPHONE RED 742

Dr. C. F. Keyser
DENTIST
Telephone Black 334
Office one door east of Wilkinson's Hospital, Grand Hotel Block.

HUTCHINSON & GILBERT
CONTRACTING AND BUILDING
UPHOLSTERING
Job work done on short notice.
Phone Red 865

WANTED
Two Hundred Men to unload Beer Bottles at
Ben Scherer's
UNION BOTTLING WORKS
127 W. Thirteenth St.

THE WILLIAMSON AFFNER CO.
ENGRAVERS OUR PRINTERS
CUTS TALK
DENVER, COLO.

Savoy Hotel,

When you are going out to Denver, the best place in Durango to stop over is the Savoy hotel. Everything is clean and up-to-date. The table is the best that the market affords.

PATENTS
PROCURED AND DEFENDED. Send model or drawing and description for search and free report. Free advice, how to obtain patents, trade marks, copyrights, etc. IN ALL COUNTRIES.
Business direct with Washington saves time, money and often the patent.
Patent and Infringement Practice Exclusively.
Write or come to us at
523 Ninth Street, opp. United States Patent Office,
WASHINGTON, D. C.
C. A. SNOW & CO.

Straight Whiskey Means

that the whiskey's flavor, mellowness and bouquet have not been artificially attained, but have been created by Nature's method—the good old honest Kentucky way—by aging in the wood alone. Such a whiskey is

Sunny Brook
THE PURE FOOD
Whiskey

It is all that the distiller's art knows about the producing and aging of a perfect whiskey. Every bottle is filled under supervision of U. S. Internal Revenue Officers and sealed with the Government "Green Stamp," a positive assurance of full proof—full measure and fully matured age. For Sale by all First-Class Dealers.

SUNNY BROOK DISTILLERY CO., Jefferson County, Ky.

Jno Kellenberger, Distributor
Durango, Colo

PETE ORELLA

SOLE AGENT FOR

ANHEUSER-BUSCH, LEMP'S and ZANG'S BOTTLED and KEG BEERS

Also Agent for the Original Manitou Ginger Ale and Mineral Waters.

PHONE 1-A. P. O. BOX 217. SILVERTON, COLO.

Kelly's Place

Formerly the BRANCH SALOON is now under the management of Jas. O'Kelly.

FINE LINE OF
Wines, Liquors and Cigars

THE SOUTHERN HOTEL
DURANGO, COLO.
Steam Heated Rooms Throughout. Clean and Well Ventilated. Excellent table.
First-Class Service at REASONABLE RATES
Opp. Depot. MRS. W. H. HACK, Prop

Colonist Rates to
CALIFORNIA AND THE NORTHWEST.
On Sale March 1 to April 30, 1907.
$30.00

FROM	TO
Denver	San Francisco
Colorado Springs	Los Angeles
Pueblo	San Diego
Canon City	San Jose
Leadville	Santa Barbara
Glenwood Springs	Sacramento
Aspen	Fresno
Grand Junction	Portland
Gunnison	Tacoma
Montrose	Seattle

A daily line of Pullman tourist cars will leave Denver via the Denver & Rio Grande, running through to San Francisco, Los Angeles, Portland without change.

For information regarding train service, Pullman reservations, etc., call on the Rio Grande Agent.

S. K. HOOPER, G. P. & T. A., DENVER.

The Bert Brown Market
AND LIVE STOCK COMPANY.
Wholesale and Retail Dealers in
MEATS AND PRODUCE
Beef, Pork, Mutton, Veal, Dry and Green Vegetables, Butter, Eggs, Cheese, Oysters, Salt and Fresh Fish. Game, Poultry, Pickles, Kraut, Sugar-Cured Hams and Bacon.
TRY OUR Breakfast Bacon, Kettle-Rendered Lard, Corned Beef, Pickled OWN MAKE Pork, Dry Salt, Sausages of all kinds.
We Guarantee Satisfaction
Supplying Mines a Specialty. Corner Greene and 11th Street

TOWN TOPICS

Mrs. C. N. Potts will entertain the ladies Whist club Monday afternoon.

Thursday night's train was delayed for some time by a broken rail in the vicinity of Rockwood.

The next meeting of the San Juan Woman's club will be held at the home of Mrs. Marion E. Bell.

The Ladies Union had a most delightful session Friday afternoon at the home of Mrs. Frank B. Brown.

There will be no Sabbath school at St. John's Episcopal church on Sunday, May 10th. All interested will please take notice.

Mrs. D. E. Carmichael very pleasantly entertained the ladies of the Shirt Waist club at her home yesterday afternoon.

The ladies of the Embroidery club held a very enjoyable meeting yesterday. Mrs. Ed. Holman was the hostess of the afternoon.

W. C. Pochon, manager of the San Juan Lumber Co., was confined to his bed with a bad cold for a day or two this week, but is again able to be around.

The Eagles memorial services which were to have been held last Sunday were postponed until Sunday, May 10th, on account of the threatening aspect of the weather.

The crowds at Brumfield's auction are increasing nicely. With every $1.00 purchase a ticket is given away entitling the holder to a chance in a drawing for valuable prizes.

The girls basket ball team have recently received new uniforms and they are practicing regularly in the old court room. They soon expect to arrange a match game with some outside team.

The Knights of Pythias of Silverton last Wednesday evening put through three candidates for the third rank. Hardly a Wednesday night passes by without work in some rank of this popular lodge.

We are sorry to report that Ben Harwood, one of our road overseers, is confined to his home by a very bad case of pneumonia. His condition is critical, but it is to be hoped that a change for the better will soon occur.

At the Silverton hospital this week Mrs. Chas. Gagner of Animas Forks presented her husband with a bouncing baby boy. Everybody is getting along well especially Mr. Gagner who is wearing a smile that won't come off.

We neglected to mention the fact that Hummel moved his ladies' furnishing goods store into the store building, formerly occupied by the Silverton Undertaking company. He now has one of the most attractive show rooms in the town.

Mr. and Mrs. Robert Burnell are proud of the fact that they are the proud parents of a ten pound baby girl born at the home of Mrs. Burnell's mother, Mrs. Richard Jenkins of Durango. Dr. Oschner, the attending physician says that both mother and child are doing nicely.

C. S. Casad is busy as a cranberry merchant making new delivery wagons for the local merchants. He has just finished a fine one for the Silverton Supply Co and a new one for J. M. Clifford is nearly completed. Two others will be under construction in a few days.

The Eagles are to have a ball team this year. Thursday afternoon a good sized crowd of aspirants for honors on the baseball diamond went down to the ball grounds for a try out. The team will be picked as soon as possible and the boys will begin active practice at once.

T. J. Shea and L. A. Klinger are returning pilgrims from Denver. While absent they crossed the sandy desert on the Shriners camel. They say that is a long and wearisome journey, but fully worth the price of admission. L. A. Klinger and E. V. Hollingsworth also took the consistery degrees on their recent trip.

The friends of Mr. Ben Scherer, a popular business man of Silverton, were very glad to receive this week invitations to his approaching marriage. He will on Monday, May 11th, at 3 o'clock in the afternoon be united in the holy bonds of matrimony to Miss Marie Theobald of Cincinnati, Ohio. The ceremony will be performed at St. Patrick's Catholic church by the Rev. Wm. J. O'Malley.

Dr. W. W. Blair of Dolores has sold his drug store there and purchased the drug business of the late B. A. Taft of Silverton and will take hold immediately. The doctor is a rustler and will command his share of the San Juan trade. He is an up-to-date business man.—Durango Democrat.

Eiler's King of the Cattle Ring, a five act melodrama was presented Monday night at the Pascoe Opera house to a crowded house. The action of the play was somewhat fast and furious at times, but all the members of the company rendered their parts in a very creditable manner and the general opinion of the audience was that the performance was a good one. An exceptionally fine band gave street concerts both afternoon and evening.

Dr. C. N. Potts and James Bothwell were in Durango Friday night. The Elks lodge met on that evening and fitted these gentlemen with a new pair of antlers each. Since returning home they have shown some signs of weariness. Charlie Kramer, who went down to see the doing now wears a satisfied look on his countenance. He was made an Elk only a few weeks ago and he knows now how the other fellow looks and he can probably remember how he feels.

Last Thursday morning the schools were closed for a few days until a thorough investigation of the contagion scare could be made. Several cases of scarletina have developed among the children in town. The cases generally were of such a mild nature that little attention was paid to them. The health authorities have taken all precautions to prevent a spread of the disease and they think that they now have the situation well in hand. The schools will probably again open in a few days.

The People's Church

Sunday services May 10th. Preaching 10:30 a. m. Subject: "The Opened Fountain;" 7:30 p. m.. "The Crisis of a Soul."

No Bible and Sunday School next week; service for Bible study and prayer Thursday, 7:30 p m.; Col. 3:1-17.

Card of Thanks.

We wish to extend our most sincere thanks to all of the many kind friends who so generously assisted us with their sympathy and help in the late illness and death of our beloved son, Bryce.

MR. ALVA B. PATTERSON,
MRS. ALVA B. PATTERSON.

May Day Dance

The American Order of Protection were in charge of a most delightful social dance given at Wyman's hall Monday night, May 4th. The crowd was so large at one time that the floor was too crowded for dancing, but all present had a most enjoyable evening. A delightful supper was served in the hall by the ladies. The occasion was certainly a decided success.

Leg Broken.

Last Monday evening John Colussi was brought down from the Silver Lake mine suffering with a broken leg. He was engaged tearing out an old ore chute in the mine. In his work he was standing upon a stall which was not firmly anchored to its moorings, it gave way, precipitating him a distance of twenty-five feet and breaking his leg just below the hip bone. The fracture, with some difficulty, was given surgical attention and the injured man is now getting along nicely.

School Notes.

During next week it was expected to have an exhibit of pupils work in the various rooms. While it is expected that the regular classes will continue as usual some of the written work will be so placed as to be readily inspected. Parents and patrons interested in the progress of the children should visit the school some time during the week.

The School City election of officers for the remainder of the school year resulted as follows:

Mayor, Joe Dresback; judge, Matt Moyle; city attorney, Clifford Montgomery; chief of police, Thos Higgins; treasurer, Helen Bertram. The aldermen elected were: Eighth ward, Lawrence Watson, Clifford Montgomery; Seventh ward, Helen Lear, Eunice Bothwell; Sixth ward, Joe Bausman, Wesley Moyle; Fifth ward, Cyril Newton; Fourth ward, Edith Brown; Third ward, George Landry; Second ward, Montford Moyle; First ward, Ruth McCrimmon.

PERSONAL

W. N. Searcy was a business visitor in Durango this week.

John Wingate of Durango was a Silverton visitor for a few days this week.

J. P. Clougher returned this week after several months spent in the Grand valley.

Mrs. Sam. Wittow and child returned yesterday from New York City, where they have been visiting for several months.

Mr. E. D. De Soto of the law firm of De Soto and Morrison of Denver, was a Silverton visitor for a few days this week.

Mrs. Laura M. Stoiber of Denver came in for a short visit the first of the week, returning to her home Thursday morning.

Mrs. L. G. Prosser is now visiting her daughters, Winnifred, Ruth and Clara Bell, who are attending school in Denver.

The many friends of Isaac Mather, attorney, are glad to see him return after a winter spent in Grand Junction and vicinity.

F. O. Sherwood is a late arrival from Illinois where he has been for several weeks visiting his old home and transacting business.

Mrs. C. H. H. Kramer who has been visiting in Durango for some time brought Charlie home Thursday morning after the session of the Elks.

Filmore Hand came in the first of the week from Hermosa intending to abide with the Silverton people during the most of the summer season.

Arthur Robin, formerly a prominent business man of Silverton, arrived here this week from Oakland, Cali., and will probably make this camp his home in the future.

B. B. Russell returned this week from Durango. He was busy receiving the congratulation of his many friends on account of his signal victory in the Mason-Vanderweide trial.

Mr. D. E. Carmichael, who was a delegate to the state Republican convention at Pueblo and has since been visiting with relatives in Denver, returned home Friday night.

Saturday, today, Miss Anna Castonguay left for Denver to attend a convention of the chief operators in the telephone service in the states of Colorado and New Mexico.

J. R. Pitcher, of the Silverton Northern and Silverton Railroad companies, is in town for a few days from Denver. In a short time he will bring his family in for the summer.

St. John's Church.

Third Sunday after Easter, Sunday school and Bible class 10 a. m. Morning prayer and sermon 11 o'clock. Evening prayer and sermon 7:30.

The Rev. W. H. Doggett, rector of St. Mark's church, Durango, will preach at both of the services.

Choir practice Saturday 8 p. m.

St. Margaret's guild will meet with Miss Lola Selleck Saturday afternoon at 2 o'clock.

Skating Rink.

The colored set of moving pictures shown last Sunday and Monday evenings at the rink were the finest we have ever seen anywhere. The subject was "Ali Baba and the Forty Thieves.". The management expect to put on several more of these magnificent sets of colored views from time to time. There are none finer shown.

Merry crowds of skaters still continue to attend the rink nightly. The floor is in splendid condition and everything conduce to an evening of perfect pleasure. It is certainly the most popular place of amusement in the town.

Mr. John Riba of Vining, Ia., says, "I have been selling DeWitt's Kidney and Bladder Pills for about a year and they give better satisfaction than any pill I ever sold. There are a dozen people here who have used them and they give perfect satisfaction in every case, I have used them myself with fine results." Sold by S. D Cunningham.

Ball Game

It snowed last Sunday. That was fortunate for some one. The Bell boarding house team was to have gone against Roger's boarding house team for blood. Tomorrow, May 10th, at 2 p. m., the affray will begin at the baseball ground, providence and weather indications permitting. The following is the line up:

Bell B. H. vs. Rodger's B. H.

Bell B. H.	Rodger's B. H.
Jackson, p	J. Evans, p
May, c	A. McCoy, c
Huber, 1st B	T. Evans, 1st B
Crum, 2nd B	E. Grimes, 2nd B
Damschroeder, 3rd B	Linn, 3rd B
Martinez, S. S.	Batchelor, S. S
Lewis, C. F	Weigel, C. F
Koehler, R. F	L. McCoy, R. F
Wright, L. F [illegible]	[illegible], L F

Adverised Letter List,

Following letters remain uncalled for in the Silverton, Colo., postoffice for the week ending Friday, May 8, 1908. Persons calling for any following letters please say "Advertised."

Clark, Mary E
Jennings, Z C
Lindquist, A L
Mitchell, John
Mullen, Michael
Meyers, E R
Patton, Clarence
Preston, Mrs E C
Pastor, M E church (2)
Scott, Harry
Sweazey, Andy

FOREIGN.

Enrico, Roner
William, Ronald Wilson
Arthur, Hilli
Giovanni, Bortolotti
Fortunato, Gasperi
Jomenico, Lorenzi
Andy, Fecyche

A. M. REED,
Postmaster.

BUSINESS LOCALS.

New Shoes and Oxfords at McCrimmon's.

The new tailor made shirt waists from 1.25 up at McCrimmon's. 23tf

FOR SALE—Sewing machine, Phone 764 red.

Now is the time to see Frank Ceely about your wall paper cleaning. He is the boss. 25 6t-p

16 button length silk gloves, double tip finger $1.50 at McCrimmon's.

"Hardknocks" boys extra heavy hose, 25 cents a pair at McCrimmon's.

Furnished rooms with bath for rent at 1338 Reese street. 18 tf-c

For sale cheap—A good range. Enquire at Standard office.

New shipment of beautifully tailored suits just opened up at Hummel's new stand opposite postoffice. 25 1t

FOR RENT—House with range. Mrs. L. G. Prosser. 46 tf c

FOR SALE—Six hole range. Call at New Windsor hotel. 22-tf c

FOR SALE—Residence and three lots, 7th and Reese streets.
B. B. ALLEN.

FOR SALE OR RENT — Two pianos; one new; the other, second hand. Call on T. J. Shea. 22 tf-c

FOR RENT—Furnished room with bath, three blocks from Grand hotel. Enquire at Standard office.

Mrs. W. E. Larkin, teacher of vocal and instrumental music, studio, corner Reese and 12th streets. Visitors are cordially welcome. 17-p-tf

You are invited to visit us in our new location and inspect our goods. Lots of new things to show you. J. C. Hummel. 25 1t

Those wash waists and suits and Ecru net waists at Hummel's are scringers and you can't beat the price by sending to Montwardery-gums or to Rears, Sawbick & Co.

FOR SALE—At $35 an acre; 160 acres of land on Pine River, 4 room house, all machinery, good well water, good water right; 65 acres in cultivation, 35 in alfalfa. Address L. B. Self, Bayfield, Colo. 21 tf

Agents Wanted—16x20 crayon portraits 40 cents, frames 10 cents and up, sheet pictures one cent each. You can make 40 per cent profit or $36.00 per week. Catalogue and samples free. Frank W. Williams Company, 1208 W. Taylor St., Chicago, Ill.

Subscribers of the Denver Times and Sunday News in Silverton, who get their papers by mail can, by addressing the undersigned, have them delivered by carrier.
CHAS. L. VALITON, Times Agent.
Box 297, Silverton, Colo. 24-2t-p

A fine graphaphone with 26 records will be raffled by Mrs. C. Gratton. The sealed number which will draw the machine has been left at the Miner office and will not be opened until all the numbers are sold. One hundred numbers running from one cent to one dollar will be sold in sealed envelops. 25-1t p

When it comes to first-class barbershops, it is an acknowledged fact that McElhaney Brothers have the most up-to-date and best tonsorial establishment in Silverton To our equipment, which is of the very best, we have lately added the famous electric massage vibrator, and only top-notch workmen are employed. No slip-shod work done in this shop. Our baths are the finest in the city. Don't forget the place, Benson block, Greene street, opposite Grand hotel.

SEND US YOUR GOLD

Prompt returns made on Placer Gold, Gold Retorts, Amalgam, Rich Ores, Cyanide Precipitates and all kinds of Gold and Silver clean ups.

RELIABLE ASSAYS

Gold	75cts	Gold and Silver	$1.00
Lead	75cts	Gold, Silver, Copper	1.50

OGDEN ASSAY CO. 1536 Court Place, DENVER, COLO.

STOP PAYING RENT
SAVE YOUR MONEY
BUY A HOME

DON'T let your savings go for worthless pieces of paper in the form of rent receipts. Our plan will enable you to own and equip a lovely home for your wife and children by using your rent money to build your home.

$6.00 PER MONTH
WILL START YOU
AGENTS WANTED
THE COLORADO CONTRACT INVESTMENT COMPANY
405 Quincy Bldg., Denver, Colo.

Please Send Me Information
Name..............
Street..............
Town..............
State..............

Jas. McNamara
THE GROCER
CORNER OF TENTH AND GREENE STREETS

Potatoes, the best in town
La Jara Eggs and Butter
Prices right on everything

Telephone Red 1094

PHOTOGRAPHS

Our Gallery is fully equipped. Our pictures will stand comparison with the work of the best artists in our large cities. We guarantee perfect satisfaction.

BRUMFIELD, Photographer.

Root & Norton
Assayers and Chemists
Successors to C. A. Cooper

Gold or Silver	$ .75
Both	1.00
Copper	.75
Lead	.75

Price List on Application

THE
OXFORD BOTTLING WORKS
AND COOR'S BEER DEPOT

BEER HALL

Delicious Dutch Lunches a Specialty.

The Place where Coor's Golden Beer is properly bottled and served in first-class style

H. W. POLLMAN, PROPRIETOR.

PLUMBING Steam Fitting
J. I. FRASER
1128 Greene St. Phone Black 323
Fine Line of Supplies

FRANK L. ROSS
Attorney-at-Law
Office in Benson Block.

For Presidential Year

You want the best daily newspaper you can get.
You want a newspaper that not only gives you all the news but gives it honestly.
Remember, the Democratic National Convention will be held in Denver,
Therefore fill out the following coupon and send as directed:

.... 1908

THE NEWS-TIMES PUBLISHING CO., Denver, Colo.

Send me { THE ROCKY MOUNTAIN NEWS (Morning and Sunday) or THE DENVER TIMES (Evening and Sunday) }

Name ....

Address........................

Mark the paper you wish sent.

JAMES DYSON
Civil and Mining Engineer
U. S. Deputy Mineral Surveyor.
1437-1447 Reese street, near the county offices. P. O. Box 33.

J. S. BAILY
DENTIST.
Phone Red 812.
SILVERTON, - - COLO

MERCHANTS' CAFE
We handle the
Best Meats
In Silverton
Everything the market affords. Courteous treatment.
J. P. Downey
Proprietor

GRAY'S
Waterproof Oil
For all Kinds of
Leather, Boots and Shoes
John B. Gray
Sole Owner and Manufacturer
MONTROSE - - - COLORADO

The Royal
Is Silverton's standard Restaurant. We have the best cooks. We buy the best meats. We have the best service. This
Restaurant
Supplies a long-felt want. Try our 35c Mid-Day Luncheon.
Short Orders All Hours.
W. K. BRADEN, Prop.

134 Thirteenth St.
CHARLES MORRIS
PAINTERS DECORATORS AND PAPER HANGERS
Carry the most complete line of WALL PAPER ever brought to Silverton — all grades and prices. We are now prepared to do all kinds of work in our line. All work guaranteed.

JULIAN T. PIERSON
ASSAYER
UPPER GREENE STREET.

GLEANING AND DYEING
Branch of Mrs. C. J. Lollinger's establishment of Durango, Colo
CLEANING, PRESSING, DYEING AND REPAIRING
First-class work. We solicit your patronage. Give us a trial.
TWELFTH AND REESE STS

NEW YORK HOUSE
775 2nd Ave., Durango, Colo.
Nice Furnished Rooms. Quite location,

KENNEDY'S LAXATIVE COUGH SYRUP
Mothers endorse it — Children like it — Tastes so good
E. C. DeWITT & CO. CHICAGO
Nearly all other cough cures are constipating, especially those containing Opiates. Kennedy's Laxative Cough Syrup moves the bowels, contains no Opiates.
For Sale by S. D. Cunningham, Druggist

...SHELF AND HEAVY...

HARDWARE

Stoves, Tinware, Crockery, Miners' Supplies, Belting, Packing, Steam and Garden Hose, Pipe and Steam Fittings, Powder, Caps, Fuse Agent for Hercules and Giant Powder. : :

JOSEPH BORDELEAU

WHOLESALE AND RETAIL DEALER.

Jack Cole's Store

Complete Stock of

General Merchandise Groceries, Cigars, Tobacco, Miners' Supplies, Boots, Shoes & Confectionery.

Eureka = = = Colorado

Telephone Silver 18-5

Independent Meat Market

Your Pocketbook Need Not Shrink

at the sight of thousands of pounds of splendid meats ready daily for your looking over here. It has been proven time after time that the selling prices we name are moderate when the kind of meat is considered. If we get your orders you will save money.

C. H. H. KRAMER. Wholesale & Retail Butcher

PATTERSON BROTHERS LIVERY

THE PICK OF THE MINES

Is the Fuel we offer the people of Silverton. Experience has taught us that to sell the best we must buy the best, and the product is here to be seen by your critical eye. Question is: Will you see our Coal?

Hesperus Coal

GROCERIES

A complete line of Fresh Fruits and Vegetables to select from. : : : : :

O. L. LESLIE,

1051 Greene St. Phone 52.

DALE FOUNDRY Planing Mill and Machine Shop. : : : :

Complete throughout. Equipped for all kinds of casting and repairing. All Brass, Copper, Bronze, Bell Metal and Aluminum Castings.

CHAS. DALE, Prop.

Corner Tenth and Mineral Sts., Silverton, Colo.

ASSESSOR'S NOTICE

All taxpayers are especially reminded that May 20th is the last day for returning schedules for the year 1908.

25-2tc THOS. COLMER, Assessor.

Bryce Patterson

Bryce Patterson, the son of Mr. and Mrs. Alva Patterson, died Monday night, April 4, 1908, aged two years and two months. The funeral occurred from the home on Wednesday afternoon.

This is the record in a few brief, cold words of a great light gone from a happy home. Only yesterday the proud parents listened to the patter of tiny feet and heard with joy the happy laughter of innocent childhood. There came to their ears the lisping accents of a baby's prattle. Soft, little hands caressed the mother's cheek and how tenderly the father greeted his boy with a home coming kiss. Today the house is silent. The joy of the home is gone. Memory calls him back again and again. The little shoes, with the stubbed out toes are put away and with them the broken toys that were used to so delight the childish heart. In years to come the mother will get them out and the tears will come to her eyes as she thinks of her first born gone away.

A loved American poet has compared the childeren to flowers. The figure seems a striking one. We gaze on the beautiful blossoms, we enjoy their fragrance and lovliness and in a few short hours they are gone. Nothing remains but memory.

It seems especially sad to see the happy vigorous child just entering the threshold of life and beginning to grasp with his little mind some of its most common mysteries—it seems sad that he should be called so soon but the ways of Providence are past finding out. It may be the best to go before the foul breath of sin and error has soiled the fair tablet of the soul. Life is full of heartache and suffering and many falter under their heavy burden before they reach the end of the way.

The little boy is gone while life is fresh and fair. The parent's hearts are saddened but we believe that their sorrow will make their lives purer and better. In this community all sorrow with them in their hour of grief

Boys Will Be Boys

and are always getting scratches, cuts, sprains, bruises, bumps burns or scalds. Don't neglect such things—they may result seriously if you do. Apply Ballard's Snow Liniment according to directions right away and it will relieve the pain and heal the trouble. Price 25c, 50c and $1 00.

The Rural Schools

After the Pilgrim fathers had landed in 1620, the very first act of the English Colonists was to establish a high school, but these were for very few people. In 1636 Harvard was founded, and soon after that Yale and Princton. About one hundred and fifty or sixty years after that, Thomas Jefferson, who was the father of the country school system; Washington the great promoter, and Alexander Hamilton the great teacher, gave time and thought to this cause, and made it possible for education to reach the masses of the people. Washington said "Lay broad and deep then, the foundation of the general diffusion of knowledge," The old method of teaching is pretty nearly eliminated. The education of today has come to our homes through the rural schools, Much of the best work is done in rural schools. Very often, the rural school children do not go to high school or to college, therefore, we must give our rural school children every advantage.

I believe that the country schools are doing a great work, but we must add domestic science and agriculture, Good results will come then through the little school house in the country and it will bring sunshine, prosperity and good citizenship into the future homes of these children.

MARY F. RAUSCH,
Professor of Domestic Science, Colorado Agricultural College, Fort Collins.

A great many people imagine they have heart trouble when the fact is that the whole trouble lies in the stomach. The pains in the side around the region of the heart are not necessarily heart trouble. We suggest that you start with the stomach and whenever you feel a depression after eating or whenever your food seems to nauseate take Kodol. It will not be very long until all these "heart pains" will disappear. Take Kodol now and until you know you are right again. There isn't any doubt about what it will do and you will find the truth of this statement verified after you have used Kodol for a few weeks. It is sold here by S. D. Cunningham.

SURVEYS APPROVED

Mineral surveys approved by U. S. Surveyor General for Colorado, during month ending April 30, 1908.

SUR. No.	LAND DIST.	NAME OF CLAIM
18258	Leadville	Elston
18519	Durango	Susie, et al.
18524	Denver	Gold Leaf, et al.
18525	Leadville	T. V., et al,
18526	Montrose	Waverly
18530-A & B	Denver	Dorothy, et al.
18531	Leadville	Hope, et al.
13143	Pueblo	Stocklinch
18320	Durango	Idaho milisite
18515	Durango	Atlantic No. 3
18546	Durango	Ragged Rube
18519	Denver	St Elmo, et al.
18514	Durango	Incas No. 1, et al.
18540	Durango	Golden Egg, et al.
18547	Denver	Salvator
18550	Montrose	Boston No. 2, et al.
18548	Denver	Old Glory, et al.
AMENDED WORK APPROVED G. L. O.		
17930—Am.	Denver	Gabriel
ADDITIONAL WORK APPROVED G. L. O.		
18149	Denver	Chicago
13321	Pueblo	Dora G.

Christian Science Society

Services are held each Sunday at 11 a. m.; and Wednesday at 7:30 p. m.; 1244 Reese street.

The reading room of the society, same address, is open to the public every afternoon from 1 to 5. Everybody is invited to attend the services or visit the reading room, where one of the ladies of the society will be present each afternoon to extend a cordial welcome. Christian Science literature can be bought or ordered at the reading room.

Firemen's Band Ball.

The Firemen's Band will give another of their enjoyable dances at the Miners' Union Hall on Thursday evening, May 21st. The special feature about these dances is the superb quality of the music. The music was the finest ever heard in Silverton, but the boys promise that the music on May 21st will be even better than it ever has been.

Mine for Sale.

Good prospect on Kendal mountain for $350 cash. All assessments done. Good timber.

PETER ANHEIR, Durango, Colo.

25-1tc

How's This?

We offer One Hundred Dollars Reward for any case of Catarrh that cannot be cured by Hall's Catarrh Cure.

F. J. CHENEY & Co., Toledo, O.

We, the undersigned, have known F. J. Cheney for the last 15 years, and believe him perfectly honorable in all business transaction and financially able to carry out any obligations made by his firm.

WALDING, KINNAN & MARVIN,
Wholesale Druggists, Toledo, O.

Hall's Catarrh Cure is taking internally, acting directly upon the blood and mucous surfaces of the system. Testimonials sent free. Price 75 cents per bottle. Sold by all druggists.

Take Hall's Family Pills for constipation.

TREASURER'S NOTICE ON REQUEST FOR TAX DEED.

To every person in actual possession or occupancy of the hereinafter described land, lot or premises, and to the person in whose name the same was taxed or specially assessed, and to all persons having an interest or title of record in or to the same.

Notice is hereby given that on the 5th day of November A. D. 1903, the following described property, situate in the County of San Juan and State of Colorado, to-wit: The Mineral King lode mining claim U. S. survey No. 2051 was sold for the taxes for the year 1902, and purchased by San Juan County.

That the said San Juan County has duly assigned the certificate of purchase issued on account of such purchase to E. C. Drew, who hath made request upon the Treasurer of said County for a deed.

That the said premises were taxed for said year 1902 in the name of Owners unknown by the assessor,

That the time of redemption of said real estate from such tax sale will expire on the 15th day of August A. D. 1908, and unless redeemed on or before said day a deed will be issued thereto.

Dated this 22nd day of April A. D. 1908.

(SEAL) THOS. ANNEAR,
Treasurer of the said County of San Juan.

NOTICE OF FORFEITURE.

SILVERTON, Colo., April 25, 1908.

To George Carlow, deceased his heirs and assigns:

You are hereby notified that I, the undersigned, have expended during the year 1907, one hundred dollars, ($100) in labor and improvements upon each of the following lode mining claims, to-wit: The Minnie S. Lode, The Fisher lode, The Osage lode, The Ontario lode and The Little Colorado lode all situate in the Eureka Mining District, San Juan county, State of Colorado, the location certificates whereof are recorded in the office of the county clerk and recorder of said San Juan county in Book 121 at pages 593, 591, 595 and 597 and in Book 128 at page 541 respectively. In order to hold said claims under the provisions of section 2324, of the Revised Statutes of the United States, and the amendments thereto, approved January 22, 1880, concerning annual labor upon mining claims, being the amount required to hold said lodes for the period ending on the 31st day of December, A. D. 1907. And if, within ninety days from the personal service of this notice, or within ninety days after the publication thereof, you fail or refuse to contribute your proportion of such expenditure as a co-owner, your interest in the claims will become the property of the subscribers, your co-owners, who have made the required expenditure, by the terms of said section. W. A. TRIPLETT.

First pub 2-29-08 Last 7-25-08.

"Correct English—How to Use it

A Monthly Magazine Devoted to the use of English

JOSEPHINE TURK BAKER, Editor.

Partial Contents.

Queries and Answers.
The Art of Conversation.
Shall and Will: Should and Would: How to Use them.
Pronounciations (Century Dictionary).
Correct English in the Home.
Correct English in the School
What to Say and What Not to Say.
Course in Grammar.
Course in Letter Witting and Punctuation.
Business English for the Business Man.
Compound Words: How to Write them.
Studies in English Literature.

AGENTS WANTED

$1 a year. Send 10 cents for sample copy.

CORRECT ENGLISH, Evanton, Ill.

NOTICE OF ADJUSTMENT DAY.

Estate of Thomas Coleman deceased.

The undersigned, having been appointed administrator of the estate of Thomas Coleman late of the County of San Juan, in the State of Colorado, deceased, hereby gives notice that he will appear before the County Court of said San Juan County, at the Court House in Silverton, in said County, on Monday, the 18th day of May, A. D. 1908, at the hour of 10 o'clock a. m. of said day, at which time all persons having claims against said estate are notified and requested to attend for the purpose of having the same adjusted. All persons indebted to said estate are requested to make immediate payment to the undersigned.

Dated at Silverton, Colorado, this 14th day of May, A. D. 1908.

DANIEL SHEAHAN
Administrator of the estate of Thmas Coleman, deceased.

First Pub. April 18. Last Pub. May 9th, 08

NOTICE OF FORFEITURE

To Pat Beecher, his heirs and assigns; Mrs. Con Callahan, her heirs and assigns; the heirs and assigns of Con Callahan, deceased:

You are hereby notified that the undersigned have expended one hundred dollars in labor and improvements during each of the years 1900, 1901, 1902, 1903, 1904, 1905, 1906 and 1907 upon each of the following lode mining claims, to-wit: Bob Tail and Ben Franklin lodes situated in Animas Mining District, San Juan county, Colorado, the location certificates of which claims are of record in the office of the Clerk and Recorder of said county, in Book 99 pages 68 and 69 respectively, in order to hold said claims under the provisions of section 2324 of the revised statutes of the United States and the amendment thereto approved January 22, 1880, concerning annual labor upon mining claims, being the amount required to hold said lode claims for the period ending on the 31st day of December, A. D. 1907. And you are notified that if within ninety days after the publication of this notice, you fail or refuse to contribute your porportion of said expenditure as a co-owner and pay the costs of this advertisement, your interest in said above named claims will become the property of the undersigned your co-owners who have made the required expenditure by the terms of said section.

WM. LONERGAN,
MRS. KATE BROWN.

First Pub 3-21-08 Last Pub 6-20-08

NOTICE OF FORFEITURE.

To Pat Beecher, his heirs and assigns.

You are hereby notified that the undersigned have expended one hundred dollars in labor and improvements during each of the years, 1900, 1901, 1902, 1903, 1904, 1905, 1906 and 1907, the following lode mining claim, to-wit: The Cincinnati lode situated in the Animas Mining District, San Juan County, Colorado, the location certificate of which claim is of record in the office of the Clerk and Recorder of said county in Book 86, page 482, and in order to hold said claim under the provisions of section 2324 of the revised statutes of the United States and the amendment thereto, approved January 22, 1880, concerning annual labor upon mining claims, being the amount required to hold said lode claims for the period ending on the 31st day of December A. D. 1907. And you are notified that if within ninety days after the publication of this notice, you fail or refuse to contribute your proportion of said expenditure as co-owner and also pay the costs of this advertisement, your interest in said above named claim will become the property of the undersigned your co-owners who have made the required expenditure according to said section.

WM. LONERGAN,
MRS. KATE BROWN.

First Pub March 21, 08. Last Pub June 20, 08

NOTICE OF SALE.

Notice is hereby given that under and by virtue of a certain execution issued on the 8th day of April, 1908, out of the District Court of San Juan County, Colorado, upon a judgment therein rendered and recovered on the 6th day of April, 1908, in favor of Joseph A. Smith and against The Delayed Mining and Milling Company, a corporation, and to me directed and whereby I am commanded to make out of the lands, tenements, goods and chattels of said defendant the sum of $3,116.00 damages and $15.75 costs, being the amount of said judgment together with interest thereon at eight per cent per annum from the date of rendition of said judgment, I have levied upon all right, title and interest of the said defendant, The Delayed Mining and Milling Company, a corporation, in and to the following described property, to-wit: The following named and described lode mining claims, all situated at Coal Bank Hill, in Animas Mining District, San Juan County, Colorado, to-wit: The Delayed, Delayed No. 6, Delayed No. 2, Delayed No. 4, Delayed No. 8, Giant, Delayed No. 8, Delayed No. 10, Delayed No. 3, Delayed No. 7, and Delayed No. 9 lode mining claims, and the amended and additional location certificates of which are of record in the office of the County Clerk and Recorder of said County in Book 92-A at pages numbered 110 to 120, inclusive, respectively; and also the Fraction lode mining claim, the location certificate of which is recorded in said office in Book 124 at page 616; and also the Giant No. 2 lode mining claim; and also all buildings, machinery, fixtures and improvements upon said properties situated. Therefore notice is hereby given that under and by virtue of said execution I will on the 21st day of May, 1908, at the hour of ten o'clock in the forenoon, at the east front door of the County Court House in Silverton, San Juan County, Colorado, expose for sale and sell at public auction to the highest and best bidder for cash all of said above described property, or so much thereof as may be necessary in order to make the amount of said judgment, costs and interest and the costs and expenses of such sale.

Dated and given at Silverton, Colorado, this 22nd day of April, 1908.

WILLIAM PALMQUIST,
Sheriff of San Juan County.

NOTICE OF FORFEITURE

To the heirs, assigns, executors and administrators of John A. Harris, excepting A. L. Harris, Pauline H. Moore, Fannie A. Clark, Josephine Lippencott, Kate Harris, and Lucy Waddell and their heirs, assigns, executors and administrators, and excepting also the undersigned Mrs. M. C. Richards:

You and each of you are hereby notified that the said A. L. Harris, Pauline H. Moore, Fannie A. Clark, Josephine Lippencott, Kate Harris and Lucy Waddell, and their heirs and assigns, together with the undersigned, have contributed in expending, during the year 1907, one hundred dollars in labor and improvements upon each of the following described lode mining claims situate in the Red Mountain Mining district in San Juan County, Colorado, to-wit: the Brooklyn and the Brooklyn Extension, the location certificates of which are recorded respectively in Book 77 on Pages 471 and 482 of the records in the office of the Clerk and Recorder of San Juan County, Colorado;

And that Paul Walker and the said A. L. Harris, Pauline H. Moore, Fannie A. Clark, Josephine Lippencott, Kate Harris, and Lucy Waddell and their heirs and assigns, together with the undersigned, have contributed in expending during the year 1907, one hundred dollars in labor and improvements upon each of the following described lode mining claims, situate in said mining district, County and State, to-wit: the Georgia Gulch and the Georgia Gulch Ext., the location certificates of which are recorded respectively in Book 60 on page 351 and Book 80 on page 121 of said records;

And that the said Paul Walker and the said A. L. Harris, his heirs and assigns, together with the undersigned, have expended during the year 1907, one hundred dollars in labor and improvements upon the St. Louis lode mining claim, situate in said mining district, County and State, the location certificate of which is recorded in Book 111 on page 310 of said records;

And that the said A. L. Harris and his heirs and assigns, together with the undersigned, have expended during the year 1907, one hundred dollars in labor and improvements upon the Bellevue lode mining claim, situate in said mining district, County and State, the location certificate of which is recorded in Book 60 on page 355 of said records;

And that of the money so expended during said year upon each of the six above mentioned lode mining claims, the repective persons, (other that the undersigned) above mentioned as contributors to the above expenditure upon each of said respective claims have, together, during said year, expended upon each of said respective claims only that portion of the said sum of one hundred hundred dollars which the combined interest of said contributors (other than the undersigned) in each of said respective claims bears to the whole of each of said claims respectively; and that, during said year, the undersigned has expended upon each of said claims sufficient to bring the total expenditure thereon to said sum of one hundred dollars;

And that said expenditures were made in order to hold said lode mining claims under the provisions of section 2324 of the Revised Statutes of the United States, and the amendment thereto approved January 22, 1880, concerning annual labor upon mining claims, being the amount required to hold each of said lode mining claims for the period ending the 31st day of December, 1907.

And if, within ninety days from the personal service of this notice, or within ninety days after the publication thereof, you fail or refuse to contribute your proportion of such expenditure as a co-owner your interest in each of said claims will become the property of the subscriber, your co-owner, who has made the required expenditure as hereinabove set forth by the terms of said section.

MRS. M. C. RICHARDS.

First Pub Feb 29, 08. Last Pub May 30, '0

Insist upon DeWitt's Witch Hazel Salve. There are substitutes, but there is only one original. It is healing, soothing and cooling and is is especially good for piles. Sold by S. D. Cunningham.

TO LIVE YOU MUST

EAT

To enjoy life you must have good things to eat, and to get the best in staple and fancy

Groceries, Fruits, Pastry

You must go to Clifford, the grocer. Our groceries are of the highest grade and insure the excellence of your meals. Our fruits are always fresh and we carry the best Bread, Cakes, Pies and Fancy Pastry in the city. Call and see us.

J. M. Clifford Phone Silver 1

Who Supplies Your Table

With groceries, staple and fancy? Are you satisfied in every respect? If so this is not meant for you; otherwise we request ever so little a share of your trade until you have judged our goods and our merchandizing methods. Surely that's fair.

The Silverton Supply Co.

DIAMONDS

AND WHY NOT?

It's the best investment you can make in the jewelry line. You get the most for your money. You get pn article that does not deteriorate and one that increases in value the longer you keep it

We Want to Convince You

That our Assortment of Stones for Quality and Price Cannot be Beat. We do not Fear Denver Prices nor Catalogue House Prices . . . .

Call and examine them. Put them under the magnifying glass. Compare them for color and last, but not least, COMPARE THEM FOR PRICE

CUNNINGHAM & CROCKER,

THE WATCH DEALERS OF SAN JUAN.

CRYSTAL ICE CRYSTAL ICE

DRINK

SUPERIOR PLACE

Silverton Brewery

CHARLES FADEN, Proprietor

BREWERS AND BOTTLERS. Patronize Home Industry

Would You Throw Away $1,000?

The man who could save and bank $5 per month and does not do it is throwing away $60 per year—the gross earning power of $1,000 at 6 per cent. interest.

Safe investments which annually pay 6 per cent. net are not so plentiful as they used to be.

Why not start an account with us and conserve this "$1,000 earning?" You can open an account with a $50 deposit, or even less. Come in and let us talk over the matter.

The Silverton National Bank

Guy L. V. Emerson, Cashier

L. G. PROSSER

OUR line of Springs, Mattresses, Comforts and Blankets will convince you that this is the place to buy your bedding. Also everything in House and Office Furnishings.

FURNITURE AND UNDERTAKER

MINERS' UNION BUILDING

Cor. Reese & Eleventh Streets

W. C. Ferrill curator Nat. History society

SILVERTON STANDARD

VOLUME XX — SILVERTON, COLORADO, SATURDAY, SEPTEMBER 19, 1908. — No. 44

MINE AND MILL SUPPLIES

Agents for Repauno Gelatin Powder.
Z. L. German Fuse and Canton Drill Steel,

SHELF AND HEAVYHARDWARE

Electrical Supplies and Ho se Wiring.

We carry in stock Queensware, Paints, Oils, Window Glass, Guns and Ammunition, Kodaks and Photographic Supplies

THE CROOKE-FULLER HDW. CO.

COAL!

LUMBER, LIME, LATH AND SHINGLES

WHEN YOU NEED ANYTHING IN THE LINE OF BUILDING MATERIAL GO TO

FRED. GOBLE

Phone Silver 93. Near Depot

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THE GROCER

CORNER OF TENTH AND GREENE STREETS

Potatoes, the best in town
La Jara Eggs and Butter
Prices right on everything

Telephone Red 1094

Buy from the

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and get the best

LUMBER, COAL FEED

Phon Silver 12. — Silverton, Colorado

Call us up at Once

If unexpected company finds you short of Bread. Rolls or Cake. We'll send what you need in that line with satisfactory promptness. o o o o o o o o o

WHAT YOU GET FROM THIS BAKERY

will equal if it does not excel anything you could bake yourself too. When your guests ask for a little more bread or a slice more cake you'll begin to realize what a waste of effort it is to do your own baking when we do it so well for you. o o

J. M. Clifford — Telephone Silver One.

L. G. PROSSER

OUR line of Springs, Mattresses, Comforts and Blankets will convince you that this is the place to buy your bedding. Also everything in House and Office Furnishings.

FURNITURE AND UNDERTAKER

MINERS' UNION BUILDING

Cor. Reese & Eleventh Streets

A Visit to the Gold King

This week your correspondent boarded the train at the Gladstone depot and in less than an hour was on the property of the Gold King Mining company, from every point of view one of the most valuable mining properties in the State of Colorado. We found a hive of industry. At the mill in Gladstone the workmen were busy getting everything ready for the reopening of that magnificent plant, which will occur in a little more than a week from now. New plates are being put in under all the stamps and the tables are being thoroughly overhauled. Everything in the mill is being put in the best of condition. In our last issue, under a mistaken impression, we stated that the Contention mill, in its test run, was the only one in the county in which a system of spigot classification was used. We find upon investigation that such a system has been in very successful operation in the Gold King mill for more than two years past. This mill will soon have eighty stamps and thirty-two tables in operation and will handle three hundred tons or more of ore daily, sending down to the smelter at Durango an average of three carloads of exceptionally high grade concentrates every day. The product of the plates will be probably more in value than the concentrates

At the mine, the work is going ahead as fast as it is practical to push it. Everything is being done with the object in view of starting work on the property as soon as possible. Improvements which can be deferred will be made after the opening. In a few days work will be started on the new mine boarding house. The tram is now in perfect working condition, all the repairs upon it having been completed more than a week ago.

September 20th is the date set for the Gold King to again resume active operations on all parts of its great property and from the present progress it looks as if that date was well chosen.

San Juan county and Silverton indeed rejoice that one of the richest gold mines of the country is again about ready to send forth into the channels of trade her rich golden treasures.

For Lieutenant Governor

The Journal congratulates its townsman, Hon. S. R. Fitzgarrald upon his success in landing the nomination for lieutenant governor, upon one of the strongest tickets the Democratic party of Colorado has ever presented to the voters. It also congratulates the convention upon the wisdom and excellence of its choice.

With an intimate acquaintance with the nominee, extending over a quarter of a century, the Journal can without reservation commend him as the soul of honor. The wealth of Rockefeller—no conceivable consideration — could tempt Steve Fitzgarrald to commit, what appeared a dishonorable act or to compromise and play false with a friend. Intensely Democratic in politics, active along this line locally and in state politics for twenty-five years, no one can cite to an instance, where he has ever been recreant to a trust or has been a party to any questionable act in the manipulation of politics.

These attributes must assuredly constitute him an element of great strength to the ticket of which he is a part.—Telluride Journal.

APPEAL FOR FUNDS

Every Democrat who is interested in the success of the National ticket should contribute as liberally as his means will allow toward the campaign fund. The committees need money to carry on the work. A dollar from every Democrat who can afford it will be a great help to the cause. Bring or send your dollar to the Standard and we shall see that it reaches the National committee. Victory is in sight. Bring in your dollar now.

The Yukon Tunnel.

A little more than three miles from Silverton on Cement creek is the property of the Boston and Silverton Mining company, of which Col. A. A. Lamont is the manager. This company owns a large group of claims, which extend over Boulder mountain from the Cement creek side to the Boulder gulch side.

The Yukon tunnel was started years ago by this company to cut the many veins which were known to exist in that place, but, principally, to cut at great depth the Uncle Sam vein, which, on the surface, had yielded some remarkably high values in gold and silver. The tunnel is now in nearly twenty-six hundred feet and it is estimated that three hundred feet more will be driven before the Uncle Sam vein is cut. It is the present intention to continue the tunnel entirely through Boulder mountain, after the Uncle Sam vein is reached. In driving the tunnel to its present point, fifteen veins have been crossed, some of them of remarkable size. Number eight vein has been drifted upon for a considerable distance. It is twenty-three feet in width and the ore shoot is about four feet. Number nine vein is also opened up for quite a distance. It is thirty-five feet wide and the ore shoot at present is wider than the face of the drift. At this point the depth is about a thousand feet below the surface. Over two thousand feet from the mouth of the tunnel. Veins number fourteen and fifteen were intersected at a depth of fifteen hundred feet. They are remarkable for their width and strength and carry bodies of good grade milling ore, which are wider than the breast of the drift.

We saw all these things and we are impressed with the fact that in the Yukon tunnel the Boston and Silverton Mining company, for the development work now done, has as remarkable a showing of high grade milling ore as any property in the San Juan district.

Williams' Jubilee Singers at Pascoe's Opera House two evenings, October 28 and 29, under the auspices of the Ladies' Union of the Congregational church.

Narrow Escape

(Durango Democrat)

To fall from a horse and narrowly escape being dragged to death, only to land (figuratively speaking) in the arms of a decidely eligible gentleman, was the fate of Miss Lulu Thompson, daughter of ex-Sheriff Thompson of this city. Miss Thompson was camping with her mother and some friends near the Little Dora mine, near Silverton, and while riding one morning towards Silverton, her saddle suddenly turned, and the young lady, who is an excellent horse-woman was precipitated to the ground. Fortunately she managed to slip her foot out of the stirrup, and so escaped serious injury. Nevertheless she was unable to return to the camp, and when Mr. Thos. Kane, a prominent mine manager of Silverton, came along in his buggy, Miss Thompson was only too glad to accept the proffered assistance. She was confined to her bed at the home of some friends for a week with a badly sprained back, returning to her home here on Saturday.

DeWitt's Little Early Risers are small pills, easy to take, gentle and sure Sold by S. D. Cunningham.

Mining and Personal

Manager Josiah Watson of the Columbus has several men at work doing development work on that property, which is situated above Animas Forks.

The new Kittimac mill is now under cover and the workmen are pushing the work forward as fast as possible on the interior finishing The machinery for this mill is now on the road to Silverton.

The test on Champion ore at the Contention mill, under the direction of T. C. Woodworth, still continues to be very satisfactory. This undoubtedly means a new mill for the camp to be erected in the near future.

L. A. Klinger this week sent some men and supplies up to his Blackstone property, which is adjacent to the Joe and John. The ore showing in this property is fine considering the amount of development work done.

The big Colorado property, just above Gladstone, is now in charge of Col. A. A. Lamont. He has just let a contract for a hundred feet of work to be done in the tunnel. This will cover the assessment work for this year on the seven unpatented claims belonging to the company.

The Anti-Periodic group on Galena mountain is now being operated under bond and lease by Landry, Dresback and Marshall. This property has a fine showing of ore in its various claims. Recently a pocket of silver glance running over 60 per cent. in silver was encountered in the Anti-Periodic.

Mrs. Luttrell recently got returns on a carload of ore shipped to the Ohio and Colorado Smelting and Refining company at Salida. They were very gratifying indeed, being in excess of any returns ever before received for a carload of ore from this property. We are informed that negotiations have been completed whereby the title of the Joe and John will soon be transferred.

We hear persistent rumors that the Aspen company will resume operations on their property in a short time. We understand that a few days ago a new cable was put in the tram from the Aspen mine to their unit of the mill. Several leases are now, and have been for several months past, operated on this mine. The Aspen has large ore bodies of splendid milling ore and we shall be glad to see it again take its place as one of the large shippers of this camp.

The Prospector.

There is more prospecting being done in San Juan county at the present than at any time for ten years past. They are exploring the hills in every direction from Silverton. In going up Cunningham gulch you can see them on King Solomon and Galena mountains and as you go up the Stony pass country they become more numerous, several being actively engaged right at the top of the pass. In crossing over the divide to the west branch of Pole creek many of these pioneers of great mining camps may be seen seeking to find out undiscovered places where nature has hidden her stores of gold and silver. This activity on the part of the prospectors in the district is one of the best things we can chronicle. There are yet in these San Juan hills many rich mines still undiscovered and it may be that this year one of these sturdy prospectors now so busily engaged scouring every approachable locality where the mineral indications are good, will uncover a property that will later develop into a Gold King or a Camp Bird.

The prospector is a valuable factor in the development of any mining country and his activity is always a sign of healthy life in any camp and bears promise of golden harvest in the future.

When you have a cold you may be sure that it has been caused indirectly by constipation and consequently you must first of all take something to move the bowels This is what has made Kennedy's Laxative Cough Syrup so does not constipate like most of the old fashioned cough cures, but on the other hand it gently moves the bowels and at the same time heals irritation and allays inflammation of the throat. Sold by S. D. Cunningham.

We Handle Blank Books

Of every shape and size, from a small pass book to the ledger. We don't handle every quality though only the best.

We Cannot Afford to Sell

the poor kinds any more than you can afford to buy them. You'll find the binding, paper and ruling in our blank books all you can desire and you'll find the price as low as you could expect and lower than you are used to paying What kind do you need now?

Dr. M. M. Blair

AT THE SILVERTON SUPPLY CO

Beech-Nut Brand

Everyone knows how nutritious and appetizing the peanut is. Made in the form of Peanut Butter it is delicious for everyday use. Beech-Nut Brand Peanut Butter is different from other kinds because it is made from the finest Spanish and Virginia peanuts, blended and ground by expert methods. You should always have it in the house for luncheons, picnics and outings, for it makes a very delicious sandwich. Better order a trial jar of the

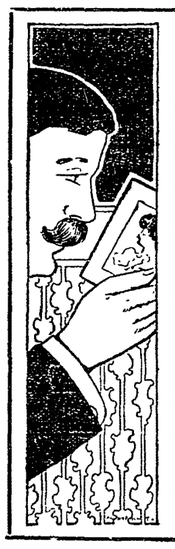
SILVERTON SUPPLY CO Peanut Butter

GROCERIES

A complete line of Fresh Fruits and Vegetables to select from. : : : : :

O. L. LESLIE,

1051 Greene St. Phone 52.



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For the most artistic and highest grade photographs go to

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DIAMONDS

AND WHY NOT?

It's the best investment you can make in the jewelry line. You get the most for your money. You get an article that does not deteriorate and one that increases in value the longer you keep it

We Want to Convince You

That our Assortment of Stones for Quality and Price Cannot be Bea. We do not Fear Denver Prices nor Catalogue House Prices . . . .

Call and examine them. Put them under the magnifying glass. Compare them for color and last, but not least, COMPARE THEM FOR PRICE

CUNNINGHAM & CROCKER,

THE WATCH DEALERS OF SAN JUAN.

SILVERTON STANDARD.

J. T. JOYCE, Editor and Publisher.

Entered at the Silverton, Colo., postoffice for transmission through the mails as second class matter

OFFICIAL PAPER CITY AND COUNTY

SATURDAY. SEPTEMBER 17, 1908.

DEMOCRATIC TICKET

For President,
WILLIAM J. BRYAN,
Of Nebraska.

For Vice-President,
JOHN W. KERN,
Of Indiana.

Democratic State Ticket

For Governor
JOHN T. SHAFROTH
For Lieutenant-Governor
S. B. FITZGERRALD
For Secretary of State
J. B. PEARCE
For Treasurer
W. J. GALLIGAN
For Auditor
ROADY KENNEHAN
For Attorney General
JOHN T. BARNETT
For Judges of Supreme Court
GEORGE W. MUSSER
MORTON S. BAILEY
W. A. HILL
S. H. WHITE
For Superintendent of Schools
MRS. KATHERINE COOK
For Railroad Commissioners
A. B. ANDERSON
W. H. BAILEY
W. L. SEELEY
For Congressman-at-Large
ED. T. TAYLOR
For Presidential Electors
CHARLES S. THOMAS
B. L. JEFFERSON
S. N. WHEELER
THOMAS EHRHEART
DEXTER SAPP

Pool Hall Changes Hands

Last Thursday afternoon a deal was made between Ira S. Franklin and Lew Haas whereby Mr. Franklin became the proprietor of the pool Hall. one of Silverton's most popular places of amusement. This place will be kept up in first class style. A fine stock of cigars, confectionery and and soft drinks will be kept always on hand. The billiard and pool tables will be thoroughly overhauled and the bowling alley will be a delight to lovers of that sport.

Ouray Elks vs. Silverton Elks

It will be Antlers against Antlers next Sunday afternoon at the Base Ball park Some weeks ago the Bull Elks of the Silverton herd went over to Ouray and in a fast game of ball played rings around the Ouray herd. That bunch has now somewhat recovered and they are coming over next Sunday for revenge. Our boys says they will get it where the little girl wears her necklace. Everybody should come out and see the fun. We guarantee that you will get your money's worth.

Mining and Personal

Fillmore Hand came in recently from Durango to do some work on his mining claims, situated on Cement creek, opposite the Mogul.

This week a bond and lease was recorded at the county clerk's office- Alfred Iles, the owner of that valuable property, gave the instrument to Col. E. C. Condit of Eureka.

The Danville Leasing company this week shipped a car of high grade grey copper ore to the smelter in Durango. This company is leasing on the Shenandoah working both ways from the Trilby tunnel. The ore showing at the present time is very good.

Dave Logan came up several days ago to look at the Burro Bridge claims, in which he and James McNamara of Silverton are the chief owners. The property looks fine at the present time. There is an ore body four feet in width opened up and this returns average assays of $1,700 in gold alone.

The Bullion King shipped a carload of high grade crude ore Tuesday. This property is now in splendid condition. The ore streak in the tunnel is now opened up for a distance of more than 1,000 feet and varies from two to four feet in width, averaging in value $17 to the ton. Besides this there is in the Oliver Twist vein a good ore body three feet in width.

FOR SALE—One corner kitchen cupboard. R. L. Gilbert. 42-3t pd

A Fitzsimmons' Wallop

Just a month more and the leaders of each league will be fighting for the championship of the world. Wonder which two teams it will be.

Ralph Glaze, who has been pitching such sensational ball for Providence in the Eastern league, has been recalled by the Boston Americans, to which team he belongs.

"Ginger" McGilvary, is certainly clouting the horsehide on the trade mark, for Harrisburg, in the Tri-State league. He is now third in the batting averages of that organization.

Stanley Ketchell, who was knocked out Labor day by Bill Lapke, the Illinois "Thunderbolt," will undoubtedly be given another chance by his conqueror in the near future.

Joe Gans of Baltimore, has announced his retirement from the ring for all time to come. This is occasioned through his recent defeat at the hands of Battling Nelson, on September 9.

Lanterborn, the second baseman, who was let go by the Denver management has made a great hit with the fans at Wilkesbarre, Pa., for which place he is now covering the position of shortstop.

Ned Hanlon, is spoken of as the manager of next season's New York American league team. No better choice could be made. as "Foxy Ned" knows the inside as well as the outside workings of a team.

All that can be heard going the rounds these days, is as follows: "When are we going to witness another game of basket ball?" Come on out of your shell girls, and get busy. Give us a run for our money.

Hans Wagner, the great Pittsburg shortstop, is the leading slugger in the National league while Ty Cobb of the Detroit Tigers, has the same honor in the American. It is a question which is the greatest batter of this pair.

There is considerable interest being taken in the propcsed match between Tommy Burns, who signs himself as "World's Champion-Heavyweight," and Jack Johnson, the big "black smoke," which is to take place in Australia in the next few weeks.

It proved beyond a doubt that no gamer little fellow ever donned the padded mitt than Owen Moran, the Britisher, who fought Abe Attell, to a draw of 23 rounds on Labor day. He fought the shifty Jew 21 rounds with a broken hand

Chas. Adams who pitched such wonderful ball for Denver in the Western league, two years ago and was drafted by Pittsburg of the National league, has been recalled from Louisville, to which club he was loaned. Here is hoping that he makes good this time.

There will be no post-season series between the leaders in the Eastern league and the American Association this year. The reason given is that the latter organization finished its season fifteen days earlier than its rival, and it would be impossible to kept the men of the leading team in shape, on account of the large expense.

The question has been asked recently as to how long it would take a man to go from the Grand hotel in Silverton, to the Beaumont hotel in Ouray, the same to be "go as you please," that means all short cuts to be allowed. The way to do is to arrange a trial of this kind and then we can tell the questioner. The distance is 25 miles.

'Tis rumored that Durango will have the services of Fred Starr, the southpaw, now with Sioux City, during the ball games at the Durango fair. Well, "Rip" never was much of a terror to the Silverton crowd, but nevertheless just watch Jack Slattery when the time arrives. Our money goes on the boys with the big black "S" on their shirt pockets. R. H. B.

Fire at Animas Forks

At three o'clock Tuesday morning fire broke out in the big store building occupied by the Tilley Hotel and Catering Company as a store building. The building and stock were a total loss. The structure cost $7,500 to build and was owned by the Morey Merc. Co. of Denver. The stock was large, estimated in the neighborhood of $10,000 and was in the name of Mrs. W. L. Tilley. There is an insurance of $6,000 on the stock. No cause of the fire has yet been discovered.

IN MEMORIAM

In loving memery of

Edward George Stoiber

Born September 18th, 1855,
New York City.
Died in Paris, France, April 21st, 1906.

Velma Corlett

On Friday last the light and joy of another Silverton home went out. Little Velma Corlett, who had just reached an age when her childish innocence and prattle were dearest in her parents' eyes, was called away from this world. At the time of her death she was three years and three days of age.

On Thursday of this week her little body was laid in its last earthly resting place in the silent city on the hill, her small girls acting as pall bearers Rev. F. E. Carter of the Congregational church preached the funeral sermon. An abundance of flowers covered the casket and a large concourse of loving friends followed in sad procession to the cemetery, where the mortal frame was given back to earth. In their profound sorrow, the sympathy of this entire community goes out to these perents bereaved of their fairest possession.

Who Is?

Here's a conversation that our reporter overheard at a recent dance.

Mamie—"Jim, ain't I the most popular girl in town?"

Jim—"You bet you are Mamie, you are the sweetest ever, and can travel on my pass as long as you live."

Mamie—"Thanks awfully, but have you asked Cunningham?"

Jim—"When did Dave Cunningham buy chips in this game?"

Mamie—"Well, you goose, you are slower than the D. & R. G. Freight, if you haven't heard about the popular lady contest. Well, I'll tell you. At Cunningham's they have the dandiest, cleanest and finest candy I ever tasted. Oh! it's delicious. They are going to give a beautiful diamond ring to the most popular lady in town. With every 25 cent purchase of candy you will get 100 votes to cast for your sweetheart, or any lady you choose. Jim, I like candy and, do you know that a diamond ring on the second finger of my left hand, would make me feel just like taking you over on Reese street to see one of those cottages."

Jim—"Mamie, you're all the candy I need. But if you feel that way, I'll go to Cunningham's and buy up the whole works."

Ask Cunningham.

Gambling

your life against 25 cents is just exactly what you are doing if you neglect a cough or cold on the chest instead of treating it with Ballard's Horehound Syrup. A 25 cent bottle of this splendid remedy will cure an ordinary cough, heal the lungs and act as a tonic for your entire system. Sold by S. D. Cunningham.

Adversed Letter List.

Following letters remain uncalled for in the Silverton, Colo., postoffice for the week ending Friday Sept. 18, 1908.

Persons calling for any following letters please say "Advertised."

Anderson, Oskar
Baily, John
Barnard, Sid
Crover, Tim
Crocker, Jake (2)
Crocker, Tom
Center, Carlo
Clark, John
Dufty, Geo.
Felt, Geo
Felt, L W
Gogin, Frank
Jackson, Mr
Jewett, Geo P
Kenedy, Hugh
Martinez, Crus
Phillips, Chas
Ranolds, Joe
Rigo, Toni D
Roady, Frank
Rowland, John E
Schweartz, Louisa
Smith, J H

FOREIGN

Joe Rasso Elbay
Martinez, Jose
Nevquist, Chas

A. M. BERG, Postmaster.

Hoppity Hop

Are you just barely getting around by the aid of crutches or a cane? Unless you have lost a limb or have a deformity—if your trouble is rheumatism, lumbago, sprain, stiff joints, or anything of like nature use Ballard's Snow Liniment and in no time you can throw away your crutches and be as well as anyone. Price 25c, 50c and $1.00. Sold by S. D. Cunningham.

Dies of Blood Poison

Miss Lucile Semaine, the twenty-year old daughter of Mr. Semaine, a well known carpenter of this city, died of blood poisoning in St. Joseph's hospital Tuesday evening. She was taken to the hospital about noon in a dying condition and never recovered consciousness. Her funeral occurred from the undertaking parlors Thursday morning with interment in Cedar Hill cemetery.—Ouray Herald.

The above lady was a sister of of Miss Emily Semaine, formerly of Silverton, but now of Durango.

Kodol will, without doubt, make your stomach strong and will almost instantly relieve you of all the symptoms of indigestion. It will do this because it is made up of the natural digestive juices of the stomach so combined that it completely digests the food just as the stomach will do it, so you see Kodol can't fail to help you and help you promptly. It is sold here by S. D. Cunningham.

Woodmen Attention.

There will be a large class of candidates from Silverton camp, W. O. W., initiated at the Log Rolling to be held at Durango, September 30th, during fair week. Head Consul I. I. Boak will have charge of the program. Every member should attend the meeting Monday, September 21st, to discuss the matter of attending this Log Rolling. If a large enough crowd can be secured a special train for the Woodmen will be run from Silverton to Durango.

A Burglar in Town

his name is "bad cough." He doesn't care for gold or silver but he will steal your health away. If he appears in your house arrest him at once with Ballard's Horehound Syrup, it may mean consumption if you don't. A cure for all coughs, colds and chest troubles. Price 25c. 50c and $1.00 per bottle. Sold by S. D. Cunningham.

Socialist Party

The decadence of the socialist party in the coal camps of Boulder county can have but little result. The Democracy is coming into its own again. Organized labor of Colorado is with the Democrats this time and its vote will count big next November. Why are the Republican county conventions all declaring for McDonald for governor instead of for Peabody, the man whose seat was secured for 24 hours by the basest political trick ever played in Colorado? The people will not forget the part Jesse Peabody McDonald took in robbing Alva Adams of his seat. He was laid off for two years and the preacher put in, in the hope that Republicans would become so disgusted with Buchtel that they would take anybody, and the expectation that the people of the state would forget after two years that Jesse McDonald was the beneficiary of political larceny, We mistake the public mind if its memory be so short-lived —Boulder Camera.

Nipped by Jack Frost

is something liable to happen to any one in this bitter weather. A frost bitten ear or finger or a toe, sometimes a bad case of chilblains. Don't wait until the accident happens to get a remedy but get it now for application right away. Ballard's Snow Liniment cures frost bite, chilblains, rheumatism, aches or pains of all kinds. Sold by S. D. Cunningham.

Trimble Springs

The old Spanish explorer crossed the ocean to find the fountain of eternal youth. Silverton people do not have to go so far. It is right at their door. Any one who bathes in the waters of Trimble Springs for a few days, is guaranteed to come out as sprightly and youthfully gay as Col. Dave Day. These famous springs will give a sparkle to the intellect more brilliant than can be found at the bottom of a wine glass and a glow to cheeks which is warranted not to rub off.

Many people suffer a great deal from Kidney and Bladder troubles. During the past few years much of this complaint has been made unnecessary by the use of DeWitt's Kidney and Bladder Pills. They are antisepic and are highly recommended for weak back, backache, rheumatic pains, inflammation of the bladder and all other annoyances due to weak kidneys. They are sold by S. D. Cunningham.

Who is the main salesman in Silverton of confectionery, books, stationery, cigars, souvenirs and Indian curios? G. Hennings.

A Most Valuable Agent.

The glycerine employed in Dr. Pierce's medicines greatly enhances the medicinal properties which it extracts from native medicinal roots and holds in solution much better than alcohol would. It also possesses medicinal properties of its own, being a valuable demulcent, nutritive, antiseptic and antiferment. It adds greatly to the efficacy of the Black Cherry-bark, Bloodroot, Golden Seal root, Stone root and Queen's root, contained in "Golden Medical Discovery" in subduing chronic, or lingering coughs, bronchial, throat and lung affections, for all of which these agents are recommended by standard medical authorities.

In all cases where there is a wasting away of flesh, loss of appetite, with weak stomach, as in the early stages of consumption, there can be no doubt that glycerine acts as a valuable nutritive and aids the Golden Seal root, Stone root, Queen's root and Black Cherrybark in promoting digestion and building up the flesh and strength, controlling the cough and bringing about a healthy condition of the whole system. Of course, it must not be expected to work miracles. It will not cure consumption except in its earlier stages. It will cure very severe, obstinate, hang-on, chronic coughs, bronchial and laryngeal troubles, and chronic sore throat with hoarseness. In acute coughs it is not so effective. It is in the lingering hang-on coughs, or those of long standing, even when accompanied by bleeding from lungs, that it has performed its most marvelous cures.

Prof. Finley Ellingwood, M. D., of Bennett Med. College, Chicago, says of glycerine:

"In dyspepsia it serves an excellent purpose. Holding a fixed quantity of the peroxide of hydrogen in solution, it is one of the best manufactured products of the present time in its action upon enfeebled, disordered stomachs, especially if there is ulceration or catarrhal gastritis (catarrhal inflammation of stomach), it is a most efficient preparation. Glycerine will relieve many cases of pyrosis (heartburn) and excessive gastric (stomach) acidity."

"Golden Medical Discovery" enriches and purifies the blood curing blotches, pimples, eruptions, scrofulous swellings and old sores, or ulcers.

Send to Dr. R. V. Pierce, of Buffalo, N. Y., for free booklet telling all about the native medicinal roots composing this wonderful medicine. There is no alcohol in it.

NOTICE OF ANNUAL STOCKHOLDER'S MEETING.

You are hereby notified that the annual meeting of the stockholders of The Sherwood Mines Company will be held at its office in the Town of Silverton, San Juan county, State of Colorado, on Tuesday, the 13th day of October 1908, at 10 o'clock a. m. for the election of directors for the ensuing year and the transaction of such other business as may be properly brought before the meeting. Respectfully yours,

JESSE H. KRAMER,
Secretary.

First Pub. Sept 11th, Last Pub. Oct. 9th,

NOTICE OF SALE

Notice is hereby given that under and by virtue of a certain writ of execution issued to me out of the County Court of San Juan County, Colorado, on the 15th day of September, 1908, under a certain judgment recovered and entered in said Court on the 6th day of November, 1907, in favor of Otto Brendel and against The Bullion Bar Mining Company, a corporation, for the sum of $1,865 05 damages and $20.20 costs, and by which execution I am commanded to make the amount of said judgment together with interest thereon from the date of such judgment at the rate of eight per cent per annum out of the lands, tenements, goods and chattels of said defendant The Bullion Bar Mining Company, I have levied said execution upon and will on the 11th day of October, 1908, at ten o'clock in the forenoon, at the east front door of the county court house of San Juan County, Colorado, expose for sale and sell at public auction to the highest and best bidder for cash the following described property, or so much thereof as may be necessary to make the amount of said judgment and costs together with interest thereon, and the costs and expenses of such sale, to-wit: All right, title and interest of said defendant The Bullion Bar Mining Company in and to the following named and described lode mining claims, all situated in Animas Mining District in San Juan County, Colorado, to-wit: The Cliff, Dump, Copper King, Surprise, Snow Bird, Silver Dollar, Prospector, Butterfly, King Fisher, Dewey, Manila, and Ruth lode mining claims, all surveyed, known and designated as U. S. Survey No. 17692; and also the following named lode mining claims, the location certificates of which are of record in the County Recorder's office of said County at the books and pages following the names of said claims hereinafter, respectively, to-wit: the Power House lode claim, Book 129, page 151; the Porcupine lode claim, Book 128, page 362; the Connection lode claim, Book 128, page 393; the Cave lode claim, Book 128, page 571; the Bullion lode claim, Book 129, page 145; the Monte Christo lode claim, Book 78, page 169; together with all buildings, fixtures and improvements on said premises situated.

Made and given this 8th day of September, 1908.

WILLIAM PALMQUIST,
Sheriff of San Juan County.

First Pub. Sept. 19. Last Pub. Oct. 10, 08.

NOTICE OF PUBLIC TRUSTEE'S SALE.

Whereas, John R. Perry, by his certain deed of trust, dated August 7th, 1905, which was recorded in Book 110 at Page 205 of the records in the office of the Clerk and Recorder of San Juan county, Colorado, duly conveyed to the public trustee of the County of San Juan for the use and benefit of M. B. Holt the following described real estate situate in said San Juan county, Colorado, to-wit: Lots numbered (11) eleven and twelve (12) in block numbered fifty-three (53) of the Town of Silverton as per the official and recorded plat of said town on file in the office of the Clerk and Recorder of San Juan county, Colorado; together with all improvements on said premises situated or which may hereafter be placed thereon, which said deed of trust was made to secure the payment of his promissory note of even date with said deed of trust for the sum of thirteen hundred dollars ($1,300.00) payable to the order of M. B. Holt on or before three years after the date thereof, with interest thereon at the rate of ten per cent per annum, all of which is more fully set forth in said deed of trust, reference to which is hereby made for greater certainty;

And Whereas, it is provided in said deed of trust that in case of default in the payment of said note, or any part thereof, the said deed of trust may be foreclosed as therein provided;

And Whereas, Default has been made in the payment of the principal of said note of thirteen hundred dollars, which was due and payable on the 7th day of August, 1908, and the said principal remains due and unpaid, and the said beneficiary named in said deed of trust having elected, on account of said default to declare said note unpaid, due and payable, and having filed with this trustee his notice and demand in writing declaring a violation of the covenants of said trust deed and electing to advertise said premises for sale and demanding such sale;

Whereas, The undersigned is now public trustee in the County of San Juan and State of Colorado, and is duly authorized by law and the terms of said deed of trust to act in the premises;

Now, Therefore, At the written request of the said M. B. Holt, the present holder and owner of said note, and pursuant to law and pursuant to the terms named in said trust deed, I, the undersigned public trustee in and for the County of San Juan and State of Colorado, do hereby give notice that I will at ten o'clock on Tuesday, the 22nd day of September, 1908, at the east front door of the County Court House, in the Town of Silverton, San Juan county, Colorado, sell at public auction to the highest and best bidder for cash, the above described premises, and all the right, title and interest of the said John R. Perry, his heirs, assigns and legal representatives therein for the purpose of paying the said sum of thirteen hundred dollars ($1,300 00) and the costs and expenses of executing this trust.

Dated at Silverton, San Juan county, Colorado, this 14th day of August, 1908.

THOS. ANNEAR,
Public Trustee in and for the County of San Juan and State of Colorado.

First pub. Aug. 22; last pub. Sept. 19, 1908.

Christian Science Society

Services are held each Sunday at 11 a. m.; and Wednesday at 7:30 p. m.; 1244 Reese street.

The reading room of the society, same address, is open to the public every afternoon from 1 to 5. Everybody is invited to attend the services or visit the reading room, where one of the ladies of the society will be present each afternoon to extend a cordial welcome. Christian Science literature can be bought or ordered at the reading room.

Pure cigar clippings for sale at Mize's cigar factory. 31-4t-c

Railway Time Table

SILVERTON NORTHERN

Time table No. 5, effective July 13, 1908. Between Silverton and Eureka.

OTTO MEARS, PRES. J. R. PITCHER, G. MGR

North Bound First Class Leave Daily		STATIONS AND SIDINGS	South Bound First Class Arrive Daily	
No. 5	No. 1		No. 2	No. 4
p.m.	a.m.		a.m.	p.m.
4.00	6.15	Silverton Depot	8.20	5.45
		Fourteenth Street		
		Power Plant		
1.15	7.00	Waldheim	8.04	5.30
		Collins		
1.25	7.10	Howardsville	7.55	5.20
		Hamlet Mill		
1.35	7.20	Middleton	7.45	5.10
		Kittimac		
4.45	7.30	Eureka	7.35	5.00
Read down, Arr			Read up, Lv	

SILVERTON RAILWAY

Leave Daily No. 3 a. m.	STATIONS	Arrive Daily No. 6 p. m.
9.00	Silverton Depot	12.20
9.25	Burro Bridge	11.57
	Brooklyn Spur	
	Chattanooga	
9.35	Silver Crown	11.15
	Ledge Mine	
9.50	Summit	11.30
10.00	Red Mountain	11.20
	Genesee	
	Yankee Girl	
	Guston	
10.30	Joker Tunnel	10.40
Read down, Lv		Read up, Arr

Savoy Hotel.

When you are going out to Denver, the best place in Durango to stop over is the Savoy hotel. Everything is clean and up-to-date. The table is the best that the market affords.

FOR RENT—House with range. Mrs. L. G. Prosser. 46 tf c

WE PAY SPOT CASH!

Prompt returns made on Placer Gold, Gold Retorts, Amalgam, Rich Ores, Cyanide Precipitates and all kinds of Gold and Silver clean ups.

RELIABLE ASSAYS

Gold and Silver.....$1.00
Gold, Silver and Copper..... 1.50
Gold ..... .75
Lead ..... .75

OGDEN ASSAY COM'Y
1536 Court Place, Denver, Colo.

DOUD : BROTHERS : LIVERY

You Ought to See

The style of our Rigs, the freshness of our vehicles and the character of our horse flesh whenever you want a turnout for business or pleasure.

No hackneyed "has-beens" here, but animals with life that it's a pleasure to draw reins over, likewise a pleasure to settle for the use of at our prices.

TELEPHONE SILVER 24
1246 GREENE ST.

The
Denver & Rio GRANDE
"Scenic Line of the World"
TO THE
Pacific Coast

Offers the traveler good train service, comfortable and luxurious accommodations and some of the most impressive scenic attractions in the world. Its three through daily trains which are operated between Denver and the Pacific Coast are provided with the latest pattern of Pullman sleeping cars, chair cars, and a perfect system of dining cars which are operated on the a la carte plan

The two morning trains from Denver carry through Pullman standard sleeping cars which are operated in connection with the Burlington, Rock Island and Missouri Pacific between Chicago, St. Louis and San Francisco without change. If you contemplate a trip to the coast, let us send you illustrated booklet free, and information as to what the trip will cost you.

S. K. HOOPER, G. P. & T. A., DENVER

PATTERSON BROTHERS LIVERY

THE PICK OF THE MINES

Is the Fuel we offer the people of Silverton. Experience has taught us that to sell the best we must buy the best, and the product is here to be seen by your critical eye. Question is: Will you see our Coal?

Hesperus Coal

The Wife Newly Wedded

must be taught by experience when, how and what to buy and there is no line of marketing where experience is more necessary than in buying meats, nevertheless the most innocent persons can safely trust us to supply them with the best cuts and choice pieces of any meats in our store. Money profits are good, but we prefer good will to your cash.

Consolidated Silverton Meat and Produce Company

THE SOUTHERN HOTEL
DURANGO, COLO.
Steam Heated Rooms Throughout. Clean and Well Ventilated. Excellent table.
First-Class Service at REASONABLE RATES
Opp. Depot. MRS. W. H. MACK, Prop

The Bert Brown Market

AND LIVE STOCK COMPANY.

Wholesale and Retail Dealers in

MEATS AND PRODUCE

Beef, Pork, Mutton, Veal, Dry and Green Vegetables, Butter, Eggs, Cheese, Oysters, Salt and Fresh Fish, Game, Poultry, Pickles, Kraut, Sugar-Cured Hams and Bacon.

TRY OUR OWN MAKE Breakfast Bacon, Kettle-Rendered Lard, Corned Beef, Pickled Pork, Dry Salt, Sausages of all kinds.

We Guarantee Satisfaction

Supplying Mines a Specialty. Corner Greene and 11th Street

= Personals =

Mr. G. Hennings has gone to Denver on a business trip.

Mr. and Mrs. Stoltz of Denver were guests in the city this week.

Mr. A. W. Harrison is attending the Montrose Fair this week.

Jim Cole is enjoying a short stay at Montrose during the fair.

Mrs. Chase of Durango is enjoying a visit with Mrs. A. J. Aurand.

Mrs. Jim Pearson left for a six weeks' visit with her parents in Delta.

Mr. G. V. Emerson spent several pleasant days at Trimble Springs.

E. A. Bode of Albuquerque, N. M., spent several days in town this week.

Mr. Workheiser of the First National bank spent Sunday in Trimble Springs.

Mr. Jim Bothwell left Silverton for Grand Junction, and Denver Wednesday morning.

Sam. Broyles, after an absence of several months, returned to Silverton on Saturday last.

J. T. Langolf of the Joe and John mine departed for Ojo Calente Springs last week.

Mr. J. J. Clark, of the Kittimac Mines Co., is enjoying a vacation with his family in Denver.

F. A. Robinson of Denver was a Silverton visitor this week and also E. C. Fox of Topeka, Kan.

Mrs. Ben Johnson recently returned from San Diego, where she has been for some months past.

John Melton and wife returned the latter part of last week from a short visit to Durango and vicinity.

Mrs. John T. Joyce returned after spending a restful week in Trimble Springs Monday evening

R. H. Myers was an arrival from his Farmington home last Friday night. Business and pleasure combined.

J. C. Woods, machinist for the Silverton Northern Railroad, was doing some machine work in the Silver Lake shops this week.

W. W. Garwood, a prominent attorney of Denver, was in Silverton several days on business for the Congress Gold and Copper Co.

J. P. Hanson, assayer for the Gold King, returned this week from a trip of two or three weeks viewing the sights of the capital city.

Fred Balcom, the "candy kid" put in an appearance last Friday evening, and on Saturday was talking his sweetest to our merchants.

John D. McCarthy of New York City who will take charge of the Southern hotel in Durango, came up yestrday to spend a few days visiting in Silverton.

Mrs. F. W. Koehler returned Saturday night from Denver, where she accompanied her daughter. Irene, who re-entered school at Loretta Heights.

Mr. and Mrs. A. P. Root, Jr., and baby daughter Jeane, left this morning for a pleasure trip to Denver. They anticipate about a week's visit in the capital city.

J. C. Sullivan, an old timer in the San Juan, formerly postmaster in Durango and at one time owner of the Durango Herald, is visiting his daughter, Mrs. Thomas Jones of Silverton.

Mr. and Mrs. R. L. Clark, who have for some time been enjoying the many pleasures of Trimble Springs, returned to Silverton Saturday and this week they are guests at the Grand hotel.

Mrs. A. M. Balcolm of Pueblo has been the guest of Mrs. A. J. Aurand. Mrs. Balcolm left Silverton Thursday morning for Durango where she will visit with her son, Mr. Fred Balcolm.

Richard Stephens, who has been working on the Iron Mask mine in Maggie gulch, came down last Friday evening for a few days' recreation, and to attend the funeral of the late John Gorman.

Among the Silverton people who spent an enjoyable day at Trimble Springs Sunday were the Misses Esther and Mable Newton, Isabelle McLennon; and Messrs. Archie McCoy, Mr. Crum and Tom Evans.

John Ellis Hallen

The Hercules mine was last week the scene of another fatal accident. On Saturday afternoon, September 12th, John Hallen, a miner, was killed there. He was just going on shift and he noticed a loose slab of rock in the top of the drift He thought that if he pried it loose it would fall away from him and so he loosened it with his shovel, but it caught and skewed around falling toward instead of away from him, pinning him to the ground and serving the main artery of one of his legs near the trunk. He was not badly injured otherwise, but he bled to death from his wound before surgical assistance could reach him.

Mr. Hallen was born in Sweden April 13, 1882, and thus at the time of his death was about twenty-six years and six months of age. He was married and the father of a small boy. Twin babies, born five days before the father's death, died at their birth. Besides this sorrowing family, a sister, Mrs. M. Melberg, is left to mourn his loss.

The funeral services were held last Monday afternoon under the auspices of the American Order of Protection and the Silverton Miners' Union of which orders the deceased was a member. Rev. F. E. Carter was in charge of the ceremonies.

John Fred, Commins.

John F. Commins was born February 10th, 1880, in Clinton county, New York, and died in Silverton at the home of his sister, Mrs. Martin Schmelzer, Monday, September 14th, at 9 o'clock in the evening. For more than a week the advent of the grim messenger had been expected as the patient was hopelessly ill with a bad case of pneumonia. Everything that medical science could do was done but to no avail.

On Thursday morning at five o'clock. Father William O'Malley held mass over the body and it was taken to Denver, accompanied by the bereaved father, mother and sister. The remains were interred in Mount Olivet cemetery.

Mesa County Fair

(Will exhibit fruit saved by smudging.)

Arrangements have been made whereby, a large exhibit of fruit will be made at the Mesa County fair, from an orchard in the Grand Valley which was saved from the frost by the smudge pot method. The exhibit will clearly demonstrate to the people what can be done by smudging when the fruit grower will take the time to make preparations and thoroughly smudge. There will also be an exhibit from the same orchard which was not smudged the quality of the fruit saved from the frost by smudging and that which was not artificially cared for to be shown side by side.

Adam S. Wagner, district agent of the Colorado National Life Insurance company, is in town talking life insurance to the dying people of this community.

Editor Clarence O. Finch and wife returned Tuesday night from Denver, where Mr. Finch was a delegate to the steam roller convention held by Senator Guggenheim in the new auditorium.

Sam Martin returned from Denver the first part of the week. Mrs. Martin who has been ill in Denver for the past month, accompanied him as far as Trimble Springs where she will remain several days to recuperate.

Among those who were in Silverton on business trips this week were: F. D. Fowler, Denver; P. B. Sprague, Denver; M. Colgin, Denver; Geo. W. Lane, Durango; Roy Tyree, Kansas City; and Frank T. Berooch of Denver.

A. G. Jury arrived this week to take charge of the Benson house for Fred. Grebles. Mr. Jury is a hotel man of experience, coming direct from the Albany hotel in Denver to Silverton. He was prior to that in the employ of the Stratford hotel in Chicago.

Mr. Frank Crooke, formerly of New York City, but for the last few months, a resident of Denver, came in on Wednesday evening's train of last week. He has accepted a position with the Old Hundred Mines company and will undoubtedly spend the winter here.

Opera Rooming House

Over Pascoe's Opera House. Rooms are clean, comfortable, desirable. Mrs. Lena Curbic. 44 2tc

Town Topics

The doors at the opera house will open at 7:30 and the curtain rise at 8:15.

FOR SALE—Sewing machine. Phone 764 red.

Variety, snap and brightness are the prime ingredients in a Joseph Newman program.

Furnished rooms with bath for rent at 1338 Reese street. 18 tf-c

Mrs. Jones is entertaining as a house guest, her father, J. C. Sullivan of Durango.

All kinds of sheet music at Dr. Blair's Drug store. Your choice 5c per sheet. 30-tf c

Mrs. L. G. Prosser entertained informally a few friends Friday evening at her home on Snowden avenue.

WANTED—To buy a good second hand 6 hole range. Inquire at the Standard office. 44-tfc

Bishop Matz on Sunday morning last confirmed a class of twenty-six at St. Patrick's Catholic church

Mrs. C. N. Potts of Durango was the house guest of Mrs. Fred Goble from Sunday until Tuesday of this week.

FOR SALE CHEAP—Gentleman's saddle and bridle in good shape Call at Standard office. 40-tfc

Mr. and Mrs. C. S. Casad have had for their house guest this week, Mr. Casad's niece, Miss Hazel Cozad of Durango.

Steve Rodgers, the electrician has purchased the home of his mother-in-law, Mrs. C. E. Newton and will soon move into it.

FOUND—A pair of spectacles. Owner may acquire same by applying to B. B. Galvin or inquiring at the Standard office and paying for advertisement.

Mrs. Hunt charmingly entertained the Whist club Monday afternoon. Mrs. C. N. Potts of Durango was the guest of honor.

LOST—A tiny gold neck chain with three small diamond pendants. Finder will receive reward upon returning same to Mrs. Fred Goble. 43-tfc

Mrs. W. K. Braydon has been very ill at her home in Denver, but present reports are to the effect that she is now rapidly getting better.

Mrs. L. G. Prosser was the charming hostess at a dinner party Thursday evening, complimentary to Mr. and Mrs. Stoltz of Denver. Covers were laid for six.

Harry C. Brown, recently purchased from Mrs. B. A. Taft the residence and furniture of the Taft home, situated on Reese street between 14 and 15th.

All parties knowing themselves indebted to C. H. H. Kramer please call and settle at once with F. J. Shea. 42-tf c

Edward C. Stimson, Democratic candidate for congress in the first district, has resigned and Chas. F. Tew will probably be put on in his place by the vacancy committeee.

FOR RENT—Furnished room with bath, three blocks from Grand hotel. Enquire at Standard office.

The Rocky Mountain News and Denver Times are giving a three map wall chart as a premium with a three month paid up subscription to either paper. See the agent about it.

We are glad to note that Dan Sheahan, who has been confined to his home for several days on account of sickness, is again able to be on our streets and attend to his accustomed duties.

J. J. Thuet and wife of Eureka had an early caller at their home at 4 o'clock Monday morning. It was a small girl with good lungs and they have decided to let her stay at their home permanently.

George Lane of Durango was on Tuesday, September 15th, nominated for district attorney of this judicial district on the Democratic ticket. Mr. Lane is a young attorney of promise in Durango, a law partner of the present district attorney, J. A. Pulliam.

The Joseph Newman company, composed of Joseph Newman, song humorist; Miss Ruth Skeel, contralto; Miss Ruby Thorpe, violinist, and Miss Clara Skeel, accompanist, will appear at the Pascoe opera house, Saturday, September 19th.

Joe Terry returned from a trip to Denver.

The Mesa County Fair

Next week the big Mesa county fair at Grand Junction, beginning Tuesday with the $1,000 free for all horserace, which is nine entries in it and a gorgeous display of Pains fireworks, including a reproduction of Niagara Falls.

At Grand Junction, beginning next Tuesday, the fifth annual Mesa County fair, with balloon races, big exhibits, 3 big $1,000 races which are full of entries, and a grand display of Pains fireworks, with special attractions. The big week on the western slope. Special rates on the Denver & Rio Grande and Colorado Midland.

Remember that next Tuesday begins the Mesa County fair at Grand Junction. The biggest racing card ever given outside of Denver, in Colorado. Ted Sparks exiting balloon races, Pains fireworks and the finest fruit and farm produce display ever gathered together on the western slope. Plenty of good music, and a good time for everybody. Special rates on the railroads.

Don't miss the battle of the Monitor and Merrimac, Niagara Falls, the Fountain of Light, the pictures in fire of Washington, Taft, Bryan and the most prominent man of Grand Junction, at the Mesa County fair beginning next Tuesday. See the Grand Junction handicap running races which has 12 horses entered including the winner of the Colorado Derby, and several from California and other fast circuits. A week of amusement in the Grand valley. Ask railroad agent about the special rates for the week.

Last Call—The Mesa County fair opens at Grand Junction next Tuesday and offers a program of extraordinary merit. Live stock and poultry show. The biggest racing program ever offered the people of Western Colorado. Balloon races, and a gorgeous display of Pains fireworks. Special rates on the railroads. The motto of the Mesa County fair, "Better Than Ever" will be strictly lived up to in every respect.

The Silverton Eagles played ball at the Montrose Fair against the Montrose Eagles on Wednesday, September 16th. The Montrose team was evidently too much for the Silverton aggregation and our boys lost the feathers. The score was 9 to 3 in favor of the valley boys.

Horace Clapp, a carpenter at the Gold King whose home is in Durango, fell from a scaffold through a distance of thirty feet to the ground. His collar bone and ribs were broken and his head bruised. He was removed to his home in Durango Tuesday morning and reports are favorable for his condition.

Kodol will, in a very short time, enable the stomache to do the work it should do, and the work it should do is to digest all the food you eat. When the stomach can't do it Kodol does it for it and in the meantime the stomach is getting stronger and able to take up its regular natural work again. Kodol digests all you eat. It makes the stomach sweet and it is pleasant to take. It is sold here by S. D. Cunningham.

The delegates to the Democratic state convention in Pueblo have all come back. They drifted in one at a time and all of them are confident that the ticket put up is a winner. Those who attended the convention are J. H. Slattery, J. T. Joyce, Jas. Pilling, W. C. Pochon, W. N. Haas, B. B. Russell, John Bawden and Chas. Worden.

DeWitt's Carbolized Witch Hazel Salve is recommended as the best thing to use for piles. It is, of course, good for anything where a salve is needed Beware of imitations. Sold by S. D. Cunningham.

We are informed that Sam Selig and another well known young gentleman in town got into a heated argument this week and that Marshal Jones had to interfere to prevent serious trouble. It seems that Sam and the other man were boosting for a young lady in Cunningham's voting contest for the most popular lady in Silverton and both men had picked the same girl. "What fools we mortals be."

Attractions at Pascoe Opera House

The following attractions have been booked at the opera house for September.

Saturday, Sept. 19th, Joseph Newman and Company.

Tuesday, September 29th, a male character impersonator, assisted by the Silverton band.

Wednesday, September 30th Orpheum Stock Co. in Esmeralda.

Bids Wanted

For running drifts from the Domingo tunnel at Eureka, 5x7 feet. All hand work. Address for information.

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Why Bryan Should be Elected.

BY GEORGE F. RINEHART IN MIDWESTERN

Righteousness exalteth a nation; but sin is a reproach to any people.—Ps. 14:34.

Mr. Bryan is an optomist. He belives the world is getting better all the time and it is impossible to be around him a great deal without sharing his hopeful view of things. I confess that I have caught the infection and believe firmly in the final triumph of righteousness over every form of wrong. That accounts for my unfaltering faith in Bryan.

The situation must be exceptionally difficult if Mr. Bryan cannot extract a grain of comfort from it. To illustrate this habit of his I recall that one time I was lamenting the fact that Tom Watson, whose ability I so much admired, permitted his desire for revenge to warp his great intellect and induced him to lambast Bryan in each and every issue of his magazine. This was while Watson was in New York lending the weight of his great name to Col. Mann of unsavory memory in the publication of "Tom Watson's Magazine." Mr. Bryan did not share my concern. Not a shadow crossed his smiling visage. He was borrowing no trouble. He had no regrets. His reply was eminently characteristic of the man. He said simply that Watson was doing a good work. I asked him how he figured that monthly abuse of himself could be accounted "good work." He replied that Watson was there in New York where in 1896 Bryanism was called populism and Tom Watson was rapidly convincing the average New Yorker that Bryan was not a populist.

Having known Mr. Bryan intimately for twelve years and shared his confidence all of that time I naturally feel a closer interest in his welfare than those less intimately associated with him. That is why some people can not understand my devotion to the man as well as to his cause. I once said to him: "Mr. Bryan, do you realize what it will mean were you to assume the role of the 'man on horseback' and say 'come on, boys?'" His reply was prompt and decisive: "That is just what democracy must try to avoid. Democracy must make this government so good, so just, so equitable that there will be no room for the 'man on horseback.'"

Personally, the great Commoner is the cleanest man I have ever known. I have heard him on many occasions, both as speaker and a listner. I have heard stories told in his presence that were more or less off color." The remainder of the crowd may have laughed, but Mr. Bryan never. He never told a story that could not have been told in a parlor in the presence of ladies.

Not long ago, Mr. Bryan attended a reception for men only. He told a number of witty stories and had the crowd convulsed. A stranger appeared in the crowd and entered into the conversation and the general give and take of the occasion By and by there fell from his lips a coarse remark. Instantly, Mr. Bryan's firm jaw closed like a steel trap and his expressive eyes snapped fire. The stranger was hustled out and several apologies were offered Mr. Bryan for the occurrence, "Never mind me," said Mr. Bryan, "the remark did me no harm; my concern was for the boy waiting to shake my hand. It was not the sort of speech for a boy to hear."

However, there is not space in this magazine to tell anecdotes of this marvelous man. I must get down to brief and concise reasons why he should be elected. I have begun with his optimism, his hopefulness, his belief in the ultimate triumph of the right. I have suggested his personal purity, his wholesome cleanliness, his high-mindedness, his immaculate ideals. These ought to recommend him to every man, woman and child that believes in the upward trend, the higher view, the struggle for the soul's disenthralment.

As a thinker, Mr. Bryan stands in the forefront of the world's statesmen. He is the only living man who has the ear of every other man. The legislators of the world love to sit at his feet. He talks to them by invitation and they listen because of what he has to say. He handles no subject which he does not illuminate. He says what is timely and appropriate, grounded always in those principles that are eternal. This is why he never makes mistakes.

As an orator he stands without a peer. His style is that of simplicity. While the composition of his speeches is prosaic, it is effective. He is in no danger of being misunderstood. His style is direct forcible. He leads up to his climaxes through a series of undulations that hold the interest and bursts at last into the full force of forensic finality. On the road to his conclusion he is an agreeable entertainer but when he reaches his climax you feel the power of the super-man. He is the ne plus ultra in the realm of speech.

Mr. Bryan is as modest as he is great He announces himself "a moon shinning by reflected light" in comparison with Jefferson from whom he has derived his inspiration, yet he is a greater man than Jefferson. He has been in no aggregation of men for twelve years in which he was not acknowledged the greatest. When in the presence of kings and emperors and czars he was the colossus and they the pigmies. Though the hand of nearly every delegate in the Democratic national convention in 1904 was against him he went out of that convention as he entered it, far and away the greatest Democrat of them all.

Nature did much for him. He has a magnificent presence. He looks distinguished. In a crowd he could not be other than the cynosure of all eyes. Nature has set her mark upon him so that the whole world may read—"This is the man." He has assisted nature materially in his development. He has been a hard student. He has learned his lessons well. In the choice of a life partner he was particularly fortunate. His wife is a queen in the larger sense of that word. The white house has never contained her superior if it has held her equal. She is withal the most learned and cultured matron we have ever known. We have observed her in her home as a sacrificing daughter, a sympathetic and helpful wife and a proud and accomplished mother.

Mr. Bryan is today the greatest moral force in this republic, he is a just man and he believes that justice will do more toward civilizing the human race than powder and ball. He has more confidence in righteousness than he has in armies and navies, and yet he believes in war as a last resort when human rights are at stake and peaceful methods fail. He is not only a teacher by precept, but he is a teacher by example, He asks no man to be better than he can, but he expects every man to render to society the best returns of which he is capable, and he, himself, sets an example it would be well to follow.

The election of Mr. Bryan is demanded by every state in this Union. Wherever men are endowned with sympathy; wherever the weak are oppressed; wherever business is suffering the unjust competition of the trust; wherever legitimate trade is at the mercy of predatory wealth; wherever good impulses dominate the conduct of men, there is a demand for the election of William Jennings Bryan.

This fact was apparent at the recent great national convention of the Democratic party at Denver. Forty-five of the fifty standards represented in that convention, from every land over which the flag floats, flocked around the standard of Nebraska that had offered to the nation the services of her most distinguished adopted son. It was the greatest gathering of representative men in the entire history of the party. It is true the Nebraskan had nothing to give them. It is true he had no big stick to compel the support of the delegates It is true he had he had no federal office holders to make a show of force and enthusiasm. It is true he had no administration behind him to threaten and intimidate, but he swayed that convention from his home at Lincoln and the two demonstrations of over one hour each were the vocal expressions of the love and devotion and fidelity of the common people who had "heard him gladly"

What is the use to talk of another man for president? In all that is good America deserves the best. She ought to show to the world that she appreciates a great man when she has one. She ought to recognize merit when it is so palpably apparent. She now has a chance to recognize her greatest production and the world is looking on to see if she will be equal to the emergency.

Is not the fact that every state wanted Bryan nominated sufficient to justify his election? Is not the fact that no state wanted Taft nominated sufficient to justify his defeat? Do the people want a man who stands upon his own merit or do they want an echo of another? Have we reached the stage of degeneracy where we, a sovereign people, will permit a president to name his successor or have we retained enough vitality to assert our right of free choice? These questions are big with interest and demand an answer in this campaign.

Of course, Mr. Bryan can not please everybody. Lincoln had bitter enemies. Washington was abused by foes. Christ was crucified. No man who does something for his fellows can expect to escape the censure of the jealous and corrupt in heart. Bryan has been the victim of more abuse than any man now living, and paradoxical as it may seem, he is the most beloved. He has a world grasp on affairs of state, a clearly defined policy on all problems of discretion, and if the American people do not elect him to the office of president the loss will be irreparable. It will not be his loss, but theirs. Bryan has survived two defeats and is greater today because of them. He can survive another or dozen; but it is doubtful whether the republic can fare as well.

When the hot blast of prejudice dries up the brain of his victim an oasis becomes a desert. Nothing can grow in territory so afflicted. Prejudice defeated Bryan before, will it do so again? It is the fate of good men to be misunderstood. Bad men are sometimes forgiven, but good men pay the penalty. This is wrong but it is true. Mr. Bryan has paid the penalty of goodness. Because he was true as the needle to the pole he was humiliated. Because he was faithful to the cause of the people he was defeated. Because he would do something for his fellow man he was denied the opportunity. Because he stands four square to all the winds that blow he is accused of shifting Because he is inflexible as fate he is called a radical. Because he is absolutely just he is branded as dangerous.

The facts are that Mr. Bryan has in him the material for the greatest president this nation has ever seen. He has the capacity for illuminating the history of this country as no other man has ever illuminated it. His danger lies in his goodness and his greatness. He is therefore made the shining mark for the corrupt and dangerous and the envy of the small and mean. God grant that the better thought, the better conscience, the better impulses of our people may triumph in the election soon to come and that Bryan shall be exalted and the nation glorified.

STATE OF OHIO, CITY TOLEDO, LUCAS COUNTY. } ss.

Frank J. Cheney makes oath that he is senior partner of the firm of F. J. Cheney & Co., doing business in the city of Toledo, County and State aforesaid, and that said firm will pay the sum of ONE HUNDRED DOLLARS for each and every case of catarrh that cannot be cured by Hall's catarrh cure.

FRANK J. CHENEY.

Sworn to before me and subscribed in my presence, this 6th day of December, A. D. 1886.

(Seal) A. W. GLEASON, Notary Public.

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Take Hall's family Pills for constipation.

San Juan Pioneers.

The annual gathering of the San Juan pioneers will be held in Durango. September 30th and October 1st, during fair week. A meeting of local pioneers will be called in a few days for the purpose of arranging a program. In the meantime a cordial invitation is extended to every pioneer in the San Juan to arrange to spend a few days in Durango. No pains will be spared in making this the grand gathering of the association. As soon as a program is arranged, a copy with personal invitation will be sent to members.

GEO. N. RAYMOND, President.

JNO W WINGATE, Secretary.

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W C Ferrill, curator
Nat. history society

SILVERTON STANDARD

VOLUME XXI — SILVERTON, COLORADO, SATURDAY, MAY 29, 1909. — No 28

MINE AND MILL SUPPLIES

Agents for Repauno Gelatin Powder,
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We carry in stock Queensware, Paints, Oils, Window Glass, Guns and Ammunition, Kodaks and Photographic Supplies

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PHONE SILVER 1

CLIFFORD

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For the next week I will offer for sale my entire stock of Navajo Rugs at the following reduced prices:

$ 1 50 Rugs for	$ .95
2.00 Rugs for	1.40
4.50 Rugs for	3.10
6.00 Rugs for	3.85
8.50 Rugs for	6.30
9.50 Rugs for	7.10
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12.50 Rugs for	9.75
14.00 Rugs for	10.25
15.00 Rugs for	11.10
17.50 Rugs for	12.05

The holder of Cash Register Tickets aggregating $10 will be entitled to receive free 50c worth of goods in trade.

LOUIS BASTIAN, Proprietor

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All purchasers will never get imposed upon by dealing at The Fulton Market, for we keep nothing but the best of Meats. All tender, fresh and of that fine flavor as only choice Meats have Our Steaks, Chops, Roasts, etc. are as good as those served at the White House. We make it a study to please our customers and confine our efforts to that at all times.

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Buy from the

San Juan Lumber Co

and get the best

LUMBER, COAL FEED

Phone Silver 12. — Silverton, Colorado

MINES AND MINING

Getting Results.

According to the following taken from the last issue of the Ouray Herald beneficial results from the efforts of Ourny's Commercial club recently organized to boost the mineral resources of the county are already in evidence. Commenting thereon the Herald says:

"The efforts of the Ouray Commerial club have not been in vain. Already communications are coming in from parties in a position to give us the desires of our hearts A letter received Wednesday from a big reduction company makes inquiry as to the amount and character of ore that can be guaranteed daily to a smelter plant located in our midst. The writer stated that he had noticed in the papers the action taken by the Commercial club with a view to procuring smelting facilities for the treatment of our ores, and he wants to know the quantity, quality and value of the ore we can deliver to a smelter per day. This looks like results, and that is just what we are seeking. To handle the low grade ores of this camp—the ores that run from eight to thirty dollars per ton—means to make Ouray county the most noted camp in the state. It means that the prospectors who have held claims of merit for years will be able to realize on their holdings, and receive their just reward for the years of hardships they have endured.

"While the committee on tabulation has not completed its work, it has made a remarkable showing with the properties from which reports have come in, and is busily engaged in getting a complete tabulation of the properties and their output per day, together with the character and values of the ore. To have the inquiry come: "How much can you deliver at a smelter per day, and of what value is the ore; of what do the values consist?" sounds like business. Complete the tabulation and let the world know what Ouray county really has and the problem of converting our mineral wealth into money is solved. Capital will seek us. Make it possible for the operator to handle ten dollar ore at a profiit and bundreds of thousands of tons of ore will come in that is not being handled at all now, and capital for development purposes will come flowing in in streams.

"The ways and means committee had a meeting at the city hall last Tuesday night and organized for the purpose of raising at least $500 to carry on the work of tabulation and other necessary expenses. E. A. Phinney was selected as chairman. Charles T. Hammon as secretary-treasurer of the committee and Wm. Story, Jr., with these two gentlemen was named as a committee to solicit funds for the good work."

During the past two years the Standard has received several inquires of a nature similar to that noted in the Herald's article. We had not the statistics at hand to give an accurate answer or even a just approximation of the possible tonnage of the mines and prospects of the county, outside of the record producers and worse we had no place to go to obtain them. Hence in reply we could only give our opinion and in the matter of investments of dollars and cents facts and not opinions are requisite to obtain results. In this connection we will add that we submitted what we considered the most important of these letters to a certain prominent mining man, and was surprised to learn that outside of the properties he was operating he could not give us reliable information. He was a good booster for his own properties and incidentally a polite knocker on all others. Again, a few weeks ago we were politely informed by another mining man of our county, that the Standard's agitation for better smelter and railroad rates, was a waste of hot air and its efforts to organize a Prosperity club or any other sort of a body to advertise our great mineral resources was like unto irridescent dream. It was quite evident that to the recepient of this unexpected roast that as long as the property he was handling continued to pay, he did not care if all the rest were in hades. Well, we will keep right on agitating just the same, because we know that San Juan county has the resources and mines opened up, containing large bodies of low grade ores in addition to its high grade mines, sufficient to keep a large reduction plant in constant operation, if rates are so regulated, as they can be, to give them a chance to work. The recent purchase of the Ross smelter by Mr. Lowe and his New York associates, may solve the problem. But before it can do so, several additions must be made to render it adaptable for the treatment of other ores beside copper. Concessions must also be obtained in order that it may fix a rate that will enable them to handle the lower grades. On the whole, if we wish to succeed as we should, and become one of the greatest mining districts of the west, as we can, co-operation is necessary, and absolutely so. We must have some place to go to get statistics in order to intelligently reply to the inquiries of outside capital seeking mining investments, not in particular to one property, but to all and pointing to the producers as evidence of success. Who will take the initiative and start a movement to whose success in after years he can point to with pride.

The Cyanide Process

Another unqualified cyanide success is reported from the Smuggle-Almont mines and mill at Denton, Dolores county. The plant was recently adjusted and modified to meet all the necessary requirements for the special treatment of the ores of the district, and a recent test proved its merits and adaptability beyond question. There are several mines in San Juan county that will readily yield to cyanide treatment and it really seems astonishing that there is not several mills in active and successful operation in different parts of the county. Especially is this true with reference to the great gold belt along the eastern portion of the county. Every season brings to light new gold properties in this now well recognized belt of exceptional richness, and all evidently susceptible to cyanide treatment. The recent large strike of high grade gold and silver in the "All OK" in Minnie gulch being the first of the season. The Esmeralda also in Minnie gulch. The Intersection, Bullion Bar, Gold Nugget, Ridgeway and Little Maud with its immense vein of gold quartz containing several high grade streaks, all in Maggie gulch. The Buffalo Boy in which large bodies of high grade gold ore were proven by last year's work and all, in the opinion of experts, who have examined the ores of these mines, will readily yield to cyanide treatment. Then it is said by those who are familiar with the ores at the head of Cunningham gulch and Arastra as well as Bear creek, Deer and Elk Parks can all be successfully treated by Cyanide This only seems reasonable when we consider the many cyanide methods in successful operation throughout the state differing in so far as their adaptability to the ores of different localities require. We are informed that the new purchasers of the Esmeralda and also the Intersection in Maggie gulch are planning the construction of cyanide plants. We predict their success from the first run and look for a dozen more to follow in rapid succession. It looks like the dawn of the cynide age for San Juan county.

Dr. Miles' Anti-Pain Pills relieve pain.

Pythian Knights Visit Durango

On Saturday afternoon at 2 o'clock about forty members of Snowflake lodge No. 61, Knights of Pythias, left Silverton to visit their brothers of Montezuma lodge No. 22 at Durango. The train arrived at Durango about 5:20 and the Silverton boys were met at the depot by Uniform Rank of Durango lodge and escorted to the Strater hotel.

After dinner in the evening, C. S. Davis, Co. No. 1 of Silverton, under the able management of Capt. W. E. Bender, drew up in front of the Strater hotel. The Durango company of Uniform Rank came down the street led by the Durango band and wheeled in on the front of Silverton's company, and the two companies led by Durango's band and followed by the members of the two subordinate ledges marched up the street and after a short parade, marched back to the Castle hall of Durango lodge. After the address of welcome by Chancellor Commander Hill of Durango lodge, to which Chancellor Commander Grimes of Silverton responded, the Silverton degree team conferred the Third Rank on Mr. Bruner of Durango. The work was given in a creditable manner by the Silverton boys.

After the work in the Third degree was finished the Durango boys escorted the Silverton boys to the I. O. O. F. hall on the floor below where an elegan spread was served to all by the ladies. A seven piece orchestra played during the banquet and it made the Silverton boys sit up and take notice. Mr. Wm. Lewis of Durango sang two solos during the banquet. He has an unusual baritone and this proved another great treat to the boys from the "snowy" city. After the banquet the boys went back to the Castle hall, where cigars, good music and talks for the good of the order finished the evening's entertainment. The violin solo by Mr. Harris deserves special mention.

The Silverton Knights went back to to the hotel after their evening's entertainment feeling that their Durango brothers were the only royal entertainers on the globe. Never in the history of the Silverton K. of P. lodge was there any entertainment to compare with the one given by Durango.

On Sunday the two lodges gathered at the Red Men's hall to pay tribute to their departed brothees. The memorial service was beautiful Rev. Brother Ripley of Pueblo, No. 52, delivered the sermon and in it were lessons that should appeal to every Knight of Pythias. The choir rendered the opening and closing ordes in a beautiful manner and every K. of P. after leaving the hall felt that he had learned the lesson of Friendship, Charity and Benevolence upon which that order is founded.

Long in the memory of Silverton Knights of Pythias will repose the gracious reception and magnificent entertainment provided for them by their Durango brothers. Everybody feels the deepest gratitude and the strongest fraternity and knows that this visit will be of great and lasting good both to the Silverton and Durango lodges.

If all the work planned for Animas Forks is only one-half carried out this summer, it will be one of the most active sections of the county, and a return of the good old days of yore are looked for There is no good reason why it should not be so. If in the olden days the ores of this famous district could be made to pay with the expensive pack train as the only means of transportation to reduction works hundreds of miles away, why is it not equally productive today with a railroad at its door and a smelter close by. Here is where the rate question becomes significant.

Another large strike is reported in the Frank Hough mine, with values in copper and gold exceeding all former discoveries, and at the point where the ore body was cut by the tunnel gives evidence of great size and extent.

PLEASANT THOUGHTS::

Of the coming summer are probably in your mind. You expect to have a lovely time of course. But there will come rainy days only fit for reading and catching up with your correspondence. Then is the time you will appreciate a supply of our

Books and Stationery

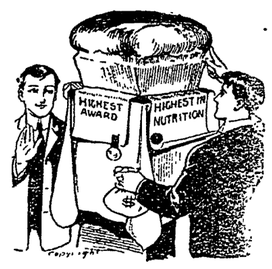
While others are hunting for a good book you will have one at hand. When others are complaining about their stationery you will have plenty of the best.

Dr. M. M. Blair

THIS IS WHAT THE

Silverton Supply Company's

Baker Does. Can You Equal It?



We have tried, are trying, to improve, the quality of our bread and rolls not that we are ashamed of it, but that we want to make it even better than it is. That's why it's as good as it is When it's better if ever it can be—it won't be higher in price and you will get the benefit. Groceries and Fresh Fruits

GRAND HOTEL BLOCK

The Way is Paved

with precious dollars when honesty, integrity and push are your assets. Money is only safe, though, in a

BANK'S STRONG VAULT.

Add to your prosperity a daily deposit here and your dollars will be safe. For deposit on investment use us. We are helpful either way.

The Silverton National Bank

GUY L. V. EMERSON, Cashier

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FOR FINE JOB WORK GO TO THE STANDARD

SILVERTON STANDARD.

J. T. JOYCE, Editor and Publisher.

Entered at the Silverton, Colo., postoffice for transmission through the mails as second class matter

OFFICIAL PAPER CITY AND COUNTY

SATURDAY, MAY 29, 1909.

Mr. Edbrooke's Report

SILVERTON, COLO., May 12, 1909.

To the Mayor and Board of Trustees of the Town of Silverton.

GENTLEMEN:—After examination of the city hall building, I beg leave to report upon its condition as follows:

I am basing my opinion upon materials that have fallen from the building and the plan of the wall in the second story.

On the first floor the condition of the building on the two sides and the rear is good, but the tower is somewhat racked The tower, however, would be sufficient to support a moderate weight.

In the second story the mortar seems to be somewhat affected by frost; the backing is wholly unfit for the purposes used; being native granite, while the backing of the first floor is made up principally of the red stone and is a good job. On the second floor, the ashler is not properly bedded and would probably bring down any wall, the beds being knocked off slack instead of being square. This information is gained from looking at the rock ready to put in place and from observation of some of the stones that have fallen out. From my observation I would conclude that on account of the condition of the mortar and the stone the second story is in an unsafe condition. This is partly and perhaps principally due to the plans; but I would say that there is a very great deviation from the plans in regard to the bonding of the work.

The rubble backing of granite is wholly unfit for this class of work, being too irregular in shape and not allowing proper joinder with the veneer or ashler; this makes it necessary to use spawls and these act as wedges, separating the two portions of the wall or at least have a tendency to do so.

The stone turned over shows a fair amount of anchors having been used, at least the holes for them are in the stones and it appears that an ample amount of anchors were furnished for the building.

DAVID RAMSEY.

SILVERTON, COLO., May 24, 1909.

To the Honorable Mayor and City Council.

GENTLEMEN:—As per your request, I have made as thorough an inspection of your new city hall building as possible under the present wrecked condition and beg leave to report as follows:

In my examination so far as I can see, I feel satisfied that the basement walls are all right. There seems to have been better stone and mortar used and better workmanship than in the stone work above.

The stone ashler above the basement was backed up with a very poor quality of stone and poor mortar was used. The stone was mostly small, irregular in form without top and bottom beds and no bonding as provided for in the specifications.

From what I can see the lime in the mortar was not all slacked, therefore very poorly mixed and not proper for that or any other kind of work. The stone backing in the first story seems to be much better than it is in the second story, and if it was bonded as specified to be, may stand all right, but the second story walls should come down and be rebuilt, as in my opinion the mortar all froze before it had time to set and therefore the stone not absorbing the moisture as it does in brick and as the frost comes out it becomes as dry sand and lost its value as mortar.

Now in my opinion the best remedy to apply in this case is to shove up the roof with strong substantial timber, work by sections, take down all stone walls to the second floor and all front tower walls to the first floor and rebuild them with proper material and in a substantial manner. You can use large flat bedded stone to back up the ashler with or extra hard burned brick which is just as good or better, anchoring each piece of stone ashler to the brick backing or stone with 1-8x1 inch iron anchors. If you back up with brick these second story walls can be four inches less in thickness than if made of stone as at present.

In rebuilding the walls under the front tower, I would prefer to build with extra hard burned brick laid up in cement mortar and grouted in every course, extending clear up to top of masonry work and I believe in rebuilding the second story exterior walls of the building without removing the roof, that it will be much easier to back up the stone in working around the timber work, etc.

Now gentlemen, I believe I have made my idea as clear as possible of the reconstruction of your city hall building from the plans and specifications and the condition of the building as I find them from my inspection, I would advise that when you resume the work of reconstruction of the building, that you employ a competent superintendent and keep him on the building at all times during working hours up to the completion of the same.

F. E. EDBROOKE.

August Fast, our popular and hustling real estate and insurance agent, Thursday paid $500.00 into the Miners' Union Hospital fund. Two months ago, when Mr. Fast promised this magnificent donation for this most worthy cause, he also agreed to double it providing two more could be found who would subscribe an equal amount within a reasonable time. Mr. Fast, concluding sufficient time had elapsed without results, accordingly made the payment as he agreed to do.

Mr. and Mrs. James L. Dyson went down to Durango Monday and later on will visit in Aztec and Farmington.

GREAT FIRE SALE!

COMMENCING MONDAY, MAY 31st, 1909.

CONTINUED UNTIL ENTIRELY SOLD OUT

Monday we will place on sale a large assortment of goods which passed through the recent fire in our store at prices so low they are astonishing. Beyond a smoked or scorched appearance these goods are not damaged in the least. In order to make room for our immense line of new goods now on the road we must dispose of these goods at once and are offering them at prices almost equal to a gift. Come early as the best is sure to go first. :: :: :: :

Fire Damaged Goods at 25c to 50c Discount

Men's Shoes	Ladies' Shoes	Childrens Shoes	Boys' Suits
$7.50 High Top Shoes at..$6.00	$5.00 Dress Shoes at.....$3.90	$4 00 Boys High Top at..$3 00	$6 00 Suits at.....$3.75
6.50 High Top Shoes at.. 5 00	4.50 Dress Shoes at..... 3 00	3.50 Boys High Top at.. 2.50	4.00 Suits at..... 2 50
5.00 High Top Shoes at.. 4.00	3 75 Dress Shoes at..... 2 75	2 50 Children's Shoes at.. 1.75	3 00 Suits at..... 2 00
6.00 Dress Shoes at..... 4 00	3 50 Dress Shoes at..... 2 50	2 00 Shaker Bal. Shoes at 1 50	16.00 Men's Corduroy suits
5.00 Dress Shoes at..... 3 50	3.25 Dress Shoes at..... 2 25	Other grades of shoes slightly	at.....$10.00
4 00 Dress Shoes at..... 3 00	2.50 Dress Shoes at..... 1.75	damaged from $2 00 to 35 cts.	All other men's goods at porportionately low prices.
3.00 Dress Shoes at..... 2.50	2.00 Dress Shoes at..... 1 50	Every Shoe a genuine bargain.	

M. BRUMFIELD

SUNFLOWER SHOES

Now is Your Chance to Get the best Bargains ever offered in Silverton. 25 to 50 per cent. discount. :: :: ::

Highland Mary Moves.

Arthur Ayres who has secured the contract for packing and hauling the ores and supplies for the Highland Mary, is now on the ground opening up the trail, when last heard from expected to reach the mine with his pack train yesterday. He hopes to be able to start getting the large amount of ore which accumulated during the winter, on the way to the smelter by Monday. James E. Merry, one of the principal owners and general manager, is at present at the mine getting things in shape for the most vigorous season's operation in its history and just as soon as Mr. Ayres makes room in the bins for the ore broken in the mine a large force of men will be put to work and the famous pronucer will again be in full swing On account of ill health Ora Kirk, who held the position of superintendent so satisfactorily for a num-number of years, was forced to resign and George C. Hill, formerly of the Shanendoah, has been appointed to succeed him. J. C Campbell, one of San Juan's most successful operators, who will henceforth act as consulting manager in company with Mr. Hill made a thorough examination of the mine Wednesday and pronounce it in better shape with more ore in sight and ready for extraction than ever before. He looks for 1909 to be its banner year and he always guesses right. During development work considerable rich ore found its way into the dumps and the company having received several applications has finally concluded to lease them for the present year.

Salesmen Wanted.

We want salesmen to sell guaranteed groceries at wholesale direct to ranchmen and farmers. Prefer experienced men, but will teach the business to a limited number. We want hustlers. Big pay. Steady work, address with reference. Hitchcock-Hill Co., Dearborn & Lake streets, Chicago, Ill. tf

New Home Bakery.

Cora Shaddle is prepared to do all kinds of home baking. Bread, cakes and pies. Fancy cakes a specialty. Removed to building next to American Carpet Co. on 13th street. Phone Silver 64.

16tf

Work on North Star Starts

Repair work was began this week on the North Star mill of the Silverton Mining company. Mr. D. M. Nichols with Morse Bros. of Denver, is in charge of the work. Mr. Nichols is one of the pioneer mill men of Colorado and his work throughout the various sections of the state testifies to his energy and ability. William Kearn is in charge of the carpenter gang.

Willfey tables, jigs and rolls will be installed. The present stamps will be used for regrinding In forty days a plant of one hundred tons capacity with the best modern machinery will be in operation. The mine has a large amount of fine milling ore opened up and the old North Star will in a few months resume the position she once had as one of the best paying mining propositions of San Juan county. The entire community rejoice with the company in the successful fruition of hard. preserving. miuerlike work on this big property. To Hon. T. R. Henahan, the efficient manager, we extend hearty congratulations

Princess Chrysanthemum.

Tonight the Senior class of Durango High School will present the popular Japanese operetta "Princess Chrysanthemum" at the Opera House. The following is the cast of characters:

Princess Chrysanthemum—Emperor's Daughter	Myrtle I. McKinney
To-To, Yum-Yum, Tu-Tu, Tu Lip — Maidens Attendant on the Princess	Lelia C Silliman, Ethel V. Berndt, Pearl L. Butler, Mary E. Spear
Fairy Moonbeam	Goldie S. Hocker
Attendant Fairies	Mary E. K. Steans, May I. Huggins, Edith L. McGregor, Emma Fankhauser
The Emperor What-For-Wha	Chas. G. Houk
Attendants on Emperor	William Buchanan, Ernest Fankhauser
Prince So Tru	Paul R. Jakway
Prince so-Sil	Reginald J Bacon
Top-Not, Court Chamberlain	Jas. A. McGillis
Saucer-Eyes, Wizard Cat	Richard R. Lane
Sprites, Attendants on Saucer-Eyes	Edward Baker, David E. Davies, George F Fritz, Harry D Willson
Scene I	The Emperor's Garden
Scene II	The Cave of Inky Night
Scene III	Same as Scene I

Admission 75c. Seats on sale at Post Office store.

Little Katherine Arrington, who has been making such a heroic struggle for life after undergoing two dangerous operations at Oschner's hospital in Durango, took a sinking spell Wednesday evening and for awhile it was thought she had only a few hours to live. Her father was 'phoned for at Silverton and made a flying trip to Durango in Otto Mears' automobile. His presence seemed to give the little sufferer courage and as we go to press she is reported very much improved.

FOR SALE—Sewing machine Phone 764 red.

With the building of the Peerless San Juan's new mill, the Kittimac in full swing, the Esmeralda going and Jim Kelly's rich discovery on the "All OK" added to the list, Minnie gulch will hum with activity from now on.

Farm Bargains Near Aztec.

No. 1. 100 acres, 5 miles from Farmington, good water right, 7½ acres orchard; $5,000, half cash.

No. 2. 30 acres, 1 mile from Aztec, 5 acres young bearing orchard; 2 acres early strawberries; 2 room house, $4,5000. Good terms.

No. 3. 17 acres at Flora Vista, half of it in fine bearing orchard. All kinds of small fruit; four room house. $4,500, half cash.

No. 4. 10 acres, 4 miles from Aztec, 5 acres pears, cherries and apples. Small fruit. 5 room frame house. $3,000, half cash.

No 5 40 acres, one and one-fourth miles from Aztec, 30 acres under ditch, 4 acres young orchard, 1½ acres small fruit, 5 room house $1,800, $1,200 down. This is a snap.

There will be a full fruit crop in this vicinity. Buy a farm where there is no danger from late frosts.

See H. G. Heath for particulars.

Great Bargains.

Do you want to buy a home in Silverton? See H. G. Heath.

Four room house, modern throughout, $2,100.

Five room house, everything modern, $2,400.

Eight room house. A fine home with all the conveniences, $3,150, $1,000 down.

Seven room house; $1,800.

Eight room house; $1,700, $800 down.

I have other desirable properties on my list.

Call on me before you buy.

Next to the Root & Norton assay office.

Notice to Owners of Loose Live Stock

You are hereby notified that the further trespass of loose and roaming live stock on the property of the Hercules Consolidated Mining Co., is hereby forbidden and that hereafter the owners of live stock found trespassing upon the company's ground will be dealt with according to law.

THE HERCULES CONSOLIDATED MINING CO.

By Thos. Kane, Manager.

27-tf

On June 1, 09, we will sell for feed bill, one sorrel horse, branded XI on left hip, weight about 1,000 pounds. DOUD BROS.

Ten Doctors Said He Would Die

"In 1903 we wrote you regarding my husband, who was suffering from heart trouble. He was superannuated by the North Georgian Conference. Ten doctors at different times said he would die. You advised Dr. Miles' Heart Remedy and Restorative Nervine: we did as advised, and improvement was apparent from the very first. He recovered and the Conference in 1904 gave him a charge. He never felt better, although he has very heavy work and does a great deal of camp meeting work. I am so glad we took your advice and gave him the medicine, and feel that I ought to let you know of the wonderful good results from its use."

MRS. T. S. EDWARDS,
Milner, Ga.

This proves what Dr. Miles' Heart Remedy will do. Get a bottle from your druggist and take it according to directions. It does not matter whether your heart is merely weak, or you have organic trouble, if it does not benefit you take the empty bottle to your druggist and get your money back.

A Corking Story

of our Navy, by Robert Dunn, the well-known war correspondent, with pictures by REUTERDAHL, the man who threw such a scare into the naval authorities last year; six other fine stories of assorted kinds; four articles that mean things, two of which were written for the special purpose of saving *you* money; bright, crisp humor—all bound in a stirring Memorial Day cover—that's the

JUNE EVERYBODY'S

For Sale at P. O. Store and Louis Bastian

FRANK L. ROSS
Attorney-at-Law
Office in Benson Block.

Design 562
Three-Button Novelty Sack, dip front, curved pockets

YOUNG MEN

desiring such effective clothes as can be made from distinctive colorings and fashions, will find every requirement fulfilled by the beautiful fabrics and original fashion ideas presented through us by those famous Chicago tailors, Ed. V. Price & Co.

Our Tailoring Department will take your measure and assure you absolute satisfaction in every attribute of style, fit, individualty, workmanship and wearing service, all for 40 to 60 per cent under the charges of the average tailor.

Will you call today?

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THE GENT'S FURNISHING MERCHANT

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THE GROCER
CORNER OF TENTH AND GREENE STREETS

Potatoes, the best in town
La Jara Eggs and Butter
Prices right on everything

Telephone Red 1094

Now is the time to cleanse the blood. Our Sarsaparilla is the best blood purifier made. Fresh, clean sassafras bark just received at Cunningham's.

Dr. Pierce's Favorite Prescription

Is the best of all medicines for the cure of diseases, disorders and weaknesses peculiar to women. It is the only preparation of its kind devised by a regularly graduated physician—an experienced and skilled specialist in the diseases of women.

It is a safe medicine in any condition of the system. THE ONE REMEDY which contains no alcohol and no injurious habit-forming drugs and which creates no craving for such stimulants.

THE ONE REMEDY so good that its makers are not afraid to print its every ingredient on each outside bottle-wrapper and attest to the truthfulness of the same under oath.

It is sold by medicine dealers everywhere, and any dealer who hasn't it can get it. Don't take a substitute of unknown composition for this medicine of KNOWN COMPOSITION. No counter'eit is as good as the genuine and the druggist who says something else is "just as good as Dr. Pierce's" is either mistaken or is trying to deceive you for his own selfish benefit. Such a man is not to be trusted. He is trifling with your most priceless possession—your health—may be your life itself. *See that you get what you ask for.*

LINOLEUMS---FLOOR COVERINGS

The prettiest line of floor coverings ever displayed in Silverton All at popular prices. Remnants of all kinds and grades will go to make room for the new stock at prices that will sell them.

LOOK AT THIS

We will meet catalogue house prices on the same grade and quality of goods in our line. If you will demonstrate where we cannot, we will order you the catalogue job and pay the freight. Isn't that fair? o o o o o o o o

THE FURNITURE STORE
L. G. PROSSER

W. D LOGAN
Coal-Transfer - Baggage
Office at Alexander's Barber Shop Phone Red 232

FOR FINE JOB WORK GO TO THE STANDARD

Town Topics

See the new shirt waists at McCrimmon's. 24

Just received some new collapsible go-carts at Prosser's. 1t

Silver Koehler is quite ill at his home with chicken-pox.

New goods arriving daily at McCrimmon's. 24

Mrs. C. S. Casad delightfully entertained a few lady friends at 6 o'clock dinner last Tuesday.

Dress waists, dress skirts at prices that talk. HUMMEL'S. 26-tf

Mrs. Thomas Annear entertained the Embroidery club at a neatly arranged dinner last Friday afternoon.

Those Suits and Jackets at Hummel's are going fast, but a few left. 26-tf

Mrs. O. F. Haas was hostess for the Whist club last Tuesday afternoon and delightfully entertained them at her home on Reese street.

25 Black, all silk petticoats, 72 inch ruffle; special for Monday, at $4 25, at McCrimmons. 27-tf

Master Henry Stockder and Lillian Gardner entertained Miss Blanche Palmquist and Mrs. Cotton at luncheon Friday, May 28, 1909.

Hummel is positively closing out to move away. Everything at bargain prices. 27

New style Missionette curtains. Others in beautiful designs. Spring patterns. Don't lose money and satisfaction by neglecting to see them.
THE FURNITURE STORE.

Mrs. James E. Merry and children of Bowling Green, Ohio, will shortly arrive in Silverton and remain during the summer with her husband, who is general manager and heavily interested in the Highland Mary mine.

This week's selling at Hummel's made the muslin underwear department look sick; same prices will be in vogue next week, but the line is smaller. A few fine muslin skirts left, at 65c and 75c. 27

Louis Bastian, our prominent confectioner and ice-cream caterer, has decided to continue his sale on Navajo blankets another week in order that those who have not availed themselves of this opportunity to procure a handsome blanket at small cost may have another chance.

Two dozen white and colored jackets, wash suits, at Hummel's. Most of them are going at a uniform closing out price of $6.35. Very latest creations, material is linen. 27

Mr. and Mrs. Allie Watson gave a delightful birthday party last Monday for their bright little six-year-old old son Barney. There were twelve of his little playmates present and all had a jolly good time.

See the new Oxfords at McCrimmon's, the famous Ultz and Dunn make.

Little Miss Margurite Sullivan was agreeably and pleasantly surprised by a large party of her school mates at her home last Wednesday evening. Although taken by surprise the little hostess did not lose her presence of mind and all the little ones enjoyed themselves immensely.

If you get a Warner corset at Hummel's before they are all gone you will never regret it. 27

The announcement of the permanent retirement of W. D. Lee as superintendent of this division of the D. & R. G., undoubtedly means that P. D. McAtee will succeed him. Everybody in Silverton hopes this is true, as we all love Mac, and believe that no better man could possibly be selected for the place.

If you are skeptical, send a friend to Hummel's store, when she returns, you will go. 26 tf

The Albany Hotel Co. of Denver have a notice in another column which is well worth reading, if you contemplate furnishing a rooming house or small hotel. The Albany is completely refurnishing 110 guest rooms, purchasing new chairs for its elegant restaurants and refitting the office. This furniture and equipment can be purchased very reasonably, if taken at once. 28-2t

FOR SALE—Two second hand pianos, good as new. One drop head Singer sewing machine. Several other articles of household furniture. Inquire of T. J. Shea, 134 West 15th street. Phone Black 343. 26-tf

The brick walls of the new Rodgers' block is rapidly climbing and will likely be finished by the middle of the week.

A few pairs of wool blankets left, at Hummel's. They are bargains. 27

R. S. Rankin, district agent for the Telephone company, with his mother and brother, are pleasantly situated at the Prosser residence.

FOR SALE — Opera Rooming house. Reason, poor health. 24-tf,

The Hub saloon which has been recently repapered, painted and decorated presents as neat and handsome appearance as any resort of its like in the west.

Florsheim Oxfords for men, the new oxblood and Russia leather, at McCrimmon's. 24

The new brackets supporting the balconys in the Pascoe Opera house are in place the former poll supports are taken out and the floor is absolutely clear and the stage free from all obstructions.

If you want to go to the post office you will find it just opposite Hummel's store. 27

The Miners' Union is making extensive preparations for a grand ball on the night of July 3rd and another to follow on the night of the 5th at Miners' Union hall. The committee in charge intend to outdo all former efforts; that means going some.

We have a strong line of one piece summer dresses in white and colors, prices $4 35, $5.45, and $7.50, at Hummel's.

Jim Clifford, one of Silverton's leading and hustling business men has undying faith in the future prosperity of the camp to which he gives evidence by erecting an immense ware house on Reese street on a lot recently purchased from Geo. Noll immediately in the rear of his big store.

Ladies Oxfords, the new golden brown shades, just received at McCrimmon's 24

Between 30,000 and 40,000 trout frye were received Thursday by Edward Lussy from the Durango batchery for the purpose of stocking South Mineral creek. Mr Lussy has been energetic in the matter and for the past three years has been heavily stocking the stream. The result of his labor will soon bring pleasure to the deciples of Newton.

As we go to press Commencement exercises for the Silverton High School are being held at Miners' Union hall. It is well attended and evidently most thoroughly enjoyed by all present. This year's graduates are Joe Dresback, Ollie Lockhart and Matthew Moyle Besides there is a larger number of grammar school graduates than usual. A full account thereof will appear in next week's issue.

The Colorado Telephone company have announced the following new toll rate to take effect May 26th: Aspen, 85c; Aztec, 60c; Creede, 30; Colorado Springs, $1.30; Delta, 55c; Denver, $1 60; Durango 30c; Grand Junction, 80c; Alamosa, 80c; Buena Vista, 90c; Salida, 80c; Leadville, $1.00; Pueblo, $1.35; Monte Vista, 65; Cripple Creek, $1.15. Farmington, Montrose, Ouray and Telluride remain at the old rate.

Homer W. Ford, assayer at the Old Hundred mine, and one of San Juan's most popular residents, accompanied by his charming young bride, formerly Miss Edith Harris of Denver, were arrivals Wednesday evening. They have secured the Aveline residence, where they are pleasantly located The Standard joins with a host of friends in wishing the happy couple bon voyage through life.

I take this opportunity to announce that I have been and am still representing the New York Life Insurance company in this district and would especially recommend its policies to those who wish life insurance. The biggest and most reliable and best of all old time companies. Parents and guardians' special attention is called to its new endownment policy for ages 15 to 20 at the lowest rates in existance.
MRS. M. H. SCHEMLZER.
28-tfc Agent.

It affords us great pleasure to acknowledge the receipt of an invitation to attend the Thirty-fifth annual commencement exercises of the Colorado School of Mines, which were held yesterday at Golden. Lohman's famous orchestra of Denver furnished the music and the principal address was delivered by John Hays Hammond, E. M. President Victor C. Anderson conferred the degree of E. M (Mining Engineer) on thirty-eight graduates. Among them being Robert Ingersol Kirchman and Donald Bryce Doyle, who were members of last year's Silverton ball team.

FOR SALE—Carpets, rugs, curtains, window shades and other furnishings of a five room modern house which will be vacated about June 1st Apply at Dr. Keyser's office. 27-tf

= Personals =

Mr. and Mrs. Charley Spicer returned Sunday from a trip to Denver.

Mike Hurley is down from the Sunnyside, taking a few days needed rest.

Manager Tom Kane of the Hercules is back from a business trip to Denver.

Editor Finch of the Miner returned Wednesday from a flying trip to Denver.

Billy Lowe is back after a year's absence, the most of the time he spent in Denver.

Attorney Ben B. Russell spent a couple of days in town early in the week on law matters.

Dr. H. B, Wagenschieffer of the Gold Queen M. & T. Co. is back from a business trip to Denver.

R. W. Hollis, who spent several days in the city early in the week, has returned to his home in Denver.

Mr. and Mrs. A. A. Brown have returned home from an extended visit to New York and other eastern cities.

Vic Kerr, new manager of the Gold King, returned from a business trip to Denver Friday.

Mrs. Rasmus Hanson, who spent the week at her Silverton home, has returned to the ranch in the Animas valley.

Rev. C. A. Page of Denver, who has been officiating at the Congregational church for the past four Sundays, returned to his home.

Sam Wittow is back from a visit to New York and other eastern cities. Summer goods of the very latest will follow in a rapid stream.

Billy Crocker is in Denver on business. But it is a sure bet that a little pleasure will be interjected here and there from time to time.

Simon Underbruner, one of the owners of the Buffalo Boy, is here for a few days from Silver Plume, where he has charge of a promising mine.

Frank Slattery, Frank Thompson and Roy Grebles, a trio of Silverton boys who are attending Kemper Military College at Booneville, Mo., will likely be home in a few days.

Rev. Father O'Malley of St. Patrick's Catholic church, spent a couple of days visiting with Father Calahan at Durango on his return from Antonito.

Mrs. C. D. Crum went down to Farmington Monday morning for a week's visit with her parents, Mr. and Mrs. Thomas Newton, formerly of this place.

Guy L. V. Emerson, cashier of the Silverton National bank, spent Sunday at Trimble Springs and continued on to Denver Monday morning on important business matters.

Mrs. J. T. Terry, who was taken so suddenly and seriously ill early in the week, that her husband who was in Denver, was immediately called home, is reported considerably improved.

Miss Elizabeth Aveline left for Grand Junction Saturday to join her mother and brother James, formerly of this place. She was accompanied by Afton, the bright little son of Mr. and Mrs. A. A. Brown.

Gene Grimes left for Booneville, Missouri, to attend the commencement exercises at Kemper Military college which he formerly attended and will spend some time visiting at different places with his former school mates.

Mrs. A. P. Root, who has been suffering for the past week from a severe cold and ear ache, leaves for Trimble Springs this morning, accompanied by her little daughter Jeane, where they will remain several days. Mr. Root and his partner in business, N. A. Norton, will also spend Sunday at the Springs.

The Grand hotel was a few days ago leased to Fred Grebles, mine host of the Benson house, for a period of five years. Mr. Grebles will take charge about June 1. The first big banquest in the new Grand is already contracted. It will be given the 22nd of next month by the Elks and two hundred and fifty guests will be served on that occasion.

Robert L. Cockran, state dairy commissioner, spent a day in the city inspecting the dairies of Silverton. He pronounced the Thompson dairy the most sanitary and up-to-date in the state. He says the city dairymen of the state could learn considerable along this line if they would visit this institution.

Billy Shea is back from Minneapolis, where he was in attendance at the National Convention of the Cook, Waiters' and Bartenders' Union, as a delegate from San Juan county.

M. Brumfield is certainly going some in way of overhauling and cleaning his big store since the recent fire. He has rebuilt the dark room in his studio and made several changes to the same, and also being alive to the wants and wishes of the buying public pushes to the front a big fire sale where bargains galore may be had. See his big 'ad" in this issue.

Mrs. Wilson of Victor, a daughter of Squire and Mrs. W. D Watson, will arrive Sunday evening and after a few days' visit will return to her home, accompanied by her mother, who will undergo further treatment for her eyes. It is hoped and expected that this treatment may be successful in every way and that her eyesight may be fully restored.

The news of the selection of Hon. John W. Wingate of Durango by the G. A. R as its Department Commander, was received with pleasure by his comrades throughout the state and particularly in southwestern Colorado where he is so well known and universally loved and respected by all, because he is the embodiment and personification of all those noble attributs of the human character which constitutes a man. While we offer our hearty congratulations to Commander Wingate with pride and pleasure, still we feel more like congratulating the Department upon the wisdom of its choice.

This Will be Pleasing to Colorado State People.

The announcment made some ten days ago that Mr. F. W. Paget was not to remain at the popular Albany Hotel, Denver, was somewhat premature on the part of some parties who wished to do Mr. Paget harm. Mr. Paget will still remain the right bower to Messrs. Dutton and Eppstein. He has their entire confidence and is too valuable a man for them to ever think of retiring.

School Notes.

The pupils writing the county examination for completion of the common school branches are as follows:

Hazel Boden, Helen Wyman, Norman Maxwell, Ollie Hodges, Mary Wood, Philip Brown, Thomas Higgins, Harold Fletcher, John Dreyer Lucy Martin, Olga Dillion, Frank McLennon.

Silver Koehler being confined to his room with the chicken-pox, is unable to write the examination with the above named pupils.

Ennis & Haas

In accordance with their promises last week's program presented at the opera house by Ennis and Haas Amusement company, was among the best ever exhibited in Silverton. "When we were Boys" recalled many pleasant memories and evoked bushels of merryment and screams of laughter. The illustrated songs by Profs. Ennis and Wright are always well received and hugely enjoyed. The boys never let up and are always looking for something new Consequently this week at great expense they have a series of film just out and have secured the exclusive right of being the first to exhibit them in the state. Some pathetic, others tragic and mostly all extremely funny. If you want to laugh and grow fat, dig up your little old ten cents and spend the evening with Ennis and Haas at the opera house.

The Gretest Bargain Ever Offered in Hotel Furniture.

On account of newly furnishing 110 rooms of the Albany Hotel, we now have for sale the complete furnishings of 110 guest rooms. This furniture has been in use for a period of four years and is practically as good as new Besides these 110 guest rooms, we have four sideboards, 50 dining chairs, Bohemia style, 60 Cafe chairs furnished in green, 18 very heavy fumed oak office chairs and 4 fumed oak office settees, 20 office chairs finished in mahogany, 4 office settees finished in mahogany, 20 upholstered parlor pieces finished in mahogany, 5 Tuna Mahoghany Davenports, 8 hall settees, 24 pieces red furniture, 6 glass top, double writing tables, 15 iron and brass beds, 50 wood cots, 40 mattresses.

As our new furniture will arrive about June 1st, this furniture can be bought very cheap, part cash and part on easy payments.

This eqipment would be exceptionally good value for anyone furnishing a large rooming house or a small country hotel.

Address all communications to Private Office, Albany Hotel, Denver, Colo 28,2t.

R. W. Hollis returned to Denver Monday.

Woodmen Memorial

On Sunday, June 6th, the Woodmen of the World, assisted by the Women of Woodcraft, will hold their annual memorial services at Hillside cemetery, when two new monuments to deceased members of the order will be unveiled Members will assemble at Miners' Union hall at 9:30 a. m. and from there march to the cemetery.

San Juan Woman's Club.

The San Juan Woman's club will meet on June 5th. with Mrs. Mundee. The following subjects will be discussed: Renaissance and Modern Art, chapters 31 and 32. Magazine article, Modern Italian Art. Responses, An Historical fact about an Italian Artist.
Leader Miss Hollingsworth.

Big Doings With the Eagles

Last Friday night was the date set for the Eagles smoker and when the appointed hour arrived a large crowd of members of the order and invited guests was assembled in the Miners' Union hall to enjoy the princely entertainment provided by Silverton Aerie, No. 177, F. O. E.

The first thing on the program was the showing of a very interesting film of moving pictures. Then came a three-round bout in the squared circle with the padded mits. Lew Haas and Roy Tewksbury were in opposing corners and their exhibition of the manly art was a fast one from start to finish. An illustrated song, "Roses," followed this bout. Rags Bausman, the singer, by his fine voice and splendid rendition, won the enthusiastic approval of the large audience. Some more pictures, portraying in realistic manner the Jeffries-Fitzsimmons fight, were then thrown upon the screen. Following this the bout between Jackson and Alvarado seemed a rather tame affair. The Mexican, who had been touted as a fighter, made a disappointing showing.

The main feature of the evening was the splendid program given by the Minstrel boys. From the opening overture to the closing chorus, "A Big Night Tonight," the audience thoroughly enjoyed and enthusiastically applauded the program. Solos by Lew Haas, "Hurry Back;" Paddy Hughes, "When the Morning Glory Twines Around the Door;" Tom Evans, "Somebody Loves You, Dear;" Will. Ennis, "M-u-m's the Word;" E. P. Grout, "Adam Never Had no Black Mammy," and a whistling solo by Wm. McAtee were all received with the greatest acclaim. The jokes which were numerous and far-reaching kept the audience in good humor and the recitation by Wally Haas hit the fancy of the crowd.

After the minstrels there was more boxing. Karl Thompson and William Koehler, Ennis and Tewksbury, Wurtz and Wiener, Tewksbury and Wurtz, Newcastle and the Gambling Kid in turn appeared in the arena and made a holiday for the assembled populace.

Cigars were good, free and plentiful. In the ante-room a splendid lunch was spread and the amber fluid, that made the reputation and fortune for several gentlemen whose names were made in Germany, flowed freely for any who cared to indulge. The crowd was good natured and well behaved. Everybody had a fine time and it was the unanimous opinion that it was the best affair of the kind ever given in Silverton. The Eagles certainly scored another success.

African M. E. Church.

A couple of years ago the members of the A. M. E. church purchased the old Catholic building on Mineral between 12th and 13th streets. At the time of the purchase the old building was practically dismantled if not demolished and in order to place it in proper condition in which to hold services, a considerable sum of money and plenty of hard work was necessary, a herculean task for the little congregation and its limited means. Matters drifted along in this manner until early last spring, when two members of the congregation, Ed. Davis and W. J. Palmer with the heart and courage of a lion concluded to take matters into their own hands and see what could be done to practically rebuild the church and make it serve the purpose for which it was bought. They went out among their friends and business men of the city and in a short time sufficient funds were on hand to enable them to buy material and begin work. They were both mechanics and volunteered to do all the work themselves at odd hours from their regular employment free of charge to their brethren. They hauled brick, timber and other material through the snow, and the final result is as neat appearing a little edifice built to glory and service of God as can be found in any village of equal size in the land. The rear of the church was petitioned off and converted into three handsome living rooms for the pastor. These men did noble work and deserve great and lasting credit for the accomplishment of a task which in the beginning seemed among the impossible. Mr. Davis and Mr. Palmer wish to extend their thanks to the many friend who helped them out in their large undertaking.

Resolutions of Condolence.

The Supreme Commander of the Universe has made another call in our midst and taken to his harbor in Heaven, Mrs. Mulford, the aged and dear mother of our beloved sister and brother, Lady Mulford and Mate Mulford. Therefore be it

Resolved, That we the members of San Juan Harbor No. 84 extend to Lady and Mate Mulford our sincere and heartfelt sympathy in their hour of grief and sorrow. Let us sympathy to the sorrowing lend, And share the sorrow of our friends.
Be it furrther

Resolved, That a copy of these resolutions be sent to Lady and Mate Mulford, and a copy recorded in our record book of this date and a copy published in the Silverton weekly papers. Signed:
LOTTA BLACK,
M. L. PORTER.
WILLIAM PALMQUIST.

Good News.

As we go to press we are reliably informed that arrangements are being made to immediately replace the buildings at the Gold King recently destroyed by the fire.

Edward Angell and Gustave Vio, who tried to jump a Silverton board bill, were arrested by Sheriff Clarke at Durango. They paid the bill and costs and went on their way relenting.

For headache Dr. Miles' Anti-Pain Pills

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Sunny Brook
THE PURE FOOD
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It is all natural whiskey—distilled and aged in the good old honest Kentucky way. Each bottle bears the Government "Green Stamp" a positive assurance of full age, proof and quantity. All First Class Dealers Sell It.
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Los Angeles, Calif., July 11th to 17th, 1909.
Nat'l Encampment, Grand Army of the Republic
Salt Lake City, Utah, August 9th to 14th, 1909.
National Irrigation Congress
Spokane, Wash., August 9th to 14th, 1909.
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Out For a Family Jaunt these fine days is invigorating and enjoyable, when the country is fresh and green and the air fresh and invigorating. We will rent you a two seated surrey or any kind of a rig you may fancy, with a driver or without. Our service is O. K.—prices ditto

PHONE KING 48

HESPERUS COAL....

SILVERTON CONSOLIDATED MEAT & PRODUCE CO.

In the Pasture, Brook or browsing on sweet herbs and meadow grass, the cattle chosen by us have fattened during the summer. We choose nothing but the finest, the fattest and primest cattle from farm or ranch for our market. We are good judges of meat on the hoof or quartered, and only the choicest Beef, Mutton, Lamb, Veal, Chickens or Fish finds room at this market.

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& Live Stock Company

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PHONE—SILVER 130

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WHOLESALE AND RETAIL DEALER.

PROCEEDINGS

OF THE

Board of County Commissioners of San Juan County, Colo.

APRIL, 1909.

UNFORESEEN CONTINGENT FUND.

War. No.	To Whom Issued.	For What Purpose.	Amt. Allowed.
1178	Silverton Miner	Printing Notice of Ex	$ 1 35
1179	San Juan Lumber Co	Coal and Kindling	9 25
1180	Thos G Dickle	Janitor	60 00
1181	Wm Palmquist	County Court	37 70
1182	Geo W Lane	McCoy case	8 75
1183	Alvine Kramer	County Court	22 50
1184	Colo Telephone Co	Phone service	18 55
1185	Town of Silverton	Lights	26 40
1186	Silverton Supply Co	Janitor Supplies	3 75
1187	E J Holman	Abstract County Assessor	13 80
1188	T J Shea	Witness Certificate	2 65
1189	Ada McGetrick	" "	2 65
1190	Samuel Wittow	Janitor Supplies	2 00
1191	Dr J S Fox	Carlson Inquest	10 00
1192	Doud Bros	Coal for Jail	8 13
1193	Silverton Standard	Printing Com. Proceedings	10 80
1194	Silverton M & P Co	Meals for Poor	5 14
1195	Patterson Bros	Coal for Poor	3 25
1196	J M Clifford	Janitor Supplies	1 75

POOR FUND.

War. No.	To Whom Issued	For What Purpose.	Amt. Allowed
826	Mrs Con Callahan	Care of Poor	$ 30 00
627	Mercy Hospital	" " "	71 25
828	Mrs P Hughes	" " "	30 00
829	J W Lackey	Contract Co Pyysician	15 00
830	M Brumfield	Care of Poor	10 00
836	J N Pascoe	Rent for Poor	10 00

E. J. HOLMAN, Clerk of Board of County Commissioners

ADMINISTRATOR'S NOTICE.

Estate of S. L. Fleitas, deceased.

The undersigned, having been appointed administrator of the estate of S. L. Fleitas, deceased, late of the County of San Juan, in the State of Colorado, hereby gives notice that he will appear before the County Court of San Juan County, at the Court House in Silverton in said County, at the June term, 1909, on the first Monday in June next, at which time all persons having claims against said estate are notified and requested to attend for the purpose of having the same adjusted. All persons indebted to said estate are requested to make immediate payment to the undersigned.

Dated at Silverton, Colorado, this 11th day of May, A. D. 1909

DAN PETTYJOHN, Administrator

First Pub. May 15. Last Pub. June 5, 1909.

NOTICE OF ADMINISTRATOR'S SALE.

IN THE MATTER OF THE Estate of George Carlow, Deceased. } ss.

By virtue of an order and decree of the County Court of San Juan County, made on the petition of the undersigned, administrator of the estate of George Carlow, deceased on the 16th day of April A. D. 1909, I shall, on the 31st day of May A. D 1909, at the hour of 10 o'clock a. m., sell at public sale, to the highest and best bidder, at the easterly front door of the County Court house in Town of Silverton, San Juan County, Colorado, the following described real estate of said deceased, to-wit: All the right, title and interest of George Carlow, deceased, and the estate of George Carlow, deceased, in and to the following described lode mining claims (the location certificates whereof are recorded in the office of the Clerk and Recorder of said county in the books and pages mentioned,) to-wit: Minnie S. Lode mining claim, Book 124, page 593, Fisher Lode Mining claim, Book 124, page 594, Osage Lode Mining claim, Book 124, page 596, Ontario Lode Mining claim, Book 124, page 597 and the Little Colorado Lode Mining claim, Book 128, page 511, all in Eureka Mining district in the County of San Juan, State of Colorado, upon the following terms, viz For cash. At the conclusion of such sale the purchaser will be entitled to a certificate of purchase, upon the approval of such sale by the Court the purchaser will be entitled to a deed of said real property.

FRANK L. ROSS,
Administrator of the Estate of George Carlow, deceased.

Dated at Silverton, Colorado, this 16th day of April, A. D. 1909

NOTICE OF FORFEITURE.

To Frank Heather, his heirs and assigns.

You are hereby notified that the undersigned has expended one hundred dollars in labor and improvements during the year 1908 upon each of the following lode mining claims, to-wit, Golden Beauty, W. M., and American Beauty situated in Animas Mining district, San Juan County, Colorado The location certificates of said claims are of record in the office of the Clerk and Recorder of said county, in Book 117, at pages 1, 2 and 3 respectively; in order to hold said claims under the provisions of section 2324 of the revised statutes of the United States and the amendments thereto approved January 22, 1880, concerning annual labor upon mining claims, being the amount required to hold said lode claims for the period ending on the 31st day of December, A. D. 1908. And you are notified that if within ninety days after the publication of this notice, you fail or refuse to contribute your proportion of said expenditure as co-owner and pay the costs of this advertisement, your interest in said above named claims will become the property of the undersigned your co-owners who has made the required expenditure by the terms of said section.

JOHN T EDWARDS,
A H. EDWARDS,
J M CORNELIUS.
CHARLES HEATHER.

First Pub March 6. Last Pub June 5.

NOTICE OF FORFEITURE,

To the heirs, assigns, executors, and administrators of John A. Harris and of Pauline H. Moore, excepting Mrs. M. C. Richards and excepting also the undersigned, Josephine Lippencot and Leila M. Cole

You and each of you are hereby notified that the said Mrs M. C. Richards together with the undersigned have contributed in expending during the year 1908, one hundred dollars in labor and improvements upon each of the following described lode mining claims, situate in the Red Mountain Mining district, in San Juan county, Colorado, to-wit; The Brooklyn, the Brooklyn Extension and the Bellevue, the location certificates of which are recorded respectively in Book 77 and on page 171, in Book 77 on page 732 and in Book 67 on page 365 of the records in the office of the Clerk and Recorder of San Juan county, Colorado.

And that Paul Walker and the said Mrs. M. C Richards, together with the undersigned have contributed in expending during the year 1908, one hundred dollars in labor and improvements upon each of the following described lode mining claims situate in said Mining District, County and State, to-wit; the Georgia Gulch, the Georgia Gulch Ext and the St Louis, the location certificates of which are recorded respectively in Book 60 on page 351, Book 86 on page 121 and in Book 111 on page 310 of said records.

And that of the money so expended during said year upon each of the six above mentioned lode mining claims, the respective persons (other than the undersigned) above mentioned as contributors to the above expenditure upon each of the said respective claims, have together, during the said year, expended upon each of the said respective claims only that proportion of the said sum of one hundred dollars which the common interests of said contributors (other than the undersigned) in each of the said respective claims bears to the whole of each of said claims respectively, and that during said year the undersigned have expended upon each of the said claims respectively, sufficient to bring the total expenditure thereon to the said sum of One hundred dollars.

That said expenditures were made in order to hold said lode mining claims after provision of section 2324 of the Revised Statutes of the United States and the amendment thereto approved January 22, A. D. 1880, concerning annual labor upon mining claims, being the amount required to hold each of said lode mining claims for the period ending December 31, 1908, and if within ninety days from personal service of this notice or within ninety days after the publication thereof, you fail or refuse to contribute your porportion of such expenditure as a co-owner, your interests in each of said claims will become the property of the subscribers, your co owners who have made the required expenditure as hereinbefore set forth by the terms of said section.

LEILA M. COLE
JOSEPHINE LIPPENCOT.

First Pub April 3 Last Pub July 10, 1909.

JNO. WALTERS' PLACE

Corner Greene and Thirteenth. Formerly the Arcade Saloon

You can get

ANHEUSER & BUDWEISER
BOTTLE BEER

Lunches of all Kinds. Side entrance to Lunch Room.

TELEPHONE RED 372

NOTICE OF STOCKHOLDERS' ANNUAL MEETING.

The annual meeting of the stockholders of The Gold Tunnel & Railway Company, a corporation of the State of Colorado, will be held in the parlors on the second floor of the Brown-Palace Hotel, Denver, Colorado, at twelve o'clock M., on Tuesday, June 8th, A. D., 1909, for the purpose of electing five directors of said corporation, and to authorize the execution of a mortgage on the property of the company to secure notes or bonds to take up and pay off the unsecured or floating indebtedness of the company, and if thought advisable to take up the present mortgage on the premises, and to continue the development of the company's mines, and for transacting such other business as may come before said annual meeting.

Dated April 26th, 1909.

CLAYTON W. EVERETT, President.
JAMES E. MERRY, Secretary

NOTICE OF ADJUSTMENT DAY.

Estate of E. J. Fuller, deceased.

The undersigned, having been appointed administrator of the estate of E. J. Fuller, late of the County of San Juan, in the State of Colorado, deceased, hereby gives notice that he will appear before the County Court of said San Juan County, at the Court House in Silverton, in said County, on Monday, the 14th day of June, A. D. 1909, at the hour of 10 o'clock A. M. of said day, at which time all persons having claims against said estate are notified and requested to attend for the purpose of having the same adjusted. All persons indebted to said estate are requested to make immediate payment to the undersigned

Dated at Silverton, Colorado, this 19th day of May, A D. 1909.

A. W. HARRISON,
Administrator of the estate of E. J. Fuller, deceased.

First Pub. May 22. Last Pub June 12, 1909.

NOTICE OF FORFEITURE.

To E O Driscoll, his heirs and assigns:

You are hereby notified that I, the undersigned, have expended during each of the years 1904, 1905, 1906, 1907, and 1908, one hundred dollars ($100) in labor and improvements upon the lode mining claim Parker, situated in Animas Mining District, San Juan county, Colorado. The location certificate of said claim is of record in the office of the Clerk and Recorder of said county, in Book 92, at page 492, in order to hold said claims under the provisions of Section 2324 of the Revised Statutes of the United States, and the amendments thereto, approved January 22, 1880, concerning annual labor upon mining claims, being the amount required to hold said lode for the period ending on the 31st day of December A. D. 1904, 1905, 1906, 1907, 1908. And your are notified that within ninety day after the publication of this notice, you fail or refuse to contribute your proportion of said expenditure as co-owner and pay the costs of this advertisement, your interest in said above named claim will become the property of the undersigned, your co-owner who has made the required expenditure by the terms of said section.

R W. HOLLIS.

First Pub May 29. Last Pub. Aug. 28, 1909.

NOTICE OF FORFEITURE.

To John Bazanella, his heirs and assigns.

You are hereby notified that I, the undersigned, have expended during the year 1908, one hundred dollars ($100) in labor and improvements upon each of the following lode mining claims, to wit: Little Johnnie, Gold King and Sheridan, all situated in Animas Mining District, San Juan County, State of Colorado, the location certificates whereof are recorded in the office of county clerk and recorder of said San Juan county, as follows Book 131 at pages 514, 515 and 516, respectively In order to hold said claims under the provisions of section 2324, of the Revised statutes of the United States, and the amendment thereto, approved January 22d, 1880, concerning annual labor upon mining claims, being the amount required to hold said lodes for the period ending on 31st day of December, A. D. 1908 And if within ninety day from the personal service of this notice, or within ninety days after the publication thereof, you fail or refuse to contribute your proportion of such expenditure, as a co-owner, and the cost of this advertisement, your interest in said claims will become the property of the subscriber, your co-owner who has made the required expenditure, by the terms of said section.

GIO BOSCHI

First Pub April 3. Last Pub July 3, 1909.

ORDER TO SHOW CAUSE.

STATE OF COLORADO, } In the County Court
County of San Juan. } in Probate.

In the Matter of the Estate of JOHN KILMARTIN, Deceased D. SHEAHAN AND W J. O'MALLEY, Executors } Order to show cause on petition for sale of real estate

This matter coming on to be heard on this 4th day of May, A. D. 1909, upon the petition filed herein by D Sheahan and W. J. O'Malley, executors of said estate, for the sale of the following described real estate to-wit:

"All of the Shamrock Extension Lode Mining claim, an undivided three-eights interest in the Copper Giant Lode Mining claim and an undivided one-half interest in the Copper Giant Extension, San Pedro, Coney, San Miguel, Quaker, Keystone and Shamrock Lode Mining claims, in the Animas Mining District in San Juan County, Colorado, for the purpose of paying the bills allowed against said estate, the costs of administration, and for the further purpose of converting all of the assets of said estate into cash for distribution, under and in accordance with the terms and instructions contained in the last will and testament of said John Kilmartin, deceased.

And it now appearing to the Court from said petition that proper and legal grounds exist for the sale of said real estate, and that the said last will and testament of said John Kilmartin, deceased, gives and grants unto said executors, full power and authority to sell lease, convey or in any manner dispose of all of said property in such manner as they may see fit, and further instructs said executors to sell said property and convert same into cash for distribution in the manner specified in said will

Now therefore, It is ordered by the Court that all persons who are legatees or divisees, of said estate, or heirs of said decedent, and all persons mentioned in said last will and testament, as legatees and divisees, be and appear before said court at the court room of said court in the Town of Silverton, in the County and State aforesaid on the 7th day of June A. D. 1909, at the hour of 10.00 o'clock, in the forenoon of said day, then and there to show cause, if any there be, why an order should not be made directing said executors to sell the whole of said real estate for the purposes specified in said petition and in the last will and testament of said John Kilmartin, deceased.

It is further ordered, That this order be published for at least four successive weeks in the Silverton Standard, a weekly public newspaper published in said county.

By the Court.

[SEAL]

WILLIAM PALMQUIST,
County Judge.

First Pub May 8. Last Pub May 29, 09.

ADMINISTRATOR'S NOTICE.

Estate of Walter Newhall, deceased.

The undersigned, having been appointed Administrator of the Estate of Walter Newhall late of the County of San Juan in the State of Colorado, deceased, hereby gives notice that he will appear before the County Court of said San Juan County, at the Court House in Silverton, in said County, at the June term, 1909, on the 14th day of June, A. D. 1909, at 10 o'clock a. m., at which time all persons having claims against said estate are notified and requested to attend for the purpose of having the same adjusted. All persons indebted to said estate are requested to make immediate payment to the undersigned

Dated at Silverton, Colo, this 11 day of May, A. D 1909.

I. MAHER. Administrator

First Pub May 15. Last Pub, June 5.

W. L. TILLEY, D. D. S.

307 Mack Building,
DENVER, COLORADO

Leroy Tewksbury

GENERAL
TRANSFER
AND
EXPRESS

I am prepared to do a general transfer business. Will make trips outside of the city. Orders given prompt attention. Give me a trial. o o o

...Telephone Red 745...

Strater Hotel

The only first-class house in Durango

Splendid Table
AND
Best of Rooms

Steam heat throughout. Courteous treatment. Prompt service. o o o

DURANGO, - COLORADO

134 Thirteenth St.

CHARLES MORRIS

PAINTER, DECORATOR AND PAPER HANGER

Carry the most complete line of WALL PAPER ever brought to Silverton — all grades and prices. We are now prepared to do all kinds of work in our line. All work guaranteed.

House cleaning

All Kinds of Job Work Done. Wall Paper Cleaned and Made to Look Like New.

W. F. HALL

Phone 783 Black

Finney Jones
Civil Engineer

Cor. Reese and 15th,
SILVERTON, - - - COLORADO

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Silverton, Colorado.

Offices over First National Bank

J. S. BAILY

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Phone Red 812

SILVERTON, - - COLO

Dr. C. F. Keyser

DENTIST

Telephone Black 334

Office one door east of Wilkinson's Hospital, Grand Hotel Block.

Central House

has been reopened for business under the management of Mr. George Noll. Meals the best.

Meals 25¢ Meals

Clean and well ventilated rooms with or without board. o o o o

GEORGE NOLL, Proprietor

Geo. Sneer

Silverton's Old Reliable

PLUMBER
AND
Steam Fitter

Is prepared to do all kinds of plumbing and pipe-fitting and tin work on short notice and at reasonable prices. Satisfaction guaranteed. Manufacturer of the only perfectly safe hydraulic powder thawer on the market. Always ready and willing to accommodate all patrons, and invites the fullest inspection of all work. Leave orders at my shop on West 13th street or o o o

Call Silver 19

Or visit our Show Rooms.

1025 Snowden Ave. Telephone Red 1213

"HILLCREST"

MRS. E. K. VEATCH, PROP

Permanent and Transient Board. Steam Heated Rooms with Bath.

Silverton, - Colorado.

The Sherman

Neat, Clean Furnished Rooms. By day, week or month. Rates reasonable.

STEAM HEAT AND BATH

Miss Minerva Danis. Prop.

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BEN. L. GILBERT

CONTRACTING AND BUILDING UPHOLSTERING

Job work done on short notice. Phone Red 865

J. P. Hansen

ASSAYER & CHEMIST

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OXFORD BOTTLING WORKS AND COOR'S BEER DEPOT

BEER HALL

Delicious Dutch Lunches a Specialty.

The Place where Coor's Golden Beer is properly bottled and served in first-class style : : : : :

H. W. POLLMAN. PROPRIETOR.

The Palace Hotel

Steam Heat in Every Room
DURANGO, COLORADO

First Door North of the Depot.

Newly furnished throughout. The best popular priced hotel in Southwestern Colorado.

Menu—Everything the market affords.

Baggage handled free to and from the depot.

Under new management.

J. F. ENGLISH,
Proprietor

BEN WRIGHT
GENERAL TRANSFER
AND
EXPRESS BUSINESS

Baggage to and from all trains. Call me up at

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J W PEARSON
THE BLACKSMITH

Is prepared to do all kinds of Blacksmithing, Wagon-making, Repairing and Horse-shoeing on short notice and reasonable prices. The patronage of the public is solicited

..OPPOSITE HOFFMAN'S..

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Successors to C. A. Cooper

Accurate Work at Reasonable Prices

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Our table is as good as money can make it. We serve the best there is in the market. : : : : :

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The Royal

Is Silverton's standard Restaurant. We have the best cooks. We buy the best meats. We have the best service. This

Restaurant

Supplies a long-felt want. Try our 35c Mid-Day Luncheon. *Short Orders All Hours.*

LASHMET & McMANN, PROPS.

ASSAYS

RELIABLE
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Gold	.75
Gold and Silver	$1.00
Gold, Silver and Copper	1.50

Gold and Silver Refined and Bought. Write for Free Mailing Sacks

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Two Hundred Men to unload Beer Bottles at

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UNION BOTTLING WORKS

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Civil and Mining Engineer

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SILVERTON STANDARD

VOLUME XXIIII | SILVERTON, COLORADO, SATURDAY, MARCH 2, 1912. | NO. 16

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We carry in stock Queensware, Paints, Oils. Window Glass, Guns and Ammunition, Kodaks and Photographic Supplies

THE WM. H. CROOKE HARDWARE COMPANY

Patronize Home Industries!

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SILVERTON COMMERCIAL CLUB
PRIDE OF SAN JUAN

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SILVERTON LA BELLE CIGARS

And convince yourselves they are the BEST.

UNION MADE

J. GEO. HAHN, Manufacturer
Phone, Red 1182.

"ARE YOU GOING?"

Glad to know you're so highly pleased with the completeness of our stock.

Thanks for Your Grocery Order.

You'll find everything we send you exactly as represented. You're always sure of "good groceries" at low prices when buying here.

Come Again When You Want GROCERIES.

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ASSAYERS AND CHEMISTS

ACCURATE WORK AT REASONABLE PRICES.

Fourteenth Street near Greene

LINOLEUMS---FLOOR COVERINGS

The prettiest line of floor coverings ever displayed in Silverton. All at popular prices. Remnants of all kinds and grades will go to make room for the new stock at prices that will sell them.

LOOK AT THIS

We will meet catalogue house prices on the same grade and quality of goods in our line. If you will demonstrate where we cannot, we will order you the catalogue job and pay the freight. Isn't that fair? o o o o o o o o

THE FURNITURE STORE

L. G. PROSSER

SUBSCRIBE FOR THE STANDARD

CYANIDING SECRET TO RECOVER SILVER AND GOLD SOLVED

Plans Drawn for New Plants in the San Juan District.

The gold mines of the San Juan are beginning to attract outside attention, especially the mines of the Eastern Gold Belt, which is evident by the following article from the Denver Post, written by General Frank Hall, considered to be one of the best mining journalists of today:

"Optimism of the highest grade prevails in Silverton. The people down there have found a way out of the woods. And here is the way, as defined by one of the largest mine owners in an interview this morning. For example, the Kittimac company shipped to Denver a short time ago 300 pounds of ore from its Little Joe vein. It is a white quartz carrying gold and silver. The values are in a manganese stain. John W. Benson, who devoloped the Camp Bird for Thomas F. Walsh, pronounces it an exact replica of the material he mined from the Camp Bird.

"Walter C. Brace, a well known mining engineer and metallurgist, who has just returned from Mexico, where he made a close study of the Mexican process of cyanidation—which in some respects is superior the Colorado practice—will treat the 300 pounds of Kittimac quartz by the system used in Mexico. He will also treat it by the system used in Mexico. He will also treat it by amalgamation, followed by concentration, finishing with cyanide. Mr Brace is drawing plans for the additional machinery, filter and tanks that are to be placed in the Kittimac mill. His preliminary cyaniding of this ore demonstrated that he could recover nearly all the values

"The question now to be determined is as to the fineness of the grinding to secure the best results These are obtained in the Mexican mills by fine grinding in tube mills, followed by compressed air agitation in the tanks. The Mexicans have been able to recover 90 per cent of the silver in regular practice. The secret of their success lies in using about one-fourth of a pound of acetate of lead to every ton of ore crushed, which costs about 2 cents per ton. The acetate goes into the solution, regenerates it and keeps the silver in suspension instead of allowing it to precipitate.

"Up to a recent time the San Juan miners have been rather opposed to adopting cyanidation, because they feared they would lose a large part of the silver. They knew the gold could be saved, but, apprehending silver losses, have not looked with favor on cyaniding. But today, by the latest developed processes, it is known that both metals can be saved. The Kittimac company will be one of the first to introduce cyanidation as defined above, into San Juan county. The quartz ores of Minnie and Maggie gulches and back along the continental divide for eight miles can be cyanided. The sulphides that are found in the andesite formation—iron pyrites—carrying gold and silver, also will cyanide, so the future of the San Juan is brighter than ever before, for the miners are going ahead on

Continued on Page Four.

FRANK GONNER COMMITS SUICIDE

Well Known Durango Business Man Cuts His Throat in a Box Car.

Had Been a Resident of the Smelter City for Upwards of Thirty Years.--- Was Highly Respected by All.

About 12 o'clock Tuesday noon, the body of Frank Gonner, a well known and highly respected business man of Durango was found cold in death in a box car near the old Stoiber sampler by Louis Fedel, proprietor of the Standard Dairy. While delivering milk to the Silverton Brewery Mr. Fedel noticed the arms and legs of a man projecting from out the door of the box car that was standing on a switch, thinking that the man was intoxicated and only seeked a needed rest he continued on his way to the brewery and while returning to town he thought he would be able to lend aid to the man and so went to the car where he discovered a man lying in a pool of blood with his throat cut Mr. Fedel at once hurried to town and notified Coroner McLeod and an investigation was made and the body was at once identified as that of Frank Gonner, of Durango

Mr. Gonner had been in Silverton since last Friday He was well known in this vicinity and spent considerable time calling upon old friends and acquaintances.

No one seems to be able to give any reason as to why Mr. Gonner committed suicide, but it is supposed that financial affairs were the cause.

The deceased had been a resident of Durango for nearly 30 years. He was about 51 years of age He leaves a son and daughter to mourn his death, his wife having died about 12 years ago in Durango. His son is employed at Ames, Colorado and his daughter is attending the Fort Lewis school.

The deceased was a member of the Durango Elks, having at one time been exalted ruler. He was also a member of the Woodmen of the World and Mystic Circle.

The remains were shipped to Durango Wednesday afternoon where the funeral was held yesterday afternoon.

A Popular Hotel

The Standish Hotel is the most desirable place to stop at when on a trip to Denver, as it is nearer the large stores, theaters, all places of interest and business, than any other hotel, being located on California street between 15th and 16th —opposite the Denver Dry Goods company store.

The Standish is new, modern handsomely furnished, and has a fine, popular-priced cafe. The rates for room are $1 00 per day and up. The Standish is the only hotel in Denver charging only 50c extra for two persons occupying the same room.

The new proprietor, Mr. S. C. Hoover, will welcome you and

ATTENTION WOODMEN

All members are requested to be present at the meeting of the W. O. W. Monday evening March 4th Initiation.

Subscribe for the Standard.

Private dining boxes at the [illegible]

Subscribe for The Standard.

Don't Forget

That a Good Time is Promised to All Who Attend the Annual Meeting of the Commercial Club.

The Silverton Commercial Club will celebrate its Second Anniversary in the Firemen's room, City Hall, on next Monday night. The members are expected to turn out in full force and bring their ladies. Promptly at eight o'clock the meeting will be called to order and the election of officers for the ensuing year will be held and reports of the secretary and various committees will be read. Several addresses and a general discussion on matters of interest to the community will be followed by a fine musical program. You will be sorry if you miss some of the new songs that will be heard the first time in Silverton. Last but not least will be a "Pie Festival," of course there will be lots of good things to eat but on this night pie will be king, so be sure to bring along your best pie appetite.

The members will consider this notice to attend as the money usually spent to send out expensive invitations will go towards buying additional good things to eat.

Cyaniding in the San Juan

The following clipping taken from the Denver Times of February 20, "Cyanide in the San Juan," a question THE STANDARD has discussed time and again:

"To the use of cyanide, more than to anything else, the maintenance of the gold production from Cripple Creek is due. For some of the other mining districts of the state where telluride ores similar to those of Cripple Creek are found cyanide can do even more.

"The product of a cyanide plant is bullion, and districts too far from a railroad to ship ore can ship bullion.

"Along the boundary between Hinsdale and San Juan counties there is a telluride zone to which the erection of cyanide mills will give a new life. Several such mills will be built there during the coming summer.

"Years ago a number of the older mines of this region, the Isolde, the Gold Bug, the Kittimac and others, made large shipments of bonanza ore. Because of the long wagon haul, only the bonanza ore could be shipped. What would be shipping ore at Cripple Creek was in this district thrown on the dump

"During the last year or two the region has again been attracting attention. It is a splendid field for prospecting and mine making. New money is opening reserves of milling ore and in several instances the reserves are now sufficiently extensive to justify the provision of local reduction plants. The Buffalo Boy, it is reported, has ore to the value of $1,000,000 blocked out.

"In the San Juan, as elsewhere, the assurance of an adequate supply of ore is all that is necessary to induce capital to furnish treatment facilities. In the region mentioned, a good beginning has been made in the development of an ore supply. As the opportunities become better known, the development will be more extensive and these mines may be expected to make large contributions to the gold production of the state."

For Only $1,400 Cash.

You can buy the Shiller claim at once.

Mrs. Scheidt

Geo. Sneer

Silverton's Old Reliable

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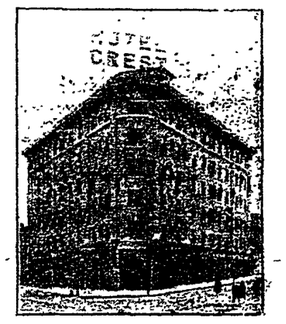
AND

Steam Fitter

Is prepared to do all kinds of plumbing and pipe-fitting and tin work on short notice and at reasonable prices. Satisfaction guaranteed. Manufacturer of the only perfectly safe hydraulic powder thawer on the market. Always ready and willing to accommodate all patrons, and invites the fullest inspection of all work. Leave orders at my shop on West 13th street or o o o

Call Silver 19

Or visit our Show Rooms.



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Corner Welton, B'way and 20th avenue,

New and Absolutely Fire proof European hotel of 114 rooms with baths. Modern and up to date in every detail. Beautiful dining rooms in connection.

MEALS A LA CARTE at POPULAR Prices. The Crest is situated within three and four blocks of all theaters, and principal business houses, but with quiet and beautiful surroundings. For all who desire high class accommodations at moderate prices and for ladies traveling alone The Crest is unsurpassed

Rates $1.00 and $1.25 per day for room with running water.
$1.50 to $2.00 per day for room with private bath.

Make the Hotel Crest your home while in Denver.

J. H. LETTOW

Investment Specialist

Do you want Gilt Edge Dividend-paying Investments in land, inventions, or legitimate enterprises, with A-1 securities? Any amount from $50 up to $10,000. Make your money earn money.
Best of reference furnished.
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Searcy & Way

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Silverton, Colorado.

Offices over First National Bank

FRANK L. ROSS

Attorney-at-Law

Office in Ranson Block

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THE GENT'S FURNISHER

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YOU will be certain of being well dressed if you buy your clothes in this store; certainty of style, certainty of all-wool quality, of fit, and of general all-round satisfaction.

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We want you to see the new fall styles now; get in early and pick out the the best things. We've got a lot of fine stuff besides clothes to show you, too.

SUITS $15.00 to $30.00

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Wholesale and Retailers of

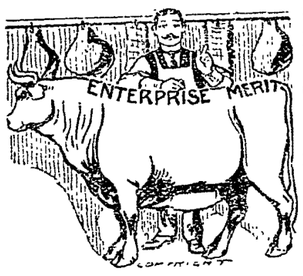
Fresh and Salt Meats, Produce. Provisions.

Fish, Oysters, Poultry and Game. Butter, Eggs, Fresh Vegetables and Delicacies. Fancy Sausage our Specialty, fresh every day.

R. W. PTOLEMY, Prop. Telephone, Silver 4

Telephone Orders Promptly Delivered.

WE OFFER EXCEPTIONALLY FINE MEATS



For your selection for table use; also the best of Butter and Eggs. Our Fruits and Vegetables are fresh daily.

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Standard Bottling Works

Wholesale Dealers in

LIQUORS, CIGARS,

ANHEUSER-BUSCH & BUDWEISER BEERS

Original MANITOU and GINGER ALE, or any other line of Soft Drinks, and also able to furnish ICE to the trade.

JNO. B. and JOE ORLLA, Props. Phone Silver 46

Subscribe for Standard

SILVERTON STANDARD.

J. T. JOYCE, Editor and Publisher.

Entered at the Silverton, Colo., postoffice for transmission through the mails as second class matter

OFFICIAL PAPER CITY AND COUNTY

SATURDAY, MARCH 2, 1912

T R. is the new synonym for X X.

If Teddy T. R.'s Taft, will the G. O. P. National convention apply the feathers?

"My hat is in the ring," says Teddy. But what about his head?

W. J. Bryan appeared in Denver during the fore part of the week and spoke before one of the largest assemblages that ever greeted a political speaker in that city.

President Taft should not be denied the same traditional rights and privileges granted to everyone of his Republican predecessors, that is a second nomination, as long as he requests it. If the G. O. P. denies him that right they not only invite defeat, but disaster and even annihilation and there is no man in the ranks of that party big enough to win under such a handicap.

We are for Champ Clark for president because he has proven by the fair and masterful way in which as speaker of the house, he has presided over the deliberations of that branch of congress, that he possesses every necessary qualification for that exalted position. For the past twenty years in the congress of the United States and outside of it he has always been found battling for the establishment of the peoples rights and against the usurpation of governmental functions by big business interests and predatory wealth The brightest pages of the nation's history as it goes down in the annals of time to posterity will be illumined by his name, his achievements and patriotism. He is the one candidate above all that will unite the warring elements within his own party just as he united them in congress and at the same time divided the ranks of the Republican party into two hostile camps and drove Cannonism into oblivion.

School Notes.

One today is worth two tomorrow.
—Franklin.

The High School received a beautiful flag from the Civic Circle and extends thanks for the same.

The book keeping class has taken up stocks and bonds and at different times during the day the study room greatly resembles the stock exchange.

The physics class is at present reviewing the work gone over in the first four months of school.

The boys of the second year High School expect to make a fortune after leaving high school by plunging on Wall street. May they succeed.

February 27th was the birthday of America's most popular and beloved poet, Henry W. Longfellow. While speaking of Longfellow I think it would be no more than fitting that every true young American should memorize one of his many poems. I will quote a stanza from one of his best known poems the "Psalm of Life," and I ask each school child to learn it, so that they will have something by which to remember this great man:

"Lives of great men all remind us;
We could make our lives sublime;
And departing leave behind us
Foot-prints on the sands of time;
Foot-prints that perhaps another,
Sailing o'er life's solemn main,
A forlorn and ship-wrecked brother,
Seeing may take heart again."

Miss Chill is preparing the children for a musical which will take place in the near future, the exact date of which will be announced later.

Professor Baker had quite a task Wednesday morning when he tried to explain to the physics class the pressure and density of water. The class is not so sure of the density of water, but there are several members of the class who seem to be very dense on the subject.

Leap Year Dance

The Leap Year dance given by the Lady Eagles at Miners' Union hall Thursday evening was one of the most successful as well as enjoyable affairs of the season. The Lady Eagles had complete charge of the dance and to them the entire credit of success is due, the supper served at the hall by the committee gained many a good word for the ones who prepared the sumptuous feast.

The Embroidery and Needlework Clubs

The Embroidery and Needlework Clubs and other guests were delightfully entertrined on Friday afternoon of last week by Mrs. C. A. Morris. At the request of the hostess, needles were laid aside and card tables and "Five Hundred" substituted. The prizes were carried off by Mrs. Frank C. Grimes, Mrs Lockwood and Mrs. Pearson. The ladies present were Mesdames B B Allen, Casad, Cooper, Crocker, C. H. Doud, M. H. Doud, Goble, Frank Grimes, Hodges, Hudson, Keyser, Lockwood, Montgomery, Robt Pearson, Searcy, Walter and Miss Chill.

Martin-Smith Nuptials

On Monday, February 19th, occurred the marriage of two of Silverton's popular young people, Miss Lucy Martin and Mr. Mate Smith. The marriage occurring at Victor, Colorado, in the presence of immediate relatives and friends.

The bride is the daughter of Mr. and Mrs John H. Martin and has resided in Silverton for some time. The groom has been a resident of Silverton for about five years, during which time he has been actively engaged in mining. The newlyweds have taken up their residence on Reese street.

The STANDARD with their many friends extends congratulations.

Womens' Civic Circle

The Womens' Civic Circle held a large and enthusiastic meeting on February 17, in honor of "Child Welfare Day." In addition to the interesting program, Mrs. Goble gave a talk on the work of the school board—what has been accomplished during the last two years and what still remains to be done; saying that while much has been done for the advancement of the school, there are yet improvements to be made in the various departments. Mrs. Goble spoke of the work connected with the building of the new school house, which, though arduous was never irksome to the school board, stating that during some months as high as fif een meetings a month were held, some of them continuing from nine o'clock in the morning until eleven o'clock at night.

A unanimous vote of appreciation and thanks was tendered to the school board—Messrs Sheahan and Palmquist and Mrs. Goble, for the thoroughly satisfactory and businesslike manner in which the handsome and modern new school house was erected and completed.

At the conclusion of the program simple refreshments were served and the members and visitors spent a pleasant half hour in informal discussion.

On February 21st the Circle presented to each of the grades and the high school a large and handsome flag of wool bunting. A fine picture of George Washington, by Mrs A. L. Cotton, was presented to the Seventh grade instead of a flag as that grade already possessed a flag. The pupils received the flags with enthusiasm and followed the presentations by singing patriotic songs.

The Circle will shortly present to the entire school a very large flag for display on the flag pole of the building.

The next regular meeting of the Circle will be held on Thursday afternoon, March 7th, at 3:30. Members and friends are requested to take this afternoon off and spend it at the school house visiting the rooms and attending the meeting.

Take Sunday dinner at the Vienna Cafe. 2-tf

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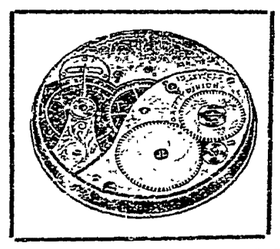

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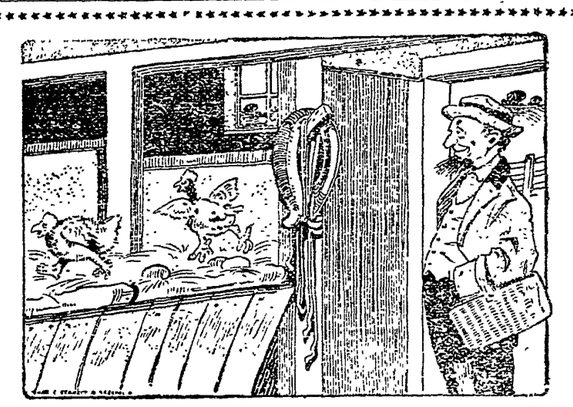
Made to order. New and up-to-date designs. Bring in your old gold and have it made over into something new.

CUNNINGHAM & CROGKER



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Besides building material, we handle FEED, HAY, GRAIN, and any kind of COAL that comes into this market.

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Fresh Milk and Cream delivered at your door every morning. o o

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Weights but 5½ pounds, operates by a mere touch, cleans thoroughly without injury to carpets or rugs, raises no dust, always ready, no burden to carry from room to room, and is the only efficient cleaning apparatus that is offered at a price within the purchasing power of everyone.

BISSELL'S Ball Bearing Sweeper excels all other cleaning devices in the work it does in the sewing room, dining room, or wherever there is a miscellaneous lot of litter to gather up. The "Bissell" picks up without effort what other cleaners cannot gather, such as lint, large crumbs, matches, threads, ravelings, scraps of paper and cloth, etc., etc. The "BISSELL" gives the *Maximum Sweeping Efficiency at the Minimum Cost.* Prices

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Our Stock of Fancy Groceries compares favorably with the stocks carried by the best city retail stores.

We are Sole Agents fer the following:

Chase & Sanborn Tea and Coffee,
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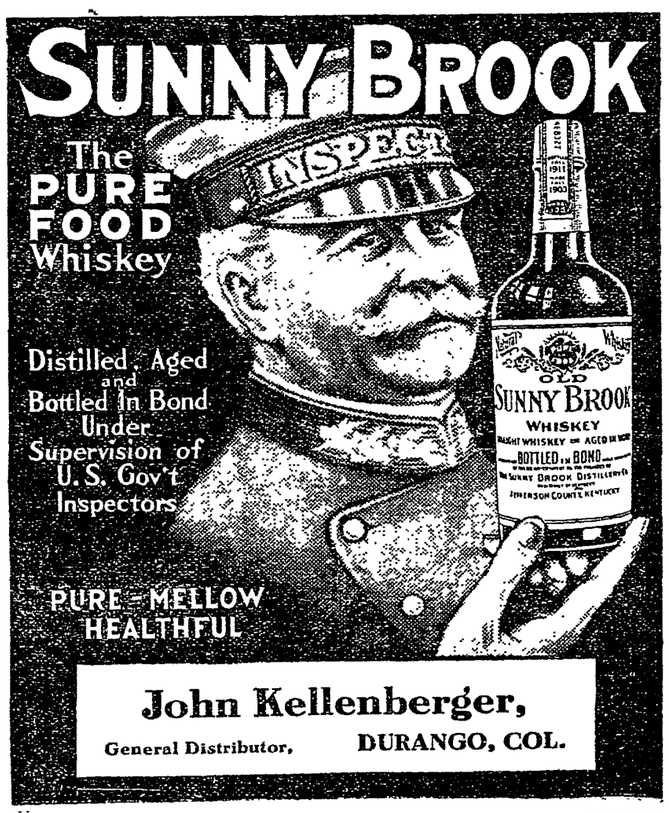
Empress Kansas Hard Wheat Flour.
Pansy Colorado Soft Wheat Flour.
Grimes Golden Butter.

We have enough on hand to fill your order.

SILVERTON SUPPLY CO.



John Kellenberger,

General Distributor, DURANGO, COL.

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that subscription. If you are in arrears remember that we can always find good use for

the MONEY

Turn Over a New Leaf

By subscribing for THIS PAPER

Town Topics

Louis Schafer was down from Eureka Thursday.

C C. Heath of Eureka spent a few days of this week in Silverton.

Raymond E. Terry was in town Thursday from the Sunnyside mine.

Mr. and Mrs. Mate Smith and Miss Lillian Martin, were arrivals Sunday noon from Victor.

Frank B Brown of Bordeleau's Hardware store, was a Durango business visitor during the week.

E. V. Hollingsworth, clerk of district court, was a Smelter City visitor during the week.

Chas. R. Waters of the Silverton Miners' Union, was a Durango visitor during the early part of the week.

Louis F. Sleade returned from a business trip to Denver and other eastern points last Saturday afternoon.

Charles Thompson was an outgoing passenger to Durango Wednesday afternoon and returned Friday noon.

Mrs. Ernest Shaw was a passenger to the Smelter City last Friday afternoon, where she will visit with friends for a few weeks.

Miss Christine Woelfle went over to Ouray during the early part of the week and has accepted a position at the Camp Bird mine.

Mrs. John Hillman of Delta, one of the head officers of the Pythian sisters, was a visitor to the Silverton lodge last Thursday evening.

Frank B. Brown returned to Silverton the fore part of the week from Denver, where he was in attendance at the State Hardware Convention.

District Attorney Geo. Lane, was up from Durango on legal business Thursday and returned to the Smelter City on yesterday's train.

Francis Karns has returned to his home in Ouray, where he expects to remain for some time to come. His vocation is that of an electrician.

J I. Fraser's smiling countenance is again seen on our streets. He just returned from Ophir, Telluride and other points on Wednesday noon's train.

Mrs. Fred Kunz and son were down from Eureka Wednesday to attend the Lady Eagle dance They were guests of Mrs Henry Langhurst and Mrs. Chas Faden

If you want a nice oyster stew go to the Vienna Cafe 50-tf

Jack McKinnon, a member of the Elk lodge, came up from Durango on Wednesday's noon train to accompany the remains of the late Frank Gonner to the Smelter City.

Tom Little was down from the hills to help make the Lady Eagles dance a success. Tom says no "bunny hug" or "Texas Tommy" for him, and leaves them for his friend, Henry Langhurst.

Save your combing and get switches made at MALCHUS'. 15tf

Ray H. Cooper returned home from Durango last Sunday noon. Ray spent a very pleasant time visiting with his parents, Mr. and Mrs. C. A. Cooper, and also done some duck hunting.

Alarm clocks, all you want at $1 each and we guarantee them. Cunningham & Crooker.

We are pleased to announce to the many friends of Mrs. Louis Bastian that she is improving as fast as can be expected under the circumstances

The Gem Chapter of the Eastern Star held a social Tuesday evening at their rooms in the Masonic hall. A number of invited guests were present to enjoy the occasion.

Esther Rodgers, daughter of Mr and Mrs S A. Rodgers, was the dainty little hostess at a birthday party, Tuesday, February 20th Each little guest present received a flag as a souvenir.

F. A. "Shorty" Franklin, the representative of the E A Peters Paper company of Denver, was calling on the trade Thursday afternoon. "Shorty" says that if Teddy gets the nomination there will be no chance to beat him (?)

The Gem Theater promises a very interesting program Sunday evening. Manager Miller has obtained some new films that have been ordered especially for to morrow evening and all in all the pictures promise to be of the top notch order.

Last Saturday evening a number of the young friends of Miss Dorothy Brown met at her home on Mineral street and gave her a surprise party The evening was spent in playing games, vocal and instrumental music after which light refreshments were served All present had a delightful time.

Ladies' Hair Switches made from combings at MALCHUS'. 15tf

On February 24th, Lloyd Meyers, the little son of Mr. and Mrs. Edward Meyers, treated his little friends to a birthday party. The decorations were little George Washington hatchets. Games were played and the afternoon most pleasantly spent in various amusements.

We will guarantee to meet any outside prices on pianos, talking machines and records Why not buy at home and yourself freight and express charges. 10tf

L O Bastian.

The Silverton High School Girls Basket Ball team departed for Durango yesterday afternoon where they play the Durango team tonight. This game will decide the championship of the Southwestern part of the state as each team has won four and lost one. It will undoubtedly be one of the swiftest games of the season. Our best wishes go with the Silverton team.

LOST—Saturday, February 10th, between residence of Mrs C H. Doud's and High school, a blue serge belt, with belt buckle Finder kindly return to Mrs. Doud or notify STANDARD office

The Salida Boys' Basket Ball team is expected to arrive in Silverton about March 15th for a game of basket ball with the Silverton team Captain Bawden has given the call for his team to appear for practice and prepar for the coming game The Salida Boys are considered one of the fastest aggregations in the state Wait until they come to Silverton.

Col. E. C. Condit, of Silverton, has received notice from the Auditor of the War Department of the U. S Treasury at Washington that he will shortly receive a draft for $8.70 balance due him for services at the time of his being mustered out in 1865. Mr Condit took part in twenty-two battles and two sieges and received but one slight wound, the scar of which still remains.

For fresh oysters and shell fish fixed up in any style you want, go to the Vienna.

DR. PRICE'S ALGRAIN 144

Just eat this food every day and have a rest from meat foods and see the benefits derived. It is made from **Wheat, Rice, Oats and Barley.**

Ask Your Grocer.

Thomas and Byan Colmer returned on Thursday's train from Dover, N. J. They were accompanied as far as Denver by their mother, but owing to her physical condition she was unable to make the trip on to Silverton. It is Mrs Colmer's intention to return to Silverton again after a few week's medical treatment in the City of Lights.

Mrs. A. J. Baker was the charming hostess at a reception last Thursday afternoon at her home on Snowden avenue. Over seventy invitations were issued by Mrs. Baker. The home was beautifully decorated with flags and hatchets. Miniture cherry trees were used as lunch center pieces. Mrs. Charles Thompson and Miss Bertha Case were the winners of the prizes at euchre.

The Silverton Supply company's recommendation is as good as your money, and they say they have fine POTATOES, that they recommend, they haven't been touched by the frost GOOD TASTE. NO WASTE MAKE HASTE. Have you tried their Dehydro Goods? If not ask your neighbors how they like them. The fruit is like fresh fruit. The vegetables are like fresh vegetables, only not so much trouble to prepare.

Yours truly.
THE SILVERTON SUPPLY CO.

Card of Thanks.

I wish to extend my heartfelt thanks to all hospital attaches, friends and members of the Eagle Lodge for kindness shown during the illness of my wife

JOHN B. GIONO.

Deafness Cannot be Curd

by local applications, as they cannot reach the deceased proportion of the ear. There is only one way to cure deafness, and that is by constitutional remedies. Deafness is caused by an inflamed condition of the mucous lining of the Eustachian Tube. When this tube is inflamed you have a rumbling sound or imperfect hearing, and when it is entirely closed, Deafness is the result, and unless the inflammation can be taken out and this tube restored to its normal condition, hearing will be distroyed forever; nine cases out of ten are caused by Catarrh, which is nothing but an inflamed condition of the mucous surfaces.

We will give One Hundred Dollars for any case of Deafness (caused by catarrh) that cannot be cured by Hall's Catarrh Cure. Send for circulars, free.

F. J. CHENEY & CO., Toledo, O.
Sold by Druggists, 75c
Take Hall's Family Pills for constipation.

Fine Improvement.

"The Auditorium Hotel of Denver is just completing some very extensive and splendid improvements. The owners are doubling their lobby space and making a fine office; making a beautiful lobby on Stout street.

"The Auditorium Hotel is being conducted in a strictly first-class manner in every way. and its business is growing every day. Its convenience to down-town-business and street car lines and yet just a few steps off the car lines for quiet, makes it very attractive for state people while in Denver The owners are to be congratulated on these fine improvements and growing success."

Death of Richard Lake.

Richard Lake, one of the old time residents of the San Juan, died at the Miners' Union Hospital last Friday afternoon after an illness of about one week Mr. Lake was employed at the Silver Lake mine, at which place he was taken sick and was removed to Silverton for treatment. The deceased was well known in the San Juan district, having lived her for about thirty years.

The only known relative is a sister-in-law in Omaha, Neb. The funeral was held from Prosser's Undertaking parlors Tuesday

Resolutions of Condolence.

Whereas, One of our members, Lady E. Brayden, has lost a loving and kind mother, Mrs. William Mason, therefore be it

Resolved, That the members of Silverton Council No. 329 of American Nobles, tender our heartfelt sympathy to our sister and the relatives in their hour of sorrow, and affliction, and be it further

Resolved, That a copy of these resolutions be sent to the bereaved daughter, and a copy be spread upon the minutes of our council, and also be published in the local papers

ISABEL LOGAN,
GERTRUDE SCHWENK,
JOHN PRISK,
Committee.

NOTICE ! ! !

Base Ball Fans are requested to be present at the Boosters Meeting held at the Commercial Club, Friday evening, March 8th at 7:30 sharp. All Fans interested in promoting a Club to represent Silverton should be on hand.

Grand Chancellor Visits Silverton.

Fred E. Sisson, Grand Chancellor of the Knights of Pythias, was a visitor in Silverton this week from Colorado Springs, the home of Mr. Sisson The Silverton members of the K. P. lodge entertained their distinguished visitor with a most enjoyable musical program Wednesday evening at the Wyman hall. Mr. Sisson addressed the lodge members congratulating them on the wonderful success of the Silverton chapter. He also lauded to the sky Silverton and her many points of interest, declaring himself more than satified with Silverton in general. Welcome back Mr. Sisson.

Chance to Get First Class Garden Seeds

The following letter from Congressman-At-Large Taylor is self explanatory:

WASHINGTON. D C., Feb 17, 1712.

MY DEAR EDITOR:—I would appreciate the courtesy if you will kindly advise your readers that I am now ready to make my annual distribution of vegetable and flower seeds, and will be pleased to send a small assortment as long as they last to all who write me for them. The supply is so limited and the requests so numerous that I can only send them out on written request, and only a few to each person.

As I only have garden and flower seeds, the applicants should state in their requests which they want, whether garden or flower, or both. But, it is useless to give a list of varieties of seeds desired, as the department will not take the time to pick out special seeds.

I receive a great many letters containing no signature or address and as there are 2,000 Taylors in Washington, a large number of letters intended for me go astray. Parties should be sure to sign their names and give their address and then direct their letters or postals as follows:

Hon Edward T Taylor,
Congressman-at-Large, Colorado
Washington, D. C.

Public Trustee's Sale.

Whereas, J. H Martin and Mrs. J. H. Martin, grantors by their Trust Deed, dated October 13, 1906, and recorded in the office of the Clerk and Recorder of San Juan County, Colorado, in book 110 at Page 265, conveyed to the Public Trustee of said County, the following land in said County, to-wit. Lots numbered nineteen (19) and twenty (20) in Block numbered sixty (60) in the Town of Silverton, San Juan County, Colorado, according to the official and recorded plat of said Town, together with all improvements on said premises situated, in trust, to secure two principal notes of even date with said Trust Deed for $300.00 each payable to N A Bellou, or order, one year after date, with interest thereon from date at the rate of eight per cent per annum, but which rate of interest was subsequently by agreement changed to the rate of ten per cent per annum.

And whereas, default has been made by the said grantors in said Trust Deed, in the performance of the covenants and conditions imposed upon them by the terms of said Trust Deed, in this, to-wit: that said grantors have failed to pay said principal notes when due, and failed to pay the interest due on said principal notes, and there is due and owing on said notes the sum of $550.00 with interest thereon from January 16, 1910, at the rate of ten per cent per annum.

And whereas, the legal holder of the indebtedness represented by said notes has filed with said Public Trustee notice and demand in writing, declaring said default, and electing to declare the whole debt represented by said notes, and interest thereon to date of sale, due and payable, and demanding the sale of said land under said Trust Deed.

Now, therefore, notice is hereby given that pursuant to said notice, election and demand, and under and by virtue of the authority vested in me by said Trust Deed and the law, I, F. J. Bawden, Public Trustee of said County, will sell the above described land for cash, at public auction to the highest bidder, at the East front Door of the County Court House in said County, on Saturday the 9th day of March, 1912, at 10 o'clock in the forenoon, for the purpose of paying said notes, interest and expenses of this sale, and will give to the purchaser thereof a certificate of purchase therefor as provided by law.

Dated February 29th, 1912.

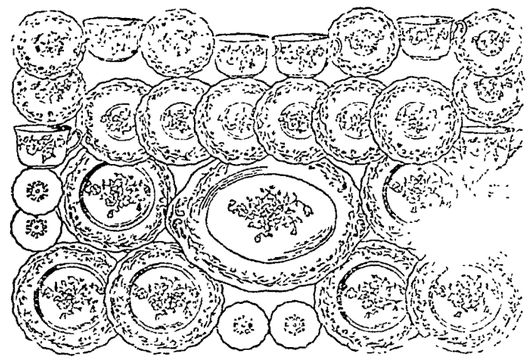
[SEAL] F. J. BAWDEN,
Public Trustee of San Juan County, Colorado
First pub. Mar. 2, 1912 Last pub. Mar 23, 1912

For fresh oysters and shell fish go to the Vienna Cafe. 50-tf

A VERY USEFUL PRESENT

Get an elegant dinner set of decorated China dishes of several different designs similar to those in this cut free of cost.

A GREAT LIBERAL OFFER which should be of particular Interest to Ladies.



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HOW TO OBTAIN THEM

Get SIX new paid up subscribers for the Standard for one year at regular subscription price, $2.50 per year, and receive this elegant 62 piece dinner set; for FIVE subscribers you will receive a Miles Standish decorated dinner set, while for THREE subscribers you will receive a pretty 31 piece dinner set. This is worth trying for, an excellent and useful offer o o o o o o o o

Now is the Time to Get Busy.

Call or write the STANDARD Office, get Receipt Book and start in. This is all that is required. This is no contest where one or two are rewarded and the balance get left.

A word to those who are interested in the welfare of San Juan County. By subscribing for the STANDARD you not only help your friend to get one of these prizes, but you also lend your aid in support of a local paper, whose columns are devoted to the development of our great mineral resources and placing them on a sound operative basis. This means your prosperity as well as ours. The STANDARD makes a study of the important matters for the betterment of all and should reach and be read by everyone interested in mining in the great San Juan District. Call at the STANDARD office, examine the sets and be convinced that the prize is worth the small effort. So get busy. o o o o o o o o o

THE STANDARD

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P. O. Box "J"

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A FAIR OFFER

Your Money Back if You're not Satisfied.

We pay for all the medicine used during the trial, if our remedy fails to completely relieve you of constipation. We take all risk. You are not obligated to us in any way whatever, if you accept our offer. That's a mighty broad statement, but we mean every word of it.

Could anything be more fair for you?

A most scientific, common-sense treatment is Rexall Orderlies, which are eaten like candy. Their active principle is a recent scientific discovery that is odorless, and tasteless; very pronounced, yet gentle and pleasant in action, and particularly agreeable in every way

They do not cause diarrhoea, nausea, flatulence, griping, or any inconvenience whatever. Rexall Orderlies are particularly good for children, aged and delicate persons.

If you suffer from chronic or habitual constipation, or the associate or dependent chronic ailments, we urge you to try Rexall Orderlies at our risk. Remember, you can get them in Silverton only at our store. 12 tablets 10 cents; 36 tablets 25 cents; 80 tablets 50 cents. Sold only at our store--The Rexall Store. M. M. Blair Drug Store.

A Bargain.

A four room house with electric lights and water; two lots in Eureka, Colo. Will sell cheap. If interested, write me for terms. R. B. SMALLEY, Mancos. Colo. tf-15

The Vienna cafe caters to the best and always has every delicacy of the season on hand.

WANTED—All kinds of sewing. Prices reasonable.

MRS. JACK COLE, 1414 Reese st. tf 15

Additional Mining.

Continued from Page One.

a campaign of practical demonstration.

"Even the complex ores in the sulphide state can be cyanided by first extracting the gold and silver before concentrating. These are matters that have been studied out during the past year. Plans for the extension of the Kittimac mill are being drawn, and mine work for opening up the six big veins of quartz that run through the Kittimac property will be pushed with all possible speed.

"There is a St. Louis syndicate now carrying on negotiations for building a large custom cyanide plant on a portion of the Kittimac ground. This is an independent concern. It is endeavoring to use the Kittimac tramway for the conveyance of ore from Minnie gulch, and will build its own tramway up Maggie gulch. It is assured sufficient tonnage from both of these gulches to keep its mill running at full capacity for years. This promises another lift to the new era now dawning over the Silverton district. The spring season now near at hand will open with a large exhibit of new energy in the form of ore treatment. Several of the larger operators already have been developing and preparing for the new departure."

A BALD-HEADED WOMAN

Shorn of her Crown of Beauty, Losses in Love and Marriage.

Hair is certainly most necessary to woman. Who could love and marry a bald-headed woman? What charms could one array to offset such a disfigurement?

A woman's goal is usually love and marriage. Her crowning glory is her hair. The loss of her hair mars her beauty, happiness and success. Yet right here in Silverton, there are thousands of women who are neglecting or injuring their hair to such an extent that it is only a matter of time when it will be utterly ruined.

Many women destroy the beauty of their hair through thoughtlessness or ignorance of certain facts. They use curling irons over-heated, or to excess, which destroys the natural oil of the hair, causing it to split, break, and come out. They do not shampoo their hair often enough, or too often. They use soaps or preparations which contain ingredients positively harmful to the scalp and hair.

As a result of such treatment, dandruff is created, the hair loosens, loses color, falls out, and baldness commences, unless proper and prompt precautions are taken in time. Then again, microbes and certain diseases bring about unhealthy scalp and hair conditions.

Almost any woman may rid herself of dandruff and diseased scalp and hair if she will but use the right remedy. We have that remedy, and we will positively guarantee that it will either cure dandruff and baldness or it will not cost the user anything.

That's a pretty broad statement, but we will back it and prove it with our own money. We will return your money if you do not find that Rexall "93" Hair Tonic is an entirely satisfactory remedy that will promote hair growth and overcome scalp and hair troubles; that it will grow hair even on bald heads, unless all life in the hair roots has been extinguished, the follicles closed, and the scalp is glazed and shiny. It gets its name from the fact that it grew hair in 93 out of 100 cases, where it received a thoroughly hard, impartial, and practical test.

We want you to try Rexall "93" Hair Tonic at our risk. You surely cannot lose anything by doing so, while you have everything to do so, while you have everything to gain. You had better think this over, and then come in and see us about this offer. You will be well repaid for your visit to our store. Remember, you can get Rexall Remedies in this community only at our store —The Rexall Store The M. M. Blair Drug Store.

School Notes

Following is the list of pupils neither absent nor tardy during the month of February, 1912:

FIRST GRADE

Hugh Allen, Arthur Borquist, Emil Bonavido, Fury Dalla, Howard Hudson, Dee Palmer, Mary Anest, Lena Arnodo, Frances Cura, Nelda Gosso, Jessie Kramer, Matilda Martinez, Bertha Sleep.

SECOND GRADE

Preston Alexander, Estin Baker, Annie Bonavida, Charles Cooper, Raymond Doud, Alfred Doud, Frank Giaconelli, Joe Klements, Paul Lonergan, Della Landry, Lloyd Myer, Jack McGrimmon, Mannie Melburg, Alex Motto, Odessa Palmer, Camille Rideau, Esther Rodgers, Elsa Sutherland, James Triplett, Barney Watson

THIRD GRADE.

Mattie Bell, Lena Bonavido, Helen Brown, Esther Callahan, Dominica Chino, Beulah Colestock, Berea Dalla, Lucy Fast, Dorothy McNeil, Della Melton, Julia Maffey, Beno Dalla, Iver Johnston, Eddie Lorenzon, Willie Stanger, Fenrick Sutherland.

FOURTH GRADE.

Winifred Allan, Hazel Born, Mary Cura, Mary Dalla, Eleanor Kramer, Frankie Leonard, Agnes Melburg, Marie Mattive, Hazel Meager, Lena Nelson, Lena Scheer, Eddie Bradfield, John Clarke, Raymond Condit, Harold Dale, Henry Doud, Edwin Larson, Arthur Pearce, Joseph Schmelzer, Carl Sutherland.

FIFTH GRADE.

Leone Wright, Adelina Lorenzon, Hilda Dillon, Caesar Gosso, Arthur Lorenzon, Peter Motto, Norman Zanoni.

SIXTH GRADE.

Sallie Bausman, Lena Cura, Lily Klements, Ruth McGrimmon, Gertrude, Motto, Chrystal Quarles, Helen Searcy, Addie Plantz, Carl Dillon, Norman Dresback, Arthur Dreyer, John Glanville, Gerald Joyce, Lottus Maguire, Paul Palmer, Johnnie Turner, John White, Willie Lonergan, Paul Clarke.

SEVENTH GRADE.

Mary Clark, Margaret Clifford, Marion Leonard, Pearl Scheer, Hazel Sleep, Blanch Stanger, Alice White, Marguerite Glanville, Arthur Doud, Joseph Dalla, George Landry

EIGHTH GRADE.

Phyllis Allen, Eulalia Bell, Ruth Brown, Evelyn Henry, Ruth Searcy, Lucile Rideau, Thelma Walter, Carl Bertram William Geany.

HIGH SCHOOL.

Philip Brown, Floyd Cooper, Ernest Hudson, Lester Kramer, Thomas Higgins, Norman Maxwell, Thomas Lonergan, Domenica Barotto, Mary Hoagland, Gertrude Hoagland.

Do not pay rent, I have many bargains at present. Several houses for sale cheap. Two boarding houses. Insurance of all kinds.

MISS ELIZA LONERGAN,
1045 Mineral st.

The City Market Co., successor to the Bert Brown M. & L. S. co, R. W. Ptolemy, Proprietor. 30-tf

Order to Show Cause on Petition for Mortgaging Real Estate.

STATE OF COLORADO, } SS.
COUNTY OF SAN JUAN. }

In the County Court.

In the matter of the estate of William H. Tagert, deceased.

The People of the State of Colorado to Joseph R. Tagert and Mary J. Stecker, and all persons who are legatees or devisees of said estate or heirs of said decedent, William H. Tagert, greeting.

You are notified that the following is and same is hereby certified to be a true copy of an order duly made and entered of record in said Court in the matter of said estate on the 31st day of January, 1912, to-wit:

ORDER TO SHOW CAUSE ON PETITION FOR MORTGAGING OF REAL ESTATE.

STATE OF COLORADO, } SS.
COUNTY OF SAN JUAN. }

In the County Court in Probate.

In the matter of the estate of William H. Tagert, deceased.

This matter coming on to be heard on this 31st day of January, A. D. 1912, upon the petition filed herein by John G. Gray, Administrator of said estate, for the mortgaging of the following described real estate, or a portion thereof to-wit: Lots twenty-one, twenty-two and twenty-three of Block numbered seven of the Town of Eureka, in said San Juan County, Colorado.

Also the following named lode mining claims, all situated in Eureka Mining District, San Juan County, Colorado, the location certificates thereof being of record in the office of the County Clerk and Recorder of said County at the Books and Pages following the names of said claims hereinafter, respectively, to-wit: Stranger, Book 82, Page 574; Fiction, Book 129, Page 512; Easy Street, Book 129, Page 514; Croesus, Book 129, Page 515; Vesta, Book 129, Page 507, American, Book 129, Page 505; Unique, Book 129, Page 510; Inter Mountain, Book 129, Page 508; Octopus, Book 129, Page 509, undivided one-half of McAlpine, Book 96, Page 249, for the purpose of paying the debts and liabilities of said estate (except the fourth now fifth class claims) and the costs and expenses of administration, and for the best interests of said estate and all persons concerned, for the sum of $4,000.00 or so much thereof as may be necessary.

And it now appearing to the Court from said petition that proper and legal grounds exist for the mortgaging of all or a portion of said real estate.

Now, therefore, it is ordered by the Court that Joseph R. Tagert, brother, and Mary J. Stecker, sister, of said deceased, and his only heirs, and all persons who are or claim to be heirs of said decedent, be and appear before said Court at the Court room of said Court, in the Town of Silverton, County and State aforesaid, on the sixth day of March, A. D. 1912, at the hour of two o'clock in the afternoon of said day, then and there to show cause, if any there be, why an order should not be made directing the said John G. Gray, Administrator, to mortgage the whole or so much of said real estate as may be necessary for the purposes specified in said petition.

It is further ordered that this order be published for at least four successive weeks in the Silverton Standard, a weekly public newspaper published in said County.

{ COURT SEAL } By the Court.
WILLIAM PALMQUIST,
County Judge.

Witness my hand and the seal of said Court at Silverton, San Juan County, Colorado, this 31st day of January, 1912.

{ COURT SEAL } WILLIAM PALMQUIST,
County Judge.

First pub. Feb. 3, 1912. Last pub. March 2, 1912

Subscribe for the STANDARD.

Applications for Grazing Permits.

NOTICE is hereby given that all applications for permits to graze cattle, horses and sheep within the DURANGO NATIONAL FOREST during the season of 1912 should be filed in my office at Durango, Colorado, on or before March 20, 1912. Full information in regard to the grazing fees to be charged and blank forms to be used in making application will be furnished on request. W. R. BRAZER, Acting Supervisor.

NOTICE OF FINAL SETTLEMENT.

In the matter of the estate of James Shelly, deceased.

Notice is hereby given, that on Monday the 18th day of March, A. D. 1912, being one of the regular days of the March 1912 term of the County Court of San Juan County, in the State of Colorado, I, Henry Langhurst, Administrator of said estate will appear before the Judge of said Court, present my final settlement as such Administrator, pray the approval of the same, and will then apply to be discharged as such Administrator. At which time and place any person in interest may appear and present objections to the same, if any therebe.

Dated at Silverton, Colorado, February 13th, 1912. HENRI LANGHURST,
Administrator of the estate of James Shelly, deceased.

First pub, Feb. 17, 1912. Last pub. Mar. 9, 1912.

Notice of Forfeiture

SILVERTON, COLO., January 1, 1912.

To Harry Heyman, deceased, his heirs and assigns:

You are hereby notified that the undersigned, your co-owners in each of the properties hereinafter described, have during the year 1911, expended the sum of One Hundred Dollars in labor and improvements upon each of the described lodes and mining claims situate in Red Mountain Mining District, County of San Juan, State of Colorado, the location certificates whereof are found recorded in the public records in the office of the Clerk and Recorder in and for said County in the books at the pages following, to-wit: Said lodes being the "Machinist lode," book 116, page 471; the "Mable V." lode," book 117, page 389; the "May Queen lode," book 123, page 146; the "Silver Dick lode," book 123, page 147; the "Doctor lode," book 123, page 148; the "Gold Stone lode," book 124, page 149; the "Engineer lode," book 123, page 151; and the "Brownie lode," book 148, page 301, that said labor and improvements was done and performed at the expense of the undersigned co-owners for the purpose and in order to hold each of said claims under the provisions of Section 2324 Revised Statutes of the United States and the amendments thereto, approved January 22d, 1880, concerning the annual labor upon mining claims and being the required amount to hold each of said claims for the period ending December 31, 1911.

And if within ninety days from the service of this notice upon you by publication you fail or refuse to contribute your proportion of such expenditures upon each of said lodes to the undersigned, your co-owners, all of said lodes and mining claims will become the property of your co-owners who have made the required expenditures, according to the revised statutes and amendments thereto concerning annual labor on mining claims.

A. MCARDLE,
J. M. FRAIN.

First pub. Jan. 6, 1912. Last pub. April 6, 1912

BEN WRIGHT
GENERAL TRANSFER
AND
EXPRESS BUSINESS

Baggage to and from all trains. Call me up at
ELEPHONE RED 742

Finney Jones
Civil Engineer
Cor. Reese and 15th,
SILVERTON, . . . COLORADO.

JAMES DYSON
Civil and Mining Engineer
U. S. Deputy Mineral Surveyor.
437-1447 Reese street, near the county offices. P. O. Box 33.

WARREN G. PROSSER
Mining Engineer
U. S. Mineral Surveyor
Silverton, Colorado.

The Palace Hotel
Steam Heat in Every Room
DURANGO, COLORADO
First Door North of the Depot
Newly furnished throughout. The best popular priced hotel in Southwestern Colorado.
Menu—Everything the market affords.
Baggage handled free to and from the depot.
Under new management.
W. H. McNEELEY,
Proprietor

Strater Hotel
The only first-class house in Durango
Splendid Table
AND
Best of Rooms
Steam heat throughout.
Courteous treatment.
Prompt service. o o o
DURANGO, - COLORADO

Subscribe for the Standard

W. C. Perrill curator
Nat. history society

SILVERTON STANDARD

VOL. XXXVI SILVERTON, COLORADO, SATURDAY, MAY 9, 1914. NO. 26

MINE AND MILL SUPPLIES

Agents for Repauno Gelatin Powder Z. L. German Fuse and Canton Drill Steel Electrical Supplies

Shelf & Heavy Hardware

We carry in stock Queensware, Paints, Oils, Window Glass, Guns and Ammunition, Kodaks and Photographic Supplies

THE WM. H. CROOKE HARDWARE COMPANY

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PLUMBING AND STEAM FITTING

Store, Phone Silver 19. Residence, Phone Silver 17.

PHONE SILVER 1.

GROCERIES

Which we are here to make
To please our many patrons
With the
Bakery Goods We Bake

Our Bread

Is of first importance,
We Know you'll find it right,
But all the other minor
things
We give
THE SAME DELIGHT.

CLIFFORDS

PHONE SILVER 1.

Joseph Bordeleau

WHOLESALE AND RETAIL DEALER IN

Hardware, mining supplies, Giant and Dupont powder, German fuse, hose and belting, crockery and plumbing goods, electrical goods.

Tin Shop in Connection with Store.

JOSEPH BORDELEAU

ROOT & NORTON

ASSAYERS AND CHEMISTS

ACCURATE WORK AT
REASONABLE PRICES.

Fourteenth Street near Greene

This Space is for Sale at very reasonable rates

Why not use it to advertise your wares

Silver Lake Mill to Operate as Custom Concentrator

A. S. & R. Behind New Project--Means Prosperity for This District.

For some time past it has been understood that the American Smelting and Refining company would start the Silver Lake mill as a custom concentrator and the announcement in another column of this paper that they are now ready to buy low grade ores containing gold, silver, copper, lead and zinc confirms this rumor and marks the very decisive step toward the upbuilding and advancement of the San Juan district. The Silver Lake mill which is most centrally located, and one of the best equipped and most modern mills in this section for handling custom ores, was originally built in 1901, destroyed by fire in 1906 and rebuilt in 1907. It has a capacity of 300 tons per day, working three shifts of eight hours, but at the start it is probable that the mill will run one shift per day treating 100 tons.

The equipment may be said to consist of a crusher, trommel screens, rolls, jigs, classifiers, Chilian mills, tables, vanners, settling tanks and canvas slimers Although any changes in the flow sheet have not been given out, it is known that experiments under the direction of Manager L. R. Clapp have been carried out, and as no question exists as to the susceptibility of the sulphide ores of this section to flotation treatment by either the Delprat or the Minerals Separation company methods, we may expect to see the flotation process installed at this mill. The proximity of the new Mears-Willey mill would seem to indicate that even the tailings from which all values have not been extracted at the Silver Lake mill will be successfully handled there.

The company offers to buy ores at the mill, and to pay for them on the basis of an automatic sample, on terms agreed upon between the shipper and the company. A continuous tonnage must of course be supplied if the mill is to operate continuously and successfully. It could not be expected that the Silver Lake management would disclose the source of their ore supply until the project is well launched, but the American Smelting and Refining company's officials are as capable of sizing up any situation in mining, ore dressing or metallurgy as any one, and they must be credited with having used their judgment in this matter before announcing that they would start this mill as a custom concentrator.

It is natural to assume that the 100-ton per day supply has been figured out as available to the plant, and it would appear that this amount could easily be secured from the Silver Lake, Aspen, Mayflower and other properties which are already connected with the Silver Lake mill by tramways, or to which tram lines could be extended. Assuming that ores from these mines are to be used as the basis for operation, then the Silver Lake mill is in a position to buy any other lots which may be delivered to the plant. These ores might come from 100 or more small properties.

The Silver Lake mill has been divided into two units for the purpose of treating custom ores, the Aspen unit will handle the lead-zinc ores, the Silver Lake unit the lead-copper ores.

This move on the part of the management of the Silver Lake is worthy of the support and confidence of the public, and will enable many a prospector and small mine operator to secure enough money from his summer's output to enable him to buy provisions and powder for the winter months and keep continuously at work developing his claims. It is an admitted fact that scores of mining properties scattered throughout this district contain veins which are capable after proper development of producing a large daily tonnage of low grade ore, and which have been unable to operate on account of the inadequate milling facilities in this section. This new custom plant will afford just such properties the chance to be developed, and at the same time to realize a financial return from their ore. The company in order to encourage the small prospect is ready even to buy ore in less than car load lots, we understand, in special cases.

L. R. Clapp will act as superintendent, Charles Gardner will be in charge of the mill, Truman T. Taylor in charge of the sampling and George Purdy in charge of the office.

We have reason to believe that the venture may prove a success, and a benefit to the community, prospectors and small mine operators.

Kittimac to Build New Cyanide Plant

Electrostatic Separator at Mill. Superintendent Card Arrives to Oversee Changes.

The arrival Monday of Frank Card, who will have charge of the remodeling of the Kittimac mill this summer, and remain as superintendent when the mill starts, marks the first step toward the resumption of operations again at this property. Mr. Card, who is the son of W. L. Card, of Denver, the inventor of the Card tables is an experienced mill manager, and will build a complete cyaniding plant, and also install an electrostatic machinery to separate and save the zinc values. Other minor changes will also be made in the mill.

Mr Card spent Wednesday and Thursday at the mill looking over the situation, and Friday morning went up to the mine. Last winter snowslides carried out several tram towers which must be replaced before the mine can resume operations, and snow conditions in Minnie gulch are also bad which may prove a hindrance to a quick resumption of work.

The work of remodelling the mill and installing the new machinery will take several weeks, and Mr. Card on Thursday informed a representative of the STANDARD that the mine would not start until the mill was ready. The Kittimac company has recently been reorganized with Daniel B. Carey, of Denver, president; J. J. Clark, of Denver, secretary-treasurer and R. J. Walter as general manager.

The starting of this mine and mill is bound to result in a benefit to the entire camp and its introduction of new methods of ore treatment will be watched with keen interest as many properties in the vicinity can also be operated at a profit by combining the cyanide and electrostatic methods of treatment.

Legislative News.

DENVER, May 7.—The chief events of the first four days of the extra session of the legislature were the election of Representative J. H. Slattery of San Juan county as speaker of the house, the clash over the payment of the militia for services in the strike districts by the issuance of bonds or a tax levy, and the skirmishing over bills providing for the establishment of a state constabulary and a compulsory arbitration board for labor troubles. The operators oppose the establishment of this board and favor the state constabulary, while the miners favor the arbitration bill and oppose the state constabulary.

REPRESENTATIVE J. H. SLATTERY HONORED.

Elected Speaker of the House. His Numerous Friends Extend Congratulations.

The selection of Hon. J. H. Slattery, of this city, as speaker of the house of representatives on the opening day of the extra session is a source of much gratification to his friends who are numbered by the thousands all over Colorado, and who rejoice that after serving two years as a member of the house his capabilities and close attention to duty and the best interests of the state have been rewarded by the highest gift in the power of the lower house of the Colorado legislature.

Especially at this time when Colorado is rent with civil dissensions, strife and confusion which have blighted its reputation throughout the entire country, the state is fortunate in being able to claim the services of such a man as Mr. Slattery, always eminently fair and impartial, always governed by his own love of square dealing and truth, whose judgment will go a long way toward bringing together both sides in this controversy which has threatened to put our state back a decade in industrial progress.

Mr. Slattery has been a resident of San Juan county for many years and has been closely identified with the development of the mining industry in Colorado, and at present is associated with Hon. Otto Mears and J. R. Pitcher, Jr., in the Gold King mine, the Iowa-Tiger mine, and has recently taken over the lease on the Silver Lake mine, one of the largest properties in Colorado, for five years.

A square deal to everybody is the substance of his simple announcement to the press when asked concerning his policy as speaker, and even those members who opposed his selection are frank in admitting that every member of the house will receive a fair deal and the recognition due him from Mr. Slattery. We have every reason to feel confident that under his able leadership the house will enact measures which will go a long way toward preventing a repetition of the terrible clashes of the past month between capital and labor, and that he will wield his power calmly and dispassionately acting only for the good of the community and the best interests of the state.

BAGLEY TUNNEL STARTS WORK.

Manager Hensen and Small Force Engaged in Preliminary Operations.

Manager Emil Hensen and Foreman S. G. Walker of the Bagley tunnel went up to the mine Monday with a small force of eight men to start the necessary preliminary work. After a pipe line is laid to the mill, and other minor changes made it is the intention of the management to put on a larger force of men, and to work the upper levels, pushing development on several of the larger mineralized veins which showed good values last summer, and to open up sufficient ore to keep the mill in constant operation this summer.

The new mill which was operated successfully last summer was left in good shape for the resumption of operations this summer, and will be started as soon as weather conditions permit probably shortly after June 1st

With the Bagley added to our list of steady shippers prospects for a busy summer look exceedingly bright.

The American Smelting and Refining Company

HEREBY ANNOUNCES THAT

AFTER MAY 1ST., 1914, THE CONCENTRATING MILL OF THE

Silver Lake Mines

at Waldheim, near Silverton, Colorado, will be Open as a

Custom Concentrator

for the purchase of low grade ores, containing Gold, Silver, Lead, Copper and Zinc.

For information apply at the plant.

SILVER LAKE MINES,

Silverton, = Colorado.

The Fulton Market

Guaranteed first-class groceries are sold at the Fulton Market at the same figure as any outside Grocery House would offer to sell for, at the same terms, and you don't have to pay for until delivered to your house and approved O. K. by the lady of the house. o o o

No Freight or Delivery Charges.

Yours Respectfully,
JOHN MORGAN.

Fulton Market and Grocery.
PHONE SILVER 85.

House Wiring. Lighting Fixtures.

PATTERSON

Motors. Heating Devices.

Phone King 121 or Silver 97.

R. E. McLeod

Funeral Director
AND
EMBALMER

Monuments and Flowers

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U. S. Mineral Surveyor

General Engineering in Mining

Office Wyman Block.

Silverton, Colorado.

James Dyson

Civil and Mining Engineer

U. S. Deputy Mineral Surveyor

1437-1447 Reese street, near the county offices. P.O Box 33.

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The only first-class house in Durango

Splendid Table
AND
Best of Rooms

Steam heat throughout.
Courteous treatment.
Prompt service. o o o

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Finney Jones

Civil Engineeer

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SILVERTON, COLO

Wm. Palmquist

Insurance of all Kinds

Real Estate, Rentals

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in great variety, artistic designs and tasteful settings. These are marked features of those sold by Cunningham & Crocker. All our emblems, etc. are of that high art quality found only in jewelry of the finest make.

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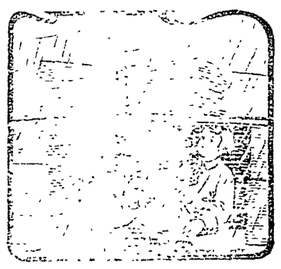
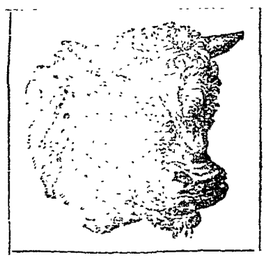


For Good Shelter

Get only sound shingles when your roof is built that way. We handle the weather defying kind—sound, knot free, uniformly cut, thoroughly seasoned red cedar shingles. Don't split if a nail looks crosswise at them and on to the roof when properly fastened on. Everything else in the lumber line here, too.

COAL, Hay and Grain of the VERY BEST.

San Juan Lumber Co. Telephone Silver 12



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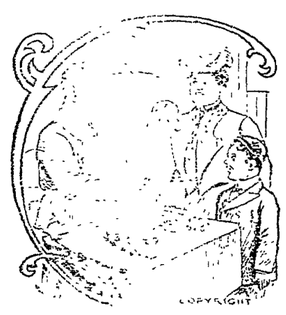
Wholesale and Retailers of

Fresh and Salt Meats, Produce, Provisions.

Fish, Oysters, Poultry and Game. Butter, Eggs, Fresh Vegetables and Delicacies. Fancy Sausage our Specialty, fresh every day.

R. W. PTOLEMY, Prop. Telephone, Silver 4.
Telephone Orders Promptly Delivered.



Lamb Chops

The most tender and delicious of all meats, when broiled just right, to meet all requirements must be cut from stock properly fed and killed. This is the kind we always supply, and what we say of our lamb is true of all our meats. o o o o

Telephone, Silver 3.
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Standard Bottling Works

Wholesale Dealers in

LIQUORS, CIGARS,

ANHEUSER-BUSCH & BUDWEISER BEERS.

Original MANITOU and GINGER ALE, or any other line of Soft Drinks; and also able to furnish ICE to the trade.

JOHN B. ORELLA, Prop. Phone Silver 46

Turn Over a New Leaf

By subscribing for THIS PAPER

SILVERTON STANDARD.

J. T. JOYCE & SON Publishers.
J. T. Joyce, Sr., Editor.
J. T. Joyce, Jr., Business Manager.

Entered at the Silverton, Colo., postoffice for transmission through the mails as second class matter

OFFICIAL PAPER CITY AND COUNTY

MEMBER COLORADO EDITORIAL ASSOCIATION

Standard's Advertising Rates.

General Advertising per inch	50
LOCAL READERS under head "Classified Ads." for first insertion	$ 10
For each subsequent insertion	05
When scattered through general reading matter per insertion for each line	10
Black face type per line extra	05
Minimum charge	25
Forfeiture Notice	15 00
Notice of Adjustment Day	4 00
Card of Thanks	50
Resolutions of Condolence	1 50
SUBSCRIPTION RATES One Year	2 00
Six Months	1 00
Three Months	50
Single Copies	05

SATURDAY, MAY 9, 1914.

MOTHER'S DAY.

Sunday is Mother's Day and the Civic Circle has arranged for exercises at the high school auditorium in the afternoon for the observance of the day, as announced elsewere in this issue. Carnations will be placed on sale and you should wear one Sunday in honor of your mother, "The Best Mother Who Ever Lived," whether she be living or dead. Our mothers inspire us with the profoundest and holiest emotions of our nature and cause us to render them our tribute of love and veneration.

There is no aspiration which any man may entertain, no achievement which he may seek to accomplish, no great or honorable ambition which he may desire to gratify, that is not directly related to his mother's influence, standing as it does for the highest type of purity, courage and constancy.

Commercial Club to Appeal to State Railway Commission.

At the meeting of the directors of the Commercial Club Thursday evening Fred Goble, who has just returned from Denver, where he interviewed the D. & R. G officials relative to the re-establishment of the through train service and was unable to obtain any promise to restore the train before May 30th, made his report and the directors unanimously decided to take the matter up with the Railroad Commission. Every other town in this district has through train service, Ouray, Lake City, Creede and Telluride, and yet the tonnage from Silverton equals the combined tonnage from all four of these towns, Silverton is the best paying branch on the narrow guage system and the practice on the part of the D. & R. G. officials in compelling passengers to remain over night at Durango and spend the better part of the next day on a mixed passenger and freight train to complete the journey is discrimination, plain and simple, and we trust that the Railroad Commission will deal with matter promptly and decisively, to the end that the daily passenger train may be rightfully restored.

The Club will soon put out a handsome folder profusely illustrated advertising the industrial and scenic advantages of this section.

Philip Argall, of Cripple Creek, the well known cyanide expert has accepted the invitation of the Club to visit this section the coming summer and look over the milling situation.

The club will also put an exhibit at the Metal Association rooms of Canon City.

William Uhles Dead.

The funeral services for William Uhles, who died at Miners' Union hospital early Friday morning after suffering a stroke of apoplexy Thursday, following a complication of diseases, will be held this (Saturday) afternoon at 1:30 o'clock from the McLeod Undertaking Parlors under the auspices of the Miners' Union of which organization he was a member.

Mr. Uhles was born in Illinois and was 45 years of age. He had been in Colorado about 12 years, and in Silverton 7 years, working the past two years at the Intersection mine where he was employed when his last fatal illness came upon him. Fellow employees hauled him to the railroad on a toboggan, and thence brought him to town, but in spite of the best efforts of physicians and nurses, his case was hopeless, and he passed away Friday morning.

He is survived by a sister, Mrs. E. Stansbury, of Durango, to whom his many friends and the STANDARD join in extending condolences in her sorrowful bereavement. The body will be taken to Durango for burial.

High School Glee Club Makes First Appearance.

Program of Rare Excellence Presented.

So overwhelmingly surprising in its finished effects, its poise and delightful tonal quality was the high school glee club concert in the auditorium of the school building Wednesday evening, that one is quite tempted to descend to the language of the street and cry "What's the matter with the high school glee club, its director, Mr. Ward, and its accompanist, Miss Ruth Brown?"

Surely only one answer can be given and that a hearty "They're all right," for from the beginning with the club grouped prettily phalanx like on the stage until the finale of the Anvil Chorus with the auditorium and stage in darkness save for the electrical effects, the fresh young voices ringing full and clear, it was a program that filled the heart of parents and friends with real pride and admiration in glee club talent, and glee club enterprise, and in the sensing of artistic worth, even though it may be local and not imported at extraordinary trouble and expense.

The opening number, "Estudiantia" was admirable for the display of different parts as well as of concerted power, a worth while sort of vocal offering that aroused whole hearted praise Nothing could be more felicitous or stirring than "The Pilgrim's Chorus" done with a delicacy of shading that in the light of the writer's knowledge of the difficulties attending the rehearsals by Mr. Ward, makes it seem almost magical

The work of the double quartette was melodious and superbly given, and the male quartette sang a varied and tempting list of selections, with a refreshing grace that was exceedingly pleasing.

William Maguire in "Solomon Levi" aroused tremendous applause, and Carl Brumfield in his rural ditty "My Gal Irene" was encored repeatedly.

Lisette Fast and Eulalia Bell were especially pleasing and enjoyable in their skit of "Mary and Marie," as was also the piano duet by Ruth Brown and Lisette Fast The "Psalm of Life," Longfellow's noble poem, was read wonderfully well by small grade pupils, and in a manner that speaks volumes for the painstaking work of their teacher, Miss Emma McAllister. Maud Hinkley recited clearly and distinctly "The Pied Piper of Hamlet."

At the close of this really notable concert the glee club sang with charming effect the "Anvil Chorus" by Verdi, and familiar as it is, nothing could have made a quicker or more general appeal. That the audience responded as a unit was evidenced by the hearty applause that greeted all numbers, and as the crowd filed out only words of praise and appreciation were heard upon all sides for the splendid entertainment.

The personnel of the club is as follows;

Tenors—Roy Brumfield, Ernest Hudson, William Maguire and Arthur Sullivan.

Basses—Carl Brumfield, Norman Dresback, Lester Kremer and Robert Schwenk.

Sopranos—Lillian Gardner, Gladys Montgomery and Anna Sullivan.

Altos—Eulalia Bell, Nell Brown, Lisette Fast, Margaret Glanville, Alice Wheeler, Vivian Hudson, Thelma Walter and May Maguire.

Accompanist—Ruth Brown.

Director—Mr. Ward.

For a nice dinner and all the trimmings that go to make an excellent meal, go to the Vienna restaurant·

Mother's Day Exercises

Mother's day will be observed at the High School auditorium on Sunday, May 10th at 8 p. m by a program given under the auspices of the Woman's Civic circle.

There will be remarks by Mrs. Goble. Father Kleinbrecht and Rev. Byers, also special music by Mr. Ward and Miss McAllister and the male quartette.

When you want a nice steak or spring chicken, go to the Vienna estaurant

Class Sermon Sunday Evening

The baccalaureate sermon which marks the beginning of every commencement exercises will be held in the high school auditorium Sunday evening at 8 o'clock. Rev. Father Kleinbrecht will deliver the address and the exercises are as follows:

Music.....Chorus
Invocation.....Reverend Byers
Music.....Chorus
Scripture Lesson.....Supt. Manning
Music.....
Announcements.....
Class Sermon....Reverend Kleinbrecht
Music.....
Benediction.....Reverend Byers

Mrs. Frank C. Grimes will have charge of the music for this service

Remember the operetta, "Snow White," at the Gem Theatre, on Monday evening, May 18th, at 8:15 o'clock. Admission 25 and 15 cents

A very delightful program was given at the Eureka school on last Friday evening by Miss Walker and the pupils. The school room was decorated with pink and white flowers and streamers. Miss Walker and the pupils are to be complimented for the work. After the program the patrons of the school enjoyed a social dance. The following pupils had parts in the program: Jane Casey, (May Queen). Esther Wagenschieffer, Ruth Wagenschieffer, Mary McDonald, Blake Casey, John Terry, Frank Lofgren, William Bailey, Harry Linde and Arthur Kuntz.

The children of the Howardsville school have completed their work for the year and the school has been closed. Miss Celestock will assist in the Silverton school for the remainder of the year.

Telephone Girls' Dance.

Decidedly successful from every viewpoint was the dance given Friday evening at Miners' Union hall by the telephone girls. The affair was one of the most enjoyable of the entire season, an unusually large crowd being in attendance The grand march began at 9.30, and was followed by a long program of dances, which seemed all too short to those present.

The hall was attractively and artistically decorated, in the center was a large bell in blue and white, and blue and white streamers were festooned from the center to the walls. A large HELLO sign hung immediately in front of the musicians' stand, which was tastefully decorated with apple blossoms and lilacs, and blue banners with white letters containing such well known phrases as "Waiting; Busy Now; Long Distance and Number," adorned the walls.

The girls are deserving of much praise for their unique and attractive decorations, which greatly added to the pleasure of the evening. The personnel of the local exchange is as follows: Mrs. Atta Lacey, chief operator: Agnes Palmquist, Elva Glanville, Mrs. Alta Bausman and Hazel Boden, relief operator.

School Election.

The annual school election Monday resulted in the selection of R H. Cooper as president of the board of education for the ensuing three years. Mr Cooper receiving 300 votes as against 150 for Mr. McCrimmon, who has filled the position the past two years.

Despite the inclemency of the weather 450 votes were cast, the friends of both candidates working hard during the day for their favorite.

Mr. McCrimmon, the retiring member of the board, has taken a deep personal interest in the work of the schools, and has given freely of his time and efforts in the endeavor to raise the standards of the schools to their present high plane, and he has every reason to feel a just pride in his excellent record Mr. Cooper. the incoming member, is well qualified to fill successfully his new position, and can be counted upon to labor for the upbuilding of the San Juan schools, and to collaborate with County Superintendent Mrs. Harriet E. Keyser, Superintendent Manning and the other members of the board to maintain and further the cause of educational advancement in this county.

The new school board held its first meeting Thursday evening and transacted such routine business as was presented for its consideration.

Alarm clocks, all you want at $1 each and we guarantee them. Cunningham & Crocker.

Subscribe for the Standard.

SILVERTON DAIRY

A Product of Sanitary and unadulterated Milk

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—BEST IN THE STATE—

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— SILVERTON, COLORADO. —

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Prompt Attention Given all Orders.
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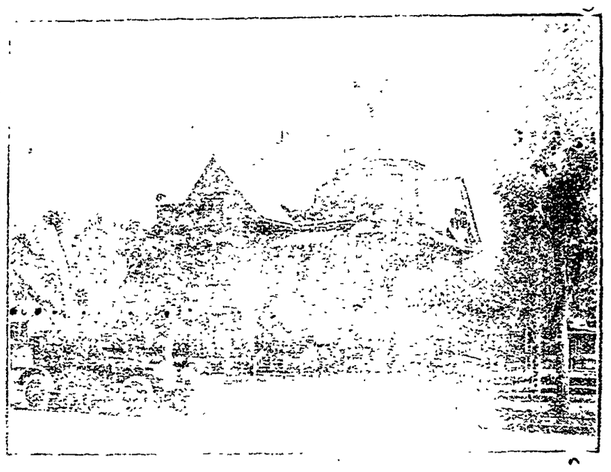

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DURANGO - - - COLORADO

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Fresh Milk and Cream delivered at your door every morning. o o

OUR MOTTO

"Cleanliness is next to Godliness."

Augusten & Giovannini
Phone Silver 103.

This is House Cleaning Time

Brighten up your furniture with a new coat of Varnish. Nothing better for this than CHINAMEL We have it in all colors of hard wood We can make your old floor look like a new hardwood o o o o o
Get a bottle of CHINAMEL EASY to rub up your furniture The best thing to use on your dust cloth, and floor mop o o o o o

The Fred Goble Lumber Co. Phone Silver 93.

CRYSTAL ICE CRYSTAL ICE
DRINK
GOLD CROWN BEER
Silverton Brewery
CHARLES FADEN, Proprietor
BREWER AND BOTTLER. Patronize Home Industry

Town Topics

Herman Bunn was in town on Monday from Eureka.

Ray Cooper made a business trip to Eureka Tuesday.

Mr. and Mrs C. C. Heath, of Eureka, were in town Saturday.

Ike Camp, of Howardsville, was in town the early part of the week.

Mrs Ellen Terry Strong returned from a trip to Denver Tuesday.

J. C Bell went down to Durango and the lower country on business Tuesday.

John Anesi, a carpenter, was an arrival from Durango on Sunday's train.

Frank Soens shot and disposed of his bear on Monday evening of this week.

Ross R Collins, was down from Eureka during the early part of the week.

Mrs. Charles Worden, of Eureka, spent several days in town during the week.

The Misses Baccus and Fenfgeld, of Alamosa, were Silverton visitors during the week.

Dick Trainor came down from the Intersection mill Tuesday for a short visit in town.

Mr, and Mrs. Frank L. Ross and children were arrivals from Denver on Sunday's train.

Mr. and Mrs. Henry Mulloolly were home comers from the Pacific coast on Tuesday noon's train.

Mr. and Mrs. Christie Rosenstock, of Eureka, were visiting in town on Tuesday of this week.

The Ladies of St. John's guild will meet next Wednesday afternoon with Mrs. B. E. Allen

Mr. and Mrs Charles Airy were down from Gladstone during the early part of the week.

Jim Fox was down from the Gold King at Gladstone and spent the Sabbath day with his wife.

Bill Balfour went up to the Silver Lake lease Thursday to resume his place on the compressor.

Louis Schaefer returned to the Trilby lease Monday afternoon after a brief trip down town.

Mrs. Robert D. Burnell returned Monday from a brief visit with her mother in the Animas valley.

Mrs. O. W. Nyberg went out Thursday to Pagosa Springs where she will visit the next two weeks.

George Gleason was down from his lease at the Gold King and spent a few days in town this week.

Mrs. C. J Estabrook left Monday for Denver where she will visit with her sisters and other relatives.

Street Commissioner Leonard had a small crew repairing a leak in the water pipe by the ball park this week.

Superintendent of Bridges Taylor, of the fourth division of the D. & R. G., was a Silverton visitor Tuesday.

A baby girl was born to Mrs. Albino Todeschi Wednesday. Mother and child are both progressing nicely.

John Higgins went up to the Intersection mill Tuesday after spending a few days in town with his folks.

The appointment of Otto Brendle as deputy sheriff was filed for record at the county clerk's office this week.

Mrs Angelo Vota was removed to the Miners' Union hospital this week suffering from an attack of typhoid fever.

Senator J. T. Joyce departed Tuesday for Denver to be in attendance at the extra session of the legislature.

Mrs. Anna Spears was an outgoing passenger Thursday bound for Durango where she will visit with relatives.

Ed Condon, who has been ill with typhoid fever, has nearly recovered and will soon be able to leave the hospital.

Dan McNaughton came up from Lake Electric where he has been putting his power boat in shape for the approaching summer.

John Prisk went down the Animas valley on Tuesday's train and returned the next day with some horses that he has purchased.

Private dining boxes at the Vienna Cafe.

Miss Gladys Montgomery returned from a short visit with friends in Durango, on Sunday noon's incoming train.

Alex Ptolemy went down to Durango Tuesday where he will meet the party who has rented his Rockwood ranch for the summer.

Leonard Toy came down from Gladstone last Friday afternoon to officiate atthe piano at the telephone girls' May Day dance.

August Beamer, who was operated upon Wednesday evening for appendicitis at Miners' Union hospital, is reported as doing fine.

The work of putting down new water mains on Reese street is progressing favorably, new pipe having been laid as far as Tenth street.

Miss Lena Coughlin is confined to her home on Reese street with a severe attack of indigestion. Her many friends trust that she may speedily recover.

Mr and Mrs. W. H. Crocker went down to their cabin at Lake Electra Thursday and will remain over Sunday preparing for the coming season.

Clarence Thompson, who has been confined to his home with an attack of appendicitis the past few days, is reported as being considerably improved.

The ladies of St. John's Episcopal church spent a very pleasant afternoon with Mrs. John Brown at her home on Mineral street last Wednesday.

Notices are posted in the post office stating that bids will be received for carrying the mail betweeen Silverton and Ouray or between Silverton and Ironton.

Miss Jeannette Brown, Mrs. Emma James and Josiah Watson acted as judges of the school election Monday in the absence of the regular members of the school board.

J. A. Clay, manager of the Western Colorado Power company, was a business arrival Tuesday going over the local situation with Assistant Superintendent R. C. Lookwood.

John J. Maloney had the misfortune to throw his shoulder out of place while getting out of a wagon, his foot slipping over the end gate, causing him to fall. He is rapidily improving.

The condition of Dr. J. S. Baily, who has been confined to his home the past few weeks, is reported as being considerably improved of late, as his many friends will be pleased to learn.

Joe Lewis, who has been troubled with a severe ulcerated tooth the past few weeks, is nearly recovered and will soon be able to resume his position at the Highland Mary compressor.

The wrecking crew of the Silverton Northern made short work of putting back on the track the box car which was derailed Thursday as it was running wild through the yards.

A. R. Wilfley returned Monday to his home in Denver where he will remain the rest of this month before returning to the Mears-Wilfley mill for the coming summer.

Manager L. R. Clapp, George Purdy and Truman Taylor, of the Silver Lake, went down to Durango Wednesday on business connected with the opening of the mill as a custom concentrator.

Steve Mullin is in charge of the C C. Heath store at Eureka, and will remain there during the absence of Mr. and Mrs. Heath, who are to take an extended trip to the lower country.

The board of county commissioners held their regular monthly meeting on Monday and Tuesday and allowed the bills for April, and also approved the bond of Ben Johnson as overseer of the west road district.

Mrs. August Berquist and son leave today for New York City from whence they will sail for Bidalife, Sweden, where they will remain for the next year visiting relatives before returning to Silverton.

Charlie Scheer returned Sunday from a business trip to Denver. While in the Capital City he placed his patent fire nozzle, which was given a thorough test by the Denver fire department, with a Boston firm.

The Vienna cafe caters to the best and always has every delicacy of the season on hand.

The regular May term of court for the sixth judicial district will open May 18th. Judge W. N. Searcy will preside. Only a few cases of importance are on the docket.

Fred Goble was a home coming passenger from Denver on Sunday's train. He had been called there on business connected with the bankruptcy case of the Silver Ledge Mining company.

A new snow plow was sent up from Durango Saturday to take the place of the one on the Silverton Northern, which was broken while bucking the heavy snow on the Gladstone road.

Miss Ercell Robbins, daughter of Mrs. Joe T. Hinkley, who was operated on for appendicitis at the Miners' Union hospital Wednesday evening, is resting as comfortably as can be expected, and is on the road to recovery.

Examinations for all fourth class postmasters in Colorado who receive over $180 per year, will be held in Durango June 20th under the civil service commission. This applies to the offices at Eureka, Howardsville, Arastra and Animas Forks.

Mrs. Alva Kearney was a returning Silvertonite from Delta on last Sunday's train. She had been visiting relatives at that place for the past two or three months. Mr. Kearney met her in Durango and accompanied her home.

Note the new ad of the American Smelting and Refining company on the first page of this issue. Those who have low grade ores for sale might call on the management and learn something to their advantage.

Col. E C. Condit, was an incoming passenger on Sunday's train from Denver and other eastern points, where he spent considerable time in matters pertaining to his mining ventures in San Juan county.

It will be pleasing news to the many Silverton friends of Mrs. Mary Finn and daughter Madge, to know that they have returned to Durango from Pacific coast points. Mrs. Finn has again taken hold of the Rochester hotel, which during her absence, was conducted by Mrs. Vic S Day.

O. W. Nyberg, of the Silverton National Bank, left Saturday for Colorado Springs where he is a delegate from Silverton to the supreme council meeting of the Modern Woodmen of America, and will later go to Pueblo for a brief visit with relatives. During the absence of Mr. Nyberg George D. Brown is attending to his duties at the bank.

Superintendent C. G. Manning received notice Sunday that he has been appointed instructor of history of the State Teachers' College at Dillon, Montana, for the summer session, which begins June 1st and ends August 31st. Mr Manning is to be congratulated upon receiving this appointment which came entirely unsolicited and as a complete surprise to him.

Mr. and Mrs. James R Pitcher, Jr., and children returned Wednesday evening from an extended vacation spent at Passadena, California and vicinity. The Silverton Northern train crew went down to Durango Wednesday afternoon and brought the family in that evening in Superintendent McGraw's private car.

The industrial edition of the Steamboat Pilot, which reached us this week, is a work of art, containing as it does, graphic descriptions of the different industries and enterprises of Routt county, with profuse and handsome illustrations The editor of the Pilot is to be congratulated upon the production of such an excellent edition.

Kindling Wood

Dry and sound, $2 a load at Dale's Phone King 102.

The office of the Western Union was moved from the telephone exchange where it has been located the past two years to the building at the corner of Reese and Thirteenth streets owned by Mrs. Cotton. This move was necessitated by the recent order dissolving the union and the Mountain States Telephone and Telegraph company and the Western Union.

Do not pay rent, I have many bargains at present. Several houses for sale cheap. Two boarding houses. Insurance of all kinds.
MISS ELIZA LONERGAN,
1045 Mineral St.

Meeting of San Juan Congress

DURANGO, Colo., May 5, 1914.

To Vice-Presidents, Commercial Clubs and the people comprising the San Juan Congress counties:

GENTLEMEN:—There will be a meeting of the San Juan Congress in Durango, Wednesday evening, May 13, 1914, for the purpose of electing officers for the coming year, also the transaction of any other business that may come before the meeting

It is especially desired that all the officers and every commercial club will be liberally represented as there are quite a number of important matters to be considered at this meeting, including a review of the work of the congress in connection with the Reagan report and statement of receipts and expenditures for the past eighteen months.

The question of state and transcontinental highways for this southwest section and advertising the Spanish Trail-Grand Canon Highway for the 1915 Panama exposition in California will be discussed. If the business cannot be concluded at the night session an adjournment will be taken to the following day and night. The meeting has been called at this time owing to the spring race meet which will be held in Durango next week. We urge your attendance.

GEO. N. RAYMOND, Secretary. J. A. CLAY, President.

A number of Silverton people are planning to attend the meeting. A. P. Root, Jr, will represent the Commercial Club as a delegate, and August Fast will attend as a vice president of the congress from this county.

Wyman Back from Tour of Inspection

Louis Wyman, state highway inspector, arrived home Thursday from the final inspection trip of officials of the highway board to investigate further the conditions between the two routes from Pagosa Springs to the San Luis valley. Those making the trip were Mr. Herr, of Durango, a member of the advisory board; County Surveyor Goodman, Mr. Riley, the engineer in charge of the work, and Mr. Wyman.

After the inspection a meeting was held and the merits of the two routes again threshed out and the west fork of Silver pass was agreed upon as the better. The following day Mr. Wyman, and the engineer, Mr. Williams, made a close inspection again of the conditions of the road, and found the snow almost entirely gone from Windy Point to within two miles of the top of Silver pass, and if the road had been built this could be opened with very little expense. This route will be thirty days earlier in the spring and that much later in the fall than the Elwood pass route, and the grade between Windy Point and Silver pass will not exceed two per cent, and from Windy Point to the San Juan river six per cent, and if the road is extended by way of south fork the grade will not exeeed five per cent over the entire distance of fifty miles.

The entire line is on the sunny side of the mountain and the scenery is beyond description. The general public has full confidence in the highway commission and all its representatives, as they are all giving their earnest efforts to secure the best possible roads in this district.

Congregational Church.

Following is the services for Sunday, May 10, 1914:

10:30 a. m.—A sermon to mothers. The music will be led by the double quartette.

The male quartette will sing, Mrs. Frank Ross will sing a solo.

All mothers are especially invited to attend this service.

11:45—Bible school.

3:00 p. m.—Junior Endeavor.

On account of the baccalaureate sermon at the school auditorium there will be no evening service at the church

R. C. BYERS Pastor.

Imaginary Heart Trouble.

Do you have pains in the region of the heart? Does your heart thump? Its terrible pounding alarms you? What is wrong? Do you believe these symptoms mean heart trouble? Organic diseases of the heart very seldom occasion much pain. Nearly all of these pains are caused by some derangement of the stomach. Meritol Tonic Digestive is especially recommended for indigestion and dyspepsia, and for restoring the stomach to its normal functions and—no more "heart disease."—S. D. Cunningham, exclusive agent.

Preparations for Normal Institute Near Completion

Mrs. Harriet E Keyser, county superintendent of schools, has been busily engaged the past few weeks in perfecting the details for the normal institute which will be held in this city from June 8th to 19th. The conductor will be Prof. J. F. Keating, superintendent of the Pueblo public schools, and Superintendent C G. Manning, of this city, will assist him during the first week, and Mr. Keating is arranging for another assistant during the second week as Mr. Manning will be compelled to leave for his summer position in Dillon, Montana. Mr. Keating has won the well earned reputation of being able to impart genuine enthusiasm in all his courses, and his lectures on school management are considered as classics.

The other instructors will be Miss Ellen Grace Shoe, of Denver, who will lecture on arithmetic, geography, school law and history; Miss Bess E. Foster, of Hammond, Indiana, who will give a practical demonstration of the most approved primary methods and devices, and Mr. Leon S Ward, of the local faculty will have charge of the music.

It is the intention to have as a special feature of the morning exercises, special talks on educational topics of interest by Mary C. C Bradford, state superintendent, the conductor, instructors and others to be announced later.

Mary C. C. Bradford, state superintendent of public instruction, will be in attendance at the institute the second week, as will Superintendent Smiley, of Durango, and the various county superintendents of southwestern Colorado. Mrs. Bradford will speak either at Miners' Union hall or the school auditorium to the general public during her stay here.

The Knights of Pythias will hold their district convention here June 8th and 9th. June 8th a musical and informal reception will be held at the school auditorium for the purpose of becoming acquainted, and the Silverton Commercial Club has arranged an excursion to the mines during the second week. A course in folk dancing lessons will be given by County Superintendent Miss Florence Salibar, of Durango, assisted by Durango teachers, two or three evenings, and Sunday, June 14th, special services will be held at the Congregational church, by Rev R. C. Byers.

An interesting feature of the institute will be the demonstration course in domestic science given in the afternoons by Miss Tormohlin at the request of the ladies of the Civic Circle. This course will be offered especially for the ladies of Silverton, and already over 30 have signified their intention of enrolling. The fee for the entire course is only $1 and all who intend to enroll should notify Miss Harris at the library.

At least 50 outside teachers are expected to be in attendance, and outside of the regular work ample time will be found for entertainment, excursions, mountain climbing and other interesting features.

This is the first time the institute has ever been held in Silverton and all citizens should co-operate to make it a success.

Firemen's Entertainment.

Everything is in readiness for the big Firemen's entertainment at Miners' Union hall Wednesday evening, May 13th. The committee consisting of William Ennis, Ed. Lewis Lew Haas, Sam Wittow and Jim Cole have taken special pains to make this the banner event of the year, and the general public, old and young, should show their appreciation by turning out in large numbers.

An orchestra consisting of Clarence Thompson, Robert Thompson and William Miller will furnish the music and everything will be absolutely free. Between the first six or seven dances a program will be presented consisting of selections by the Silverton Mandalin club composed of Miss Tormohlin, Harry L. Frank, Joe Dresback, Cliff Montgomery and John Smith. Professor Thompson will give a monologue, the Baasman children will present a dance and song, the Thompson brothers will render vocal solos and one or two other numbers not yet fully arranged will be presented.

Let all attend and enjoy the festivities of the evening.

ATTENTION LADIES

The ladies of Silverton are cordially invited to a social afternoon, Saturday, May 9th, 1914, at the home of Mrs. B B. Allen, for the benefit of St. John's church Euchre at 2 o'clock. Admission 25 cents. Kindly notify some member of the committee of your acceptance.

Mrs. B. B. Allen, Mrs. S. A. Rodgers and Miss Sarah McNutt, Committee.

Gold Prince Sale Postponed Again.

The Gold Prince mining property was offered for sale Saturday, May 2, at the county court house by Sheriff James W. Pearson, as Special Master, in the case wherein the Federal Trust company is paintiff and the Gold Prince Mines, et al, defendants. No bidders appearing Mr. Pearson postponed the sale until Saturday, June 27th, at 10 a m

Track Meet at Durango.

Although Durango high school won a decided victory at the first San Juan Valley track meet, Silverton third, as announced in last week's STANDARD, the results of the meet are gratifying rather than disappointing to the followers of the local high school track athletics.

Silverton could not expect to win the meet against the Durango team of veterans, and considering that it was the first time any member of the squad ever competed in a track meet, the lack of outdoor work, the unfavorable weather conditions under which the meet took place, the squad and Coach Williamson have every reason to feel proud of their showing.

Schwenk was Silverton's star performer, entering six events and qualifying and winning one or more points in all but one. He won first place in the shot put, distance 36 feet 6 inches; second in the 220-yard dash; second in the discus; third in the 100 yard dash and fourth in the 220-yard hurdles, a total of 14 points. Roy Brumfield finished third in the quartermile, scoring Silverton's other two points.

Coach Williamson will enter Schwenk, Roy Brumfield and possibly Kramer, at the Boulder meet May 16th.

The Silverton team was royally entertained during their stay in Durango, a dance was tendered them Friday evening, and other social functions arranged in their honor.

The Elks cup must be won three times before it becomes the permanent property of any high school, and the victory of Friday gives Durango one leg on this cup.

Stop That Itch.

Just a few drops of that mild, soothing, cooling wash, Meritol Eczema Remedy, so highly recommended for eczema, and the burning and itching is gone. Don't fail to try this excellent remedy for any form of eczema. We know Meritol Eczema Remedy will give you instant relief. Sold and guaranteed by S D. Cunningham, sole agency.

ASSESSOR'S NOTICE.

As a reminder I will state that the law requires that all Tax Schedules be returned to the assessor not later than the 20th day of May, and upon those who have not already done so I urge the necessity of doing so immediately.

JOHN GLANVILLE,
County Assessor.

PREMIER

"Non-Puncture" Auto Tires

Guaranteed 7,500 Miles Service.

These tires bear the greatest known mileage guarantee, yet are sold at a price even less than tires of ordinary guarantee. This guarantee covers punctures Blow-outs and general wear. Guarantee covers 7,500 miles service against everything except abuse. These tires are intended for most severe service.

As a SPECIAL INTRODUCTORY offer, we will allow the following prices for the next ten days.

TIRES—TUBES

	Tire	Tube
28x3	$ 9 20	$ 2 00
30x3	10 25	2.30
30x3½	13.50	2 80
32x3½	14 05	3 00
31x3½	15 25	3 20
31x4	17 00	3 25
32x4	18 00	3 30
33x4	19.50	3.40
34x4	20.10	3.60
35x4	21.00	3 80
36x4	22.00	3 90
35x4½	26 00	5.00
36x4½	27 00	5 10
37x4½	27.50	5.15
37x5	32 60	5.40

All other sizes. Non-Skids 20 per cent extra. 5 per cent discount if payment in full accompanies order and if two are so ordered, shipping charges will be paid by us. C. O. D. on 15 per cent of amount of order. Our output is limited, so we suggest early ordering. We sell direct only, giving purchaser the advantage of all middlemen's profits.

STRONGTREAD RUBBER CO.
Dayton, Ohio.

Classified Ads.

FOR RENT—A three or two room furnished house. Phone Black 202 8tf.

FOR RENT.—Two furnished houses Mrs. Ed. Fox. Phone silver 47. 1tp

Kindling wood at reduced prices. Let us put in your winter's wood supply. Dale Carpenter and Machine Shop. Phone King 102.

FOR SALE CHEAP—One sewing machine and washing machine, in good condition. Apply at STANDARD office. 20-tf

Fessenden Says.

The Silver Coin group of mining claims is situate on the eastern slope of Treasure Mountain at Animas Forks. The group consists of five patented claims, heavily timbered and well mineralized.

The location for economical and continuous working cannot be excelled. This is a rare opportunity to secure a bargain.

Address:
J. H. FESSENDEN, sole owner,
Tampa, Florida.

FOR SALE.

MY ENTIRE LOT OF GROCERY AND BUTCHER FIXTURES, ALSO WAGON, SLED AND HORSES AT A BARGAIN.
Mrs. E. Brayden.

PROCEEDINGS

Board of County Commissioners of San Juan County, Colo.

APRIL, 1914.

At the meeting of the Board of County Commissioners of San Juan County, Colorado, held at the Court House in the Town of Silverton in said county and state on Monday and Tuesday the 4th and 5th days of May, 1914, the following proceedings inter alia were had and done to-wit:

ORDINARY REVENUE FUND.

War No	To Whom Issued.	For What Purpose.	Amt. allowed
9951	Henry Forsyth	Commissioner's salary	$ 18 00
9952	Wm H Dickie	" " "	15 00
9953	Frank B Brown	" " "	15 00
9954	C E Dresback	Clerk of Board and stationery	54 92
9955	Frank L Ross	County Attorney	35 00
9956	Thos G Dickie	Janitor at Court House	75 00
9957	I J Hanson	Salary and stationery	114 67
9958	Out West Printing Co	Stationery	81 33
9959	S D Cunningham	" etc	22 00
9960	Silverton Standard	" and printing	11 24
9961	Ray Cooper	District Court	13 00
9962	Geo W Lane	" Attorney	34 90
9963	Mtn States T & T Co.	Phones	15 30
9964	Jos Bordeleau	Merchandise for Court House	3 00
9965	T Sheahan	" " " "	3 50
9966	Silverton Supply Co	" " " "	1 75
9967	Town of Silverton	Lights	18 62
9968	E J Holman	Justice Court Juror	2 00
9969	E A Hollingsworth	" "	2 00
9970	William Palmquist	County Court	22 50
9971	James Pearson	Sheriff's fees	36 40

UNFORESEEN CONTINGENT FUND.

War. No.	To Whom Issued.	For What Purpose.	Amt Allowed
1266	Commercial Club	Advertising	$ 150 00
1267	James Pearson	Sheriff's expense	36 50

POOR FUND.

War. No.	To Whom Issued	For What Purpose...	Amt Allowed.
1259	Henry Forsyth	Merchandise for Poor	$ 7 00
1260	Jos Bordeleau	" " "	4 15
1261	J M Clifford	" " "	15 00
1262	San Juan Lbr Co	Coal for Poor	3 25
1263	Con S M & P Co	Merchandise for Poor	13 90

ROAD FUND.

War. No.	To Whom Issued.	For What Purpose.	Amt. Allowed.
2339	Ben Johnson	Road Work, West District	$ 8 00
2340	Chris Hansen	" " "	6 00

C. E. Dresback, County Clerk and Recorder

THE S[illegible] ON SUPPLY CO.

Groceries Wholesale.
Groceries Retail.
Bakery in Connection.

Well fixed at our warehouse on track to fill large mining orders. We usually have in stock anything you would expect to find in a Grocery or Bakery of [illegible].

SILVERTON SUPPLY CO.

Chas. Scheer

PLUMBING, STEAM AND HOT WATER FITTING

Orders given prompt attention

Bell-Jean Phone, Silver 120
Residence Phone, Red 1145.

1108 Greene Street.

WM. COLE
GENTS' FURNISHER

YOUNG men's suits and overcoats, smart new colorings, styles full of life and snap, things that will delight the young fellows. Made special by

Hart Schaffner & Marx.

WILLIAM COLE

This store is the home of Hart Schaffner & Marx clothes.

Auditorium Hotel

Comfort and convenience as well as expense are to be considered when planning either a pleasure or business trip. The luxury of a comfortable bed in a cozy quiet place, the best things to eat in a pretty cheerful dining room, surrounded by a homelike atmosphere, add greatly to the rest and recreation of a few days away from home, especially if it can be had within a stone's throw of the active business center, the best street car connections to every place of interest. Such we believe is the Auditorium Hotel and its hospitality is extended to you whenever you have occasion to be in Denver.

RATES $1.00 A DAY AND UPWARD

Take Colfax Car at Depot to Stout Street, Hotel just to Right

AUDITORIUM HOTEL
DENVER, 14th and Stout Streets.

[R]OOMS WITH BATH, $1.50 AND $2 PER DAY
THE ALBANY HOTEL
[TH]IS IS SOMETHING NEW FOR A DENVER HOTEL

Larger rooms with bath $2 50 and $3 00 per day.
Try one of these moderate priced rooms with bath, and you will be pleased. New Fire Proof Annex, every room with bath, completed July 1st, 1912.

[T]he Albany Hotel
DENVER, COLORADO

SEXUAL KNOWLEDGE

ILLUSTRATED 320 PAGES

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Health Note.

A Chicago physician says: "Good health demands that the mouth be kept closed while asleep." Cases are known where a man's health would be in better condition if he'd kept his mouth closed while awake.—Boston Transcript.

Sporting Notes.

From all appearances it looks as though Freddie Welsh's next opponent of importance will be Willie Ritchie, the lightweight title holder, on or about July 4th at San Francisco. Freddie's recent defeat of Loach Cross in a twenty-round go makes him the logical contender for the crown that rests on Ritchie's head.

The relay team that came over to this country from Oxford college, have gone back home again, but before leaving highly commended the sportsmen of this country for the manner in which they treated visitors to this side of the Atlantic.

And now comes the news that Champion Ritchie has done away with his manager, Harry Foley. Says he can lock after his own affairs from now on.

Outfielder Schreiber, who was on the spring training trip with the Chicago White Sox, has been purchased by the Lincoln team of the Western league.

Charlie Jones, who managed Denver in the Western league, a few years ago, has been given his unconditional release by the Winnipeg club of the Northern league. Jones has played at different times during his career with Detroit, St. Louis, Boston, Chicago and Washington, and this is his first release

No hit and no run games seem to be a favorite amusement among college pitchers this season.

Young Drew, the sensational colored 100-yard runner from Leland-Stanford University, of California, says that he expects to see the time, when the 100 yards will be run in nine seconds flat.

Louis Criger, one of the greatest catchers that ever put on a base ball glove, is reported to be down and out in Boston, Mass, and the fans of the "Hub" who appreciated his services in days gone by, are arranging for a big benefit game for his relief, and have selected the hard hitting Detroit Tigers for the event. Criger was the battery mate of "Cy" Young and Billy Dineen, in their palmy days. It is almost a certainty that these two old time hurlers will again don their uniforms and help swell the receipts for their old comrade in many a hard fought battle.

Benny Chavez, the Trinidad featherweight has secured a fifteen round go with Johnny Kilbane, the champion, for the latter part of this month at the stock yards stadium near Denver.

Last Friday evening, Eddie Campi, the Los Angeles bantam weight, outpointed Young Fox, of England, in a ten-round go in New York City.

At Butte, Montana, last Friday night "Kid" Jackson, of Helene, floored Jimmy Fox, of San Francisco, in the first round of a twelve-round mix.

The proposed twenty-round go between Wolgast and Rivers at San Francisco billed for May 10, has been postponed indefinitely, because of an injury to Wolgast's hand which he received in his recent set to with Young Tillman.

Cliff Healy, the pitcher formerly with Denver in the Western, has been released by Ogden of the Union Association to Terre Haute of the Central league.

Deafness Cannot be Cured

by local applications, as they cannot reach the diseased proportion of the ear. There is only one way to cure deafness, and that is by constitutional remedies. Deafness is caused by an inflamed condition of the mucous lining of the Eustachian Tube. When this tube is inflamed you have a rumbling sound or imperfect hearing, and when it is entirely closed, Deafness is the result, and unless the inflammation can be taken out and this tube restored to its normal condition, hearing will be distroyed forever; nine cases out of ten are caused by Catarrh, which is nothing but an inflamed condition of the mucous surfaces.

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Go to the Vienna restaurant for fresh mountain trout and other game of the season.

STRANGE BIRD OF DESERT

Chaparral Cock Said by Cattlemen to Build Cactus Fence Around Rattlesnake.

Does the road runner or Chaparral cock snare the rattlesnake by building a fence of cholla spikes around him and then dispatch the reptile at leisure? The story, received with skepticism, has often been told about this bird of the southwest. Mr John Feeney of Elgin recently went to Arizona to learn the truth. He learned from some of the pioneers that they were ready to make affidavits that they had witnessed the capture and death of rattlesnakes in the aforesaid fashion. Mr Sidney de Long of Bisbee affirmed that he had seen a pair of road runners, evidently mates, do the trick. Cattlemen were prolific in experiences of the kind, but the Arizona Historical society had no data.

The road runner is such a strange bird that anything told about it is believed. Dr. William T. Hornaday, in his "American Natural History," is credulous himself. The bird, he says, "is remarkably odd in form and also in its habits." He thus describes it:

"It is about the size of a small crow, with a tail as long as its entire body and head, and legs that are so long and strong they seem like those of a grouse, save that the toes are longer. The body is slender, but the neck and head are large and the head has a conspicuous crest. The beak is large. Although the bird has wings it seldom uses them, and they must constantly be growing smaller through disuse."

Mice, lizards, snakes, centipedes, and insects are provender. The doctor testifies that it is the most nervous of birds, abnormally suspicious and phenomenally quick in its movements. It flies little, but leaps far and high with closed wings. He estimates that if the road runner "goes on 10,000 years in its present habits" it will cease to fly at all and will be able to leap 20 feet in the air. This remarkable description of the uneasy and elusive bird of the Arizona desert prepares one for "the many strange yarns" that have been told about it, including the story of how it traps the somnolent rattler. In the interests of veracious natural history Mr. Frank M. Chapman should visit Arizona and write a monograph about Geococcyx californianus.

All the Facts.

One of the first tasks set the new curate, who was handicapped by youth and inexperience, was to investigate the bona fides of a "widow woman," who had applied to the church for help.

He departed nervously on his errand, and knocked, as ill luck would have it, at the wrong door

"How long has your poor husband been dead, my good woman? What number of children have you? Are any of them working? If so, what amount of money are they earning together?" were the questions he fired, like shots from a revolver at the slatternly woman who answered his summons. "I presume I am addressing Mrs. Harriet Phillips?" he added, noticing with alarm that she looked angry.

"No, you ain't!" answered the woman snappishly. "My name is Selina Jackson, my bairns go to school, and my 'usband's deid, what is necessary to a plateful of rump steak and onions at this very moment. Would you like to know anything else? Where was I born? When was I christened? At what age I started courtin'? Perhaps," she concluded sarcastically, rolling her tattered sleeves up above her elbows, "you'd like to see my vaccination marks before you go!" But the bashful curate, redder in face than a beetroot, was already in full flight.—Pearson's Weekly.

Last King of the Goths.

Roderick, the last king of the West Goths in Spain, was overthrown and probably slain by the Saracens in 711. The fate of Roderick has always been a mystery. His horse and sandals were found the day after the battle on the river bank, but his body could not be found. Probably he was drowned and washed out to the sea, but the Spaniards would not believe this. They clothed the dead king with a holy mystery which certainly did not enshroud him when alive. He became a legendary savior, like Arthur of Britain, and it was long believed that he would come again from his resting place in some ocean isle healed of his wound, to lead the Christians once more against the infidels. Spanish legends record that Roderick fled to the mountains and became a hermit until, by penance, he was purified of his sin and was then suffered to depart to the enchanted isle to await the time for his reappearance.

Who Was Jack Robinson?

You have uttered that famous phrase, "As quick as one could say Jack Robinson," of course but have you any idea who the real Jack Robinson was? Well, John Robinson proves to have been a politician who flourished in the time of George III and who was a great favorite of the English king against whom the 13 American colonies revolted, says a writer in the Buffalo Express. Robinson's political career was a long one and he was a member for Harwich for 26 years.

On one occasion he was bitterly attacked by Sheridan, who, denouncing bribery and its instigator, replied to the cries of "Name! Name!" by pointing to Robinson on the treasury bench exclaiming: "Yes I could name him as soon as I could say Jack Robinson." Thus originated the saying still current.

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It is an easy matter to prevent diseases of the scalp by using Meritol Hair Tonic. It should be used regularly to keep the scalp free of germs, as these germs are the cause of the majority of cases of dandruff and later baldness. We are authorized to guarantee Meritol Hair Tonic.—S. D. Cunningham's exclusive agency

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For Providence is kind,
And bear we all life's changes
With a calm and tranquil mind
Though pressed and hemmed
On every side,
Have faith and we'll win through
For ilka blade of grass
Has its ain drop o' dew.

VEXING LEFT-OVER PROBLEM.

One of the chief recommendations for the casserole is that it is a fine help in using up left over meats. Take two cupfuls of boiled rice, two cupfuls of chopped or sliced meat that has been left from dinner, a cup of brown or cream sauce, one tablespoonful of chopped onion, one of parsley, a teaspoonful of salt and a few dashes of red pepper. Line the casserole a half inch deep with the boiled rice. In another dish melt a tablespoonful of butter, add a tablespoonful of flour and stir until smooth, then add the seasonings, the brown or white sauce, the meat, and finish the top with another layer of rice. Steam in a pan of hot water for 45 minutes, then serve with tomato sauce. This may be made in a granite dish, unmolded on a platter, and the tomato sauce poured around it.

Beef Steak Pie.—This is a dish that may be most palatable if nicely made. Line a baking dish with a good plain paste. Parboil four potatoes for ten minutes, and drain. Take four cups of cold cooked steak, cut in dice, fill the dish by adding a layer of meat and a layer of sliced potatoes, a few mushrooms. Season each layer until all the meat and vegetables are used. Roll out some paste and cover, leaving a hole in the top in which a funnel is inserted. After it is well baked pour into the funnel two cupfuls of brown sauce. Bake about 45 minutes.

Stuffed Peppers.—This is a dish which is growing in popularity. Take two cupfuls of chopped cooked meat and mix with a cup of sausage, add a half cup of boiled rice, a seasoning of paprika, one egg, and mix well. Fill the peppers after parboiling them five minutes, and bake until tender. Or the peppers may be cooked in tomato and the meat in balls cooked until tender and served with the sauce poured around the peppers and balls.

Cold cooked fish makes most appetizing salads.

Nellie Maxwell.

I HAVE told you of the Spaniard who always put on his spectacles when he ate cherries, so that they might look more tempting. In like manner, you should look at your own blessings. —Southey.

SEASONABLE DISHES.

The good old Virginia corn bread and griddle cakes are a treat when made as they were originally.

Virginia Corn Cakes.—Scald a pint of cornmeal with three-fourths of a pint of boiling water, cover and let stand while you separate and beat two eggs. Add a cup of sour milk, a teaspoonful of soda to the yolks and a teaspoonful of salt and a tablespoonful of sugar to the meal. Beat the ingredients all together and fold in the whites of the eggs the very last. Have the griddle well heated, and bake a rich brown before turning.

Mock Venison.—Lay a leg of mutton in a dish with diluted vinegar, a fifth vinegar and four-fifths water, add two small sliced onions, six pepper corns, six cloves, a dozen allspice, four bay leaves and one tablespoonful of crushed juniper berries. Roast the mutton after it has laid in this vinegar solution four days. Use the vinegar to baste with when roasting.

Hominy Pudding.—Scald two cups of milk in a double boiler, add a tablespoonful of cornstarch diluted with a little cold milk, cook for ten minutes. Reheat two cups of cooked hominy, add the thickened milk, one cupful of sugar, a fourth of a teaspoon of salt, one square of chocolate melted, two eggs well beaten and a teaspoonful of vanilla. Pour into a buttered baking dish and bake until firm in the center. A few raisins may be added, if desired.

Raised Doughnuts.—Take a cup of butter, a cup of sugar, a teaspoon of cinnamon or nutmeg, and two eggs well beaten. Work this mixture into two cupfuls of bread dough ready for its second rising, and let it rise an hour or so. When light, add a few chopped raisins, citron and currants. Roll thin, cut out and fry in deep fat. Roll in powdered sugar before serving.

Prune Souffle.—Remove the stones from half a pound of stewed prunes, press through a sieve, add the yolks of three eggs slightly beaten and four tablespoonfuls of powdered sugar. Fold in the whites of four eggs, turn into a buttered baking dish and bake until firm. Serve at once with whipped cream and sugar.

Nellie Maxwell.

Madison, Wis., Jan. 1, 1913.

M. D. Reynolds says.—This is to certify that I have been a great sufferer from rheumatism since 1891. Contracted the disease while working with a snow plow on the railroad. For several years I have been obliged to use crutches a great part of the time. Having used three boxes of the Meritol Rheumatism Powders I have thrown away the crutches and am now almost fully recovered. It certainly has done wonders for me and I heartily recommend it. M. D. REYNOLDS.

Sold by S. D. Cunningham, sole agent.

NOTICE OF FINAL SETTLEMENT.

In the Matter of the Estate of Henry M. Allen, deceased.

Notice is hereby given, That on Monday the 12th day of May A. D. 1913 being one of the regular days of the March Term of the County Court of San Juan County, in the State of Colorado, I, Jeanette M. Allen, Administratrix of said estate, will appear before the Judge of said court [illegible] my final settlement as administratrix of said estate, when and where all persons in interest may appear and object to the same, if they see fit. And at the same time and place, I will apply to the said court to be discharged as such administratrix at which time and place any person in interest may appear and present objections to the same if any there be.

Dated at Dolores, Colorado, April 14th, 1913. JEANNETTE M. ALLEN, Administratrix of the Estate of Henry M. Allen, Deceased.

First Pub April 18. Last Pub May 9, 1913

NOTICE OF FORFEITURE.

Silverton, Colo., February 16, 1913.

To Nerval H. Hand, his heirs, assigns and legal representatives:

You are hereby notified that the undersigned has expended One Hundred Dollars in labor and improvement upon each of the following lode mining claims, to wit: The Black Rover No. 1, Black Rover No. 2, Black Rover No. 4, Parsons and Primo, all situate in Eureka Mining District, San Juan County, Colorado, for the years 1911 and 1912, the location certificates of said mining claims being of record in the office of the County Clerk and Recorder of San Juan County, in the Books and Pages as follows to wit: The Black Rover No. 1, Black Rover No. 2, [illegible] Book 1[illegible], Pages 2[illegible] and 2[illegible] respectively; Black Rover No. 2, Book 1[illegible], Page [illegible]; Primo, Book 1[illegible], Page 1[illegible] and Parsons, Book 1[illegible], Page [illegible], in order to hold said claims under the provisions of Section 2324 of the Revised Statutes of the United States and the amendment thereto approved January 22, 1880, concerning annual labor on mining claims, being the amount required to hold said lode mining claims for the periods ending on the 31st day of December, A. D. 1911 and 1912.

And you are hereby further notified that if within ninety days after the publication of this notice you fail or refuse to contribute your proportion of said expenditure as co-owner your interest in said claims will become the property of the undersigned, your co-owner, who has made the required expenditure by the terms of said section.

F. T. [illegible]

First pub. Feb. 21. Last pub. May 23, 1913.

TREASURER'S NOTICE COMPLYING WITH A REQUEST FOR NOTIFICATION SO AS TO BECOME ENTITLED TO A TAX DEED. LAW OF 1905.

To every person in actual possession or occupancy of the hereinafter described land, lot or premises, and to the person in whose name the same was taxed or specially assessed, and to all persons having an interest or title of record in or to the same.

Notice is hereby given that on the 25th day of October, A. D. 1909, the following described property, situate in the County of San Juan and State of Colorado, to-wit: The [illegible] lode mining claim, U. S. Sur. No. [illegible], situate in the [illegible] Mining District, San Juan County, State of Colorado, was sold for the taxes for the year 1908 and purchased by [illegible]; that the said San Juan County has duly assigned the certificate of purchase issued therefor to [illegible]; that [illegible] such purchase to request upon the Treasurer of said county for notification, as provided by law so that such tax deed may be made: that [illegible] the said premises were taxed or specially assessed in the name of [illegible] and that the time of redemption of said real estate from said sale will expire on the 12th day of August, A. D. 1913, and a deed will issue therefor on the 13th day of August, 1913, unless redeemed before such time.

Dated the 23rd day of April, A. D. 1913.

[SEAL] [illegible], Treasurer of San Juan County.

First Pub April [illegible]. Last pub. May 9, 1913.

FRANK L. ROSS
Attorney-at-Law
Office in Benson Block.

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Mining and Milling

High Price of Tungsten May Open Big Field in San Juan County.

Flotation in General Use Will Start Mines and Mills That Have Been Idle For Years.

The wonderful work of flotation on San Juan ores insures its installation in every mill in the county within a year. Not only those now in operation but those that have laid idle for years. It does not take one long to figure out what that means to the future of San Juan county. It means resumption of such great mines and mills as the Grand Mogul at Gladstone, 500 tons capacity, the Old Hundred, 300 tons, the Green Mountain, 200 tons, the Kittimac 150 tons, the Hercules 150 the North Star, 100 tons, and others

With all these properties under way and several more to follow means the trebbling of our annual output in a very short time. When we add to this the output of the gold and silver mines of the Eastern San Juan gold belt, which are sure to follow shortly either through flotation or by cyanide process, it will not be long before we will be crowding the best for first place honors.

While tungsten is quoted at $45 00 per unit, it would probably bring a shipper of concentrates between $30. and $35. But at that it will place low grade tungsten ore on a paying basis. A steady market is assured by the increased commercial uses of the metal. It is now known that tungstenized steel possesses a tensile strength 100 per cent greater than ordinary steel.

At present its greatest use is in the manufacture of the heavy guns used in the great war, but it is being rapidly extended to the strengthening of steel in industrial uses, where great sustaining and resisting powers are necessary Hence its demand is bound to be much greater than the present known fields are capable of supplying.

England, Germany and all the other tungsten producing nations engaged in the European war, have absolutely forbidden the exportation of tungsten. This throws the United States dependent upon the production of American mines for its tungsten supply.

At present Boulder county in this state is the leading source of supply in the United States and the Tonopah Mining company is producing tungsten quite extensively from some of its Nevada mines. The tungsten discoveries in San Juan county offer excellent opportunities for investments in this line. It is known to exist in goodly quantities in the Gold King mine at Gladstone. the Tom Moore mine above Eureka and several other properties. but until lately failed to receive the attention it deserved long ago.

In the Galty Boy group, Louis Schafer and Prof. Paul have opened up a good tungsten vein and are now actively engaged in fitting up the Yukon mill to treat the same

The work is being watched with unusual attention, as its success means a big prospecting campaign in the spring, which may result in opening a tungsten field that will rival the greatest in the world as the possibilities of the San Juan are beyond human comprehension.

Tungsten at $3000 per ton makes the fellow with a tungsten mine or prospect feel mighty joyful these days

Read Neal of the Navy and subscribe for the Standard.

Mine Commissioner Carroll Address Big Meeting at Commercial Club.

Last Monday evening a well attended meeting of more than passing significance, was held at the rooms of the Silverton Commercial Club, by the mining, business and professional men and citizens of Silverton, to welcome our present state commissioner of mines, Hon. Fred Carroll, of Ouray, who arrived in the city Sunday afternoon.

Commissioner Carroll is making a tour of the mining camps of the state in order to obtain first hand information of existing conditions, to aid him in the discharge of the important duties of his office.

In his address Mr. Carroll told of the bright promise that was looming upon the horizon of the mining industry, through such agencies as flotation and the rapid advances being made in all branches of mining and milling by the practical application of the new discoveries and inventions of science and metallurgy. He pointed out that great veins and deposits of complex and rebellious ore, so low in grade and difficult of treatment, as to be considered worthless, practically up to the present time, would within a very short space of time become heavy producers of both the precious and industrial metals and that meant an enormous increase in the dividend payers of the state.

He dwelt upon many other interesting things concerning mining, giving sound advice and also strong assurances of his friendship and loyalty to the great San Juan, which he regards as the greatest of all the western fields, and promising his aid in all our legitimate undertakings, while at the same time lending all the influences of his important office to the general welfare of the mining industry.

He was followed by Senator Curran, who pointed out important relations between good roads and mining, also by Prof W. H. Paul, interested with Louis Schafer of this city, in the development of the tungsten veins in the Galty Boy group, who spoke very in interestingly upon the uses and increasing demand for tungsten and its importance to the mining industry in the state, district and county.

Commissioner Carroll's visit was quite unexpected and the meeting was accordingly quite hurriedly gotten up by the club directore, who regret that they had not sufficient time to send notices to all parts of the county, so that all our mining men would have had the opportunity of meeting him He will always be a welcome visitor to Silverton, but we sincerely trust that when he visits us again that he will let us know far enough in advance to give notice in ample time to have all the mining and mill men of the county on hand to meet him.

There has been a notable increase in the production of our mines during the past year, but it will not be close to the year 1916

Silver is still going up, lead on the up grade, zinc about r. copper and tungsten. Looks like boom days ahead.

MARION BALLOU FISK.

The Guard of Honor.

One of the most interest audiences Marion Ballou Fisk ever had wasn't a real audience at all. They were four boys who came in the hall to see her pack up after the entertainment was over—four boys of the street, unkept and neglected.

There was Jerry, a rollicking Irish lad, who wore a blue gingham shirt, though the night was bitter cold. Then there was "the kid", Jerry's little brother, and two others, Jerry's loyal satelities. All, even "the kid" helped take down the easels, and as they worked Jerry broke forth; "Say, that was a swell show you put up tonight, The last one who was here didn't put up no good show at all. He didn't have no pictures, nor sinin' nor nothin'. He just stood up and chewed a rag, and chewed a rag."

"I'm glad you liked it," smiled Mrs. Fisk. "I didn't know you were here. I didn't happen to see you."

With a knowing smile at his companions, Jerry replied: "Oh yes, we was here all right, but where you couldn't see us. Us fellows have got some boxes that we set up outsides the windows after the show's begun, an' if its good we stay all through. We can see all right, an' if its loud we can hear most of it. We heard yer sing, but what was this here picture about?"

As he spoke he lifted up one of the pictures she had drawn. What if the hour was late? Mrs Fisk sat down on her trunk and while the boys looked over her pictures she told them all the stories that went with them, and many others thrown in for good measure. At the end Jerry breathed an ecstatic sigh. Wot do yer do with these pictures", he asked. "Why I give them away. You boys can have them if you want" The boys divided them with beaming faces.

At the door Mrs Fisk bade them goodnight, but Jerry protested. "No mom, we're goin' to see you home to the hotel. We know what,s owin' to a lady."

"But you'll take cold. You haven't any coat on," demonstrated Mrs. Fisk.

A chorus of derisive laughter greeted this, and even "the kid" snickesed with brotherly pride. "Oh no, Jerry won't take cold. Jerry never takes cold."

So the little cavalcade moved up the street in the starlight, led by the immune Jerry, and talking of the stories they had heard that night, of patriotism, and manhood and high purposes in life.

At School Auditorium Thursday evening, Dec. 2. under auspices of Lyceum Committee.

HAIR WORK OF ALL KINDS
SHAMPOOING AND SINGEING
ALL KINDS SCALP TREATMENT
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The only first-class house in Durango

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AND

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Steam heat throughout.
Courteous treatment.
Prompt service. o o o

DURANGO, - COLORADO

DO YOUR CHRISTMAS SHOPPING IN SILVERTON

Make a round of our city stores before sending out. You will find better bargains than you think. Keep the SILVERTON DOLLAR here. It means Greater Prosperity and a Merrier Yuletide. o o o

This is our Xmas Ad Complimentary to the Merchants of Silverton. The Print Shop Included.

Patronize Home Merchants.

NEWS-00047
p. 1 of 6

No Unadorned Beauty

can compare with one wearing some of our jewelry Posts to the contrary women's charms are heightened by the add ition of well chosen ad rnments. Especially when they are so artistic and attractive as the jewelry we display. Come in and see it A glance will give you an idea of its beauty. A question will show the moderateness of its cost.

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Fish, Oysters, Poultry and game. Butter, Eggs, Fresh Vegetables and Delicacies. Fancy Sausage our Specialty fresh Every day.

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Standard Bottling Works

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LIQUORS, CIGARS,

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Original MANITOU and GINGER ALE, or any other line of Soft Drinks; and also able to furnish ICE to the trade.

PETE ORELLA, Prop. Phone Silver 46

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YOUNG men's suits and overcoats, smart new colorings, styles full of life and snap, things that will delight the young fellows. Made special by

Hart Schaffner & Marx.

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This store is the home of Hart Schaffner & Marx clothes.

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SILVERTON STANDARD.

J. T. JOYCE, Sr., Editor & Publisher

MEMBER COLORADO EDITORIAL ASSOCIATION

Entered at the Silverton, Colo., postoffice for transmission through the mails as second class matter

OFFICIAL COUNTY PAPER

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Resolutions of Condolence	1 50
SUBSCRIPTION RATES One Year	2 00
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Six Months	1 00
Three Months	50
Single Copies	05

All legal publications will be charged for at the legal rate.

"AMERICA FIRST" Woodrow Wilson.

According to the Rocky Mountain Herald's list of Republican availables the party is in one awful fix outside of Denver,

Keep the Silverton Dollar at home this Xmas season. It means employment to more people, better times and a Merrier Xmas. Then keep up the habit for 1916.

"America First" will be the issue of 1916. President Wilson has not sought to raise the issue, but it is being daily forced upon the country and every true American will sustain both the president and the country on that question

Let's see, isn't the Hub Work who says that Elihu Root will be the next president, the same Hub Work who a year ago predicted that Hub Work would be the next U. S. Senator from Colorado. Sure Gee! but he is some prognosticator.

K. of P. Entertainment.

One of the most delightful social events of the season took place Wednesday evening at Wyman's hall when the members of Snowflake lodge No. 61, entertained the members and their ladies and friends by a delightfully arranged program followed by a social dance The program follows. Mandolin solo. C. W. Montgomery and Joseph Dreeback Vocal solo, Mrs Frank C. Grimes. Reading, Miss Mary Luther. Vocal solo. D. D. Barrett. Piano selection, Roscoe Wright.

At the end of the program, the Master of Ceremonies called B. Van Slyck to the stage and then Senator H. E. Curran stepped forward, as had been previously arranged and in words well chosen and most appropriate presented Mr. Van Slyck with a beautiful jeweled K of P. emblem in recognition of twenty-five years of faithful membership.

Then the hall was cleared and the balance of the evening was spent in dancing.

Mrs. James McNamara's Father Dies at Antonito.

Mrs. James McNamara was called to Antonito by the death of her father, William Eagan, which occurred on Monday morning of this week. Mr. Eagan was one of the early pioneers of the San Luis valley and extremely known throughout the southwestern part of the state.

He had lived nine years beyond the alloted three score and ten. Colorado had been his home since he was 22 years of age For more than 35 years he was in the employ of the D & R. G. Since 1913 ill health has been his portion, but his condition was not critical until the last of the week. The deceased is survived by two daughters, Mrs. James McNamara of Silverton, and Mrs. Richardson of the San Luis valley.

The STANDARD extends its deepest sympathy to Mrs. McNamara and surviving members of the family over the sorrow that has come into their lives.

Congregational Church.

Sunday, November 28, 1915.

10:50 a m Subject: Salvation Worked Out.

11:45 a. m Sunday school.

7:00 p m. Juniors.

6:30 p. m. Young people's meeting

7:45 p m Subject. Scriptural Directions About Prayer.

The morning sermon is the second of a series on How God and Man co operates in the Matter of Man's Salvation.

R C BYERS, Pastor.

Subscribe for the Standard.

Meets Sudden Death.

Jiulio Alberetti was suddenly killed, and Marshall Jones and Chris Vocus, slightly injured by a peculiar accident at the Sunnyside mine last Sunday evening. Alberetti while engaged in breaking a chunk of ore which was thrown out by a blast and which evidently contained some giant powder that had not exploded, hit the powder with his pick causing it to explode with considerable force, killing him and injuring Messers Jones and Vocus who were working with him. Their escape from death was miraculous. Mr. Alberetti was about 33 years of age, born in Italy, single and was a member in good standing in the Miners Union and Royal Order of Moose. His remains were shipped to Durango. Wednesday by Undertaker McLeod on request of some relatives who reside there. The funeral was held in that city Wednesday afternoon from the Sacred Heart church under the auspices of the Moose.

Lee Nelson Accidentally Killed

While engaged at his work on the top floor of the Iowa mill attending to the elevator, last Sunday afternoon, Lee Nelson in some way missed his footing and fell down the elevator shaft to the Chilian mill floor, a distance of about 100 feet. When his fellow workman rushed to the shaft to take him out they found him unconscious and knew that he was seriously injured No time was lost in rushing him to the Miners Union hospital in the city where he died 45 minutes after reaching that institution. He was 36 years of age, born in Sweden, where he leaves a wife and several small children to mourn his death. The funeral was held from McLeod Undertaking parlors Wednesday afternoon, Rev. R. C. Byers officiating.

Sends Best of Wishes to All.

We are in receipt of a letter from our old time friend and one of the best liked young men, who ever lived in Silverton, Oscar Gempp, the blind pianist, who now resides with his parents in Wright City, Mo. As usual Oscar expresses his best of wishes for the Silverton people for whom he always entertains the kindliest feeling and in return the STANDARD on behalf of his legion of friends in this city extend to the blind boy, Oscar Gempp, of whose wonderful performance on the piano we still boast with joy and pride, and to his parents our wishes for a merry Christmas and happy new year.

Insurance Paid Promptly.

The late lamented Miss May Maguire was one of the first to join the Womens Benefit Association of the Maccabees when that fraternal insurance order for ladies was instituted in Silverton early in the fall. Only a few weeks intervened when her sad death occurred in October

In less than a month following, warrant No. 1461 for the sum of $1000. in payment of her beneficiary certificate, issued by home office in Port Huron Michigan, under date of November 20th. was received by Mrs. Maude Gooch, record keeper of Silverton Review No. 59 and by her paid over to the beneficary of Miss Maguire.

The promptness with which this claim has been met and paid speaks volumes for the stability and reliability of the M. B. A. M. as an order full worthy of consideration by ladies desiring fraternal benefits and insurance.

Money Cursed or Foolish.

The poor boob who is planning to start an other paper in Ouray or any other town of its size, which is well served by two active weekly newspapers must be suffering from a lack of brains or else he is cursed with money to throw to the dogs.

Teachers' Examination.

The regularly quarterly examination for teachers will be held at the Court House December 16th, 17th, and 18th, 1915.

Morning sessions, 9.00 to 12:00.

Afternoon sessions, 1:30 to 4:00.

HARRIET E. KEYSER,
County Supt. of Schools

3 3t.

The ladies of St. John's Guild will hold a bazaar and delicatessen sale at the Hotel Imperial on Saturday afternoon, Dec. 4th, at 2 o'clock. Many attractive articles suitable for Christmas gifts will be on sale at reasonable prices.

Among our many visitors from the Sunnyside during Thanksgiving, were Dick Tramor, Tom Clark, Herman Spiegr. and Johnny Higgins.

THE DURANGO TRUST COMPANY

Will be pleased to receive Savings Accounts from depositors and pay interest at 4 per cent per annum credited on December thirty-first and June.

Checks may be sent by mail, or currency by registered letter

Deposits made on or before the fifth of each month will draw interest from the first.

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SILVERTON, COLO.

A WORD TO HOUSEWIVES

Upon you depends the economy of the home.

You must see that every penny expended brings its full value.

You know that for table use, cooking and medical purposes, nothing compares with the milk of the Purebred Registered Holstein cows and that every nickel and dime paid out for Holstein milk brings more in value than any other necessity of life.

We sell no other kind, Cleanliness, Purity and good measure is our motto.

SILVERTON DAIRY KARL THOMPSON, Prop
Phone King 58.

All the employes of the Iowa mill came down Wednesday afternoon to attend the funeral of their comrade, Lee Nelson, who was accidentally killed at the mill Sunday afternoon.

Do not pay rent, I have many bargains at present. Several houses for sale cheap. Two boarding houses Insurance of all kinds
MISS ELIZA LONERGAN,
1045 Mineral St.

Silverton Standard

SILVERTON, COLORADO, NOVEMBER 27, 1915

Notice of Tax Sale

TREASURER'S OFFICE
County of San Juan,
State of Colorado. } SS

Public Notice is hereby given, that I, the undersigned Treasurer of said County, will, according to law, offer at Public Sale, at the office of the treasurer of the County of San Juan, State of Colorado, in Silverton, Colorado, on

Monday, the 6th Day of December, A. D. 1915,

and succeeding days commencing at the hour of ten o'clock a. m., of said day, so much of the following described real estate, situate in the said County, on which taxes for the year 1914, and such prior years as are hereinafter designated, have not been paid, as shall be necessary to pay the taxes thereon, respectively, herein below set down, interest and penalties, to-wit:

MINING CLAIMS.

TAXES FOR THE YEAR 1914 (Except as Otherwise Designated)

NAME OF OWNER OR OWNERS.	NAME OF MINING CLAIM	MINING DISTRICT	SURVEY No.	NUMBER OF ACRES	VALUATION Dollars	VALUATION Cents	AMOUNT OF TAX Dollars	AMOUNT OF TAX Cents	Total Tax, Penalties and Interest Dollars	Total Tax, Penalties and Interest Cents
Barnes, George H	Buckingham	Uncomp	2140-A	10.	600.00		9.60		10.73	
Bartels, Carrie I	An und 45-80 of British Queen	Uncomp	643	3.6	563.00		9.00		10.09	
Bartels, Carrie I	An und 45-80 of Thunderbolt	Uncomp	685	10.	338.00		5.40		6.21	
Bell, Anna C	An und 1-4 of Pokeepsie	Uncomp	2029	8.7	135.00		2.16		2.72	
Bell, Anna C	An und 1-4 of First S. W. Poughkeepsie Ext	Uncomp	2177	10.3	150.00		2.40		2.98	
Bell, Anna C	An und 1-4 of Alabama	Uncomp	305	10.3	150.00		2.40		2.98	
Bell, Anna C	An und 1-4 of Digger Indian No. 2	Uncomp	485	10.3	150.00		2.40		2.98	
Bell, Anna C	An und 1-4 of Honolulu	Uncomp	236	7.4	120.00		1.92		2.45	
Born, Matilda S	Improvements at Middleton				50.00		.80		1.26	
Brazillian Monitor Mining Co	Brazillian	Uncomp	2264	4.5	300.00		4 80		5.56	
Brazillian Monitor Mining Co	Monitor	Uncomp	2263	10.33	800.00		12 80		14 18	
Brazillian Monitor Mining Co	Pittsburgh	Uncomp	19025	6.72	420.00		6.72		7.63	
Brazillian Monitor Mining Co	Alleghaney	Uncomp	19025	10 07	600.00		9 60		10.73	
Brazillian Monitor Mining Co	Aspenwall	Uncomp	19025	10.23	600.00		9.60		10.73	
Brazillian Monitor Mining Co	Avalon	Uncomp	19025	7.49	480.00		7.68		8.67	
Brazillian Monitor Mining Co	Mt. Washington	Uncomp	19025	9.03	600.00		9.60		10.73	
Brazillian Monitor Mining Co	Clear View	Uncomp	19025	10.10	600.00		9 60		10 73	
Brazillian Monitor Mining Co	Bellevue	Uncomp	19025	10 33	600.00		9.60		10.73	
Brazillian Monitor Mining Co	Oakland	Uncomp	19025	8 41	540.00		8 64		9.70	
Brazillian Monitor Mining Co	Sewickley	Uncomp	19025	1.14	120.00		1.92		2 45	
Brazillian Monitor Mining Co	Wilkinsburg	Uncomp	19025	7.87	480.00		7.68		8.67	
Colorado Copper Co	Copperopolis	Animas	13561		600.00		9.60		10.73	
Colorado Copper Co	Galena North Star	Animas	13561		600.00		9.60		10.73	
Colorado Copper Co	Magician	Animas	13561		600.00		9.60		10.73	
Colorado Copper Co	Mineral Queen	Animas	13561		600.00		9.60		10.73	
Colorado Copper Co	New Era	Animas	13561		600.00		9.60		10.73	
Colorado Copper Co	Plutocrat	Animas	13561		600.00		9.60		10.73	
Colorado Copper Co	Silver Chief	Animas	13561		600.00		9.60		10.73	
Conservative Securities Co	An und 1-2 of Mineral Slope No. 1	Ice Lake	19486	10.33	300.00		4.80		5.56	
Conservative Securities Co	An und 1-2 of Mineral Slope No. 2	Ice Lake	19486	5.97	180.00		2 88		3.48	
Conservative Securities Co	An und 1-2 of Mineral Slope No. 3	Ice Lake	19486	10 33	300.00		4.80		5 56	
Conservative Securities Co	An und 1-2 of Mineral Slope No. 1	Ice Lake	19486	5.88	210.00		3.36		4.01	
Cubitt, Arnold and R. A. Callow	An und 91-100 of Columbus	Ice Lake	11693	10.3	546 00		8.73		9 80	
Cubitt, Arnold and R. A. Callow	An und 91-100 of Last Hope	Ice Lake	11695	4.7	273.60		4.36		5.09	
Cubitt, Arnold and R. A. Callow	An und 91-100 of Webster	Ice Lake	11695	10 3	546 00		8.73		9.80	
Cubitt, Arnold and R. A. Callow	An und 91-100 of Grand View	Ice Lake	11693	10.3	546.00		8 73		9.80	
Cubitt, Arnold and R. A. Callow	Ice Lake M. S.	Ice Lake	11694	5.	2,300.00		36.80		40.03	
Egerton, W. I	An und 1-4 of Gilmore	Eureka	745	10.3	150 00		2.40		2 98	
Ezell, J. B	Sound Democrat	Eureka	2686	9.	4,200.00		67.20		72.77	
Fontius, John J	An und 1-2 of Good Hope	Animas	7761	10.3	550.00		8.80		9 87	
Fontius, John J	An und 1-2 of Wonder	Animas	7761	10.3	550.00		8.80		9.87	
Fox, Josephine E	An und 3-8 of Terrible	Animas	272	10.33	563.00		9.00		10.09	
Gold Prince Mines Co	Tramway from Gold Prince mine to Animas Forks				9,000.00		144.00		155.09	
Glatzel, Robert	Golden Age	Animas	15089	10.33	600.00		9 60		10.73	
Glatzel, Robert	Part of Humboldt	Animas	15090	8.	480.00		7 68		8.67	
Glatzel, Robert	Volapuk	Animas	15090	9.	540 00		8.64		9.70	
Hall, Alfred W	Crescent	Eureka	18238	5.42	360.00		5.76		6.60	
Hall, Alfred W. and W. A. Burleigh	Narrow	Animas	2227	10.3	600 00		9.60		10.73	
Hammett, P. P	Cary	Red Mt	1339	2.7	180.00		2.88		3.48	
Hammett, P. P	Stonewall	Red Mt	1338	7.6	480.00		7.68		8.67	
Hammett, P. P	U. S. Treasury	Red Mt	1336	10.1	600.00		9.60		10.73	
Hammett, P. P	U. S. Treasury No. 2	Red Mt	1048	10.3	600 00		9.60		10 73	
Hammett, P. P	U. S. Mint	Red Mt	1337	10.3	600.00		9.60		10.73	
Haskins, R. W	Cleveland	Uncomp	5072	10.3	600.00		9 60		10.73	
Haskins, R. W	Cleveland No. 2	Uncomp	5072	10	600 00		9 60		10 73	
Haskins, R. W	Dayton	Uncomp	2285	7.1	480.00		7.68		8.67	
Hayes, Estate of Frances	An und 1-2 of Colin Kilroy	Animas	16872	9.46	300.00		4.80		5 56	

MINING CLAIMS

TAXES FOR THE YEAR 1914 (Except as Otherwise Designated)

NAME OF OWNER OR OWNERS.	NAME OF MINING CLAIM	MINING DISTRICT	SURVEY No.	NUMBER OF ACRES	VALUATION Dollars	VALUATION Cents	AMOUNT OF TAX Dollars	AMOUNT OF TAX Cents	Total Tax, Penalties and Interest Dollars	Total Tax, Penalties and Interest Cents
Helmtoldt, A. W	Custer	Eureka	14438	10.3	600.00		9 60		10 73	
Henrietta Mining & Milling Co	Henrietta	Red Mt	15526-A	10.	1,000.00		16 00		17.63	
Henrietta Mining & Milling Co	Humboldt	Red Mt	15526-A	10	600 00		9 60		10.73	
Henrietta Mining & Milling Co	Lizzie	Red Mt	15520 A	8 22	540 00		8 64		9 70	
Henrietta Mining & Milling Co	Mineral King	Red Mt	2051	10.33	600.00		9 60		10 73	
Hollingsworth, E. V	Don Eduardo	Animas	18470	10.33	600.00		9 60		10.73	
Hood, Andrew F	An und 1-2 of Pontoon No. 2	Eureka	1368	8 55	270 00		4 32		5.05	
Hood, Andrew F	An und 1-2 of Crown	Eureka	1370	7.27	180 00		2.88		3 48	
Hood, Andrew F	An und 1-2 of Silver Eagle	Eureka	1369	5.72	180.00		2 88		3.48	
Hood, Andrew F	An und 1-2 of Annetta	Eureka	1367	6 11	210 00		3.36		4.01	
Hood, Andrew F	An und 1-2 of Old Domingo	Eureka	1371-A	10 70	300.00		4.80		5 56	
Hood, Andrew F	An und 1-2 of Old Domingo M. S.	Eureka	1371-B		150.00		2.40		2.98	
Kittimac Mines Co	Forest Queen No. 6	Eureka	18843	10.05	600.00		9 60		10 73	
Kittimac Mines Co	Forest Queen No. 7	Eureka	18843	10.33	600.00		9 60		10.73	
Kittimac Mines Co	Forest Queen No. 8	Eureka	18843	10.33	600.00		9 60		10.73	
Kittimac Mines Co	Forest Queen No. 9	Eureka	18843	10.33	600 00		9 60		10 73	
Kittimac Mines Co	Forest Queen No. 10	Eureka	18843	8.45	540.00		8 64		9.70	
Kittimac Mines Co	Part of J. H. French Placer	Eureka and Animas	45	76.02	12,210 00		195 84		211 31	
Kittimac Mines Co	Improvements in Minnie Gulch				2,000 00		32 00		34 86	
Kittimac Mines Co	Tramway from mine to mill on J. H. French Placer				5,000.00		80.00		86.56	
Kornaley, H. A	Durant No. 3	Animas	16928	10.3	600 00		9.60		10.73	
Kornaley, H. A	Gold Fish Ext.	Animas	17063	10.2	600.00		9.60		10.73	
Kornaley, H. A	Mammoth	Animas	16918	10.305	600.00		9 60		10 73	
Kornaley, H. A	Utica	Animas	16921	10.32	600.00		9 60		10.73	
Little, Harry	La Garita	Eureka	18221	8 34	500 00		8 00		8 66	
Little, Harry	Portion of lots 11 and 12 Wonder lode	Eureka	17527	0.322	10.00		.16		.57	
McArdle, A	Improvements at Chattanooga	Red Mt			200 00		3 20		3 84	
McCrimmon, J. A	An und 17-100 of Bruce	Eureka	19320	7.313	82.00		1.31		1.90	
McCrimmon, J. A	An und 17-100 of Little Julia	Eureka	19320	8.239	91.00		1 45		1 85	
Niegold, G. F. and Oscar Roedel	Niegold Townsite	Animas	17287		540 00		8.64		9 69	
Niegold, G. F. and Oscar Roedel	Townsite	Animas	17287		600.00		9 60		10.73	
Neptune Mining & Milling Co	Neptune	Eureka	1427	10.3	1,000.00		16.00		17.63	
Neptune Mining & Milling Co	Nathan Rich	Eureka	6306	1.2	120.00		1 92		2.45	
Occidental Mining Co	Chattanooga	Red Mt	18163		600.00		9 60		10.73	
Occidental Mining Co	Pueblo	Red Mt	18163		600.00		9 60		10.73	
Occidental Mining Co	Rebecca	Red Mt	18163		600.00		9.60		10.73	
Occidental Mining Co	Sunnyside	Red Mt	18163		600.00		9 60		10.73	
O'Neill, Sarah E	An und 1-4 of Terrible	Animas	272	10.33	188.00		3 01		3.63	
Pearson, Jennie	Great Western	Animas	2106	10.3	600.00		9.60		10 73	
Pettyjohn Dan	An und 1-2 of Mineral Slope No. 3	Ice Lake	19486	10.331	300 00		1 80		5 56	
Pettyjohn, Dan	An und 1-2 of Mineral Slope No. 4	Ice Lake	19485	6.887	210 00		3.36		4.01	
Porphyry Gulch M. Co	El Paso	Red Mt	16291	10.331	600 00		9 60		10.73	
Porphyry Gulch M. Co	Silver Fountain	Red Mt	16291	10.331	600.00		9.60		10.73	
Porphyry Gulch M. Co	Silver Spring	Red Mt	16291	10.331	600 00		9 60		10 73	
Robin, C. E	Tennessee	Eureka	5985	10 2	600 00		9 60		10 73	
Ross, Alexander	Achilles	Animas	2580	1.2	150 00		2 05		2 67	
Ross, Alexander	Silver Beauty	Animas	5407	10.03	600 00		9 60		10.73	
Ross, Alexander	Silver Fountain	Animas	2581	3.3	210 60		3.81		4 51	
Ross, Alexander	Mackinaw	Animas	12715	9.795	600 00		9 60		10 73	
Ross, Alexander	Oneida	Animas	12690	10.33	600 00		9 60		10 73	
San Juan Mines Corporation	Fitz Lee	Ice Lake and Animas	16194	10.33	600.00		9 60		10 73	
San Juan Mines Corporation	Standard	Ice Lake and Animas	16194	10.331	600.00		9 60		10 73	
Sherwood Mercantile Co	Portion of Wonder lode mining claim known as lots 55 and 56	Eureka	17527		880 00		14 08		15 56	
Smith, W. F. et al	San Juan Queen	Eureka	18853	10.331	600 00		9.60		10 73	
Smit, Egbert	An und 1-4 of Leo	Animas	15696		150.00		2 40		2.98	
Smit, Egbert	An und 1-4 of Amen	Animas	15696		150 00		2 40		2.98	
Snyder, Charles H	An und 1-5 of Mountain Eagle	Eureka	15304	10.331	120 00		1.92		2.45	
Sultan Mountain M. & M. Co	Alladin's Lamp	Animas	13298	7 101	480.00		7.68		8.67	
Sultan Mountain M. & M. Co	Junior Warden	Animas	16752-A		600.00		9.60		10.73	
Sultan Mountain M. & M. Co	Right of Way M. S.	Animas	16752 B	5.	300.00		4 80		5 56	
Sultan Mountain M & M. Co	Senior Warden	Animas	13298	7.101	1,080.00		17.27		19.00	
Sultan Mountain M. & M. Co	Tyler	Animas	16752-A		600.00		9.60		10.73	
Syndicate Gold Mining Co	Gold Bug	Animas	11691-A	10.3	1,000.00		16.00		17.63	
Syndicate Gold Mining Co	Gold Bug Millsite	Animas	11691-B	5.	1,300 00		20.80		22.80	
Syndicate Gold Mining Co	Gold Nugget	Animas	11691-A	10.3	1,000 00		16.00		17 63	
Syndicate Gold Mining Co	Repeal	Animas	11691-A		1,000 00		16.00		17.63	
Shook, P. B	Flat Broke	Animas	100	10.3	600 00		9.60		10.73	
Shook, P. B	An und 4-5 of Dagenfels	Animas	719	8.9	432 00		6 91		7 84	
Shook, P. B	International	Animas	1055	4 1	300.00		4.80		5.56	
Shook, P. B	King William	Animas	646	10	600 00		9 60		10.73	
Shook, P. B	Leonard	Animas	1409	8.6	540.00		8 64		9.70	
Shook, P. B	Lawrence	Animas	15139	7.017	480.00		7.68		8 67	
Shook, P. B	Last Chance	Animas	1218	4.5	300.00		4.80		5.56	
Shook, P. B	New York	Animas	17470-A	4.9	300.00		4.80		5.56	
Shook, P. B	Osceola	Animas	85	2.9	180 00		2.88		3.48	
Shook, P. B	Old Hammer	Animas	17470-A	8.1	540.00		8 64		9.70	
Shook, P. B	R. Blum	Animas	581	10.3	600 00		9.60		10.73	
Shook, P. B	An und 4-5 of Treasury Ext	Animas	720	9.9	480.00		7.68		8 67	
Shook, P. B	Nan C. Millsite	Animas	17470-B	5.	300 00		4.80		5.56	
Shook, P. B	Charlston Placer	Animas	12365-	28.667	17,100.00		274.56		296.10	
Shook, P. B	Tramway from mine to mill				1,500 00		24 00		26.25	
Shook, P. B	Savannah	Animas	581	10.3	600.00		9 60		10.73	
Torrey, Ira A	Camp Bird No. 1	Animas	19024	10.331	600.00		9 60		10.73	
Torrey, Ira A	Camp Bird No. 2	Animas	19024	7.378	480.00		7 68		8.67	
Twitchell, L. F. and S. G. Gill	An und 1-4 of Detroit	Eureka	16250	6.5	105 00		1 68		2 20	
Twitchell, L. F. and S. G. Gill	An und 1-4 of Hummer	Eureka	16250	10.	150.00		2 40		2 98	
Twitchell, L. F. and S. G. Gill	An und 1-4 of Little Gus	Eureka	16250	7.	105 00		1.68		2.20	
Watson, Josiah	Virginia Ext	Eureka	6678	10.33	600.00		9.60		10 73	
Unknown	Silver Storm	Red Mt	2097	7.1	180.00		7 68		8 67	

(CONTINUED ON NEXT PAGE.)

MINING CLAIMS

TAXES FOR LAST HALF OF YEAR 1914

NAME OF OWNER OR OWNERS.	NAME OF MINING CLAIM	MINING DISTRICT	SURVEY No	NUMBER OF ACRES	VALUATION Dollars	VALUATION Cents	AMOUNT OF TAX Dollars	AMOUNT OF TAX Cents	Total Tax, Penalties and Interests Dollars	Total Tax, Penalties and Interests Cents
Koenneker, C. C	An und 1-2 of Cascade	Animas	12212	10 3	300	00	2	10	2	92
Koenneker, C. C	An und 1-3 of Columbine	Animas	12212	10 33	200	00	1	60	2	08
Koenneker, C. C	An und 1-3 of Forester	Animas	12212	9 3	260	00	1	60	2	08
Koenneker, C. C	An und 1-2 of Mountain View	Animas	12212	7 65	210	60	1	92	2	28
Koenneker, C. C	An und 1-2 of Ruby	Animas	12212	10 2	300	00	2	10	2	92
Koenneker, C. C	An und 1-3 of White City	Animas	12212	8 30	180	00	1	11	1	91
Koenneker, C. C	An und 2-5 of Mountain Eagle	Eureka	15301	10 33	210	00	1	92	2	28
Koenneker, C. C	Topaz	Animas	18266	6 33	120	00	3	36	3	92
Koenneker, C. C	Diamond	Animas	18266	6 32	120	00	3	36	3	92
Koenneker, C. C	Saphire	Animas	18755	7 65	180	00	3	84	4	13

MINING CLAIMS

TAXES FOR THE YEAR 1913 (Except as Otherwise Designated)

NAME OF OWNER OR OWNERS.	NAME OF MINING CLAIM	MINING DISTRICT	SURVEY No	NUMBER OF ACRES	VALUATION Dollars	VALUATION Cents	AMOUNT OF TAX Dollars	AMOUNT OF TAX Cents	Total Tax, Penalties and Interest Dollars	Total Tax, Penalties and Interest Cents	YEAR
Cotton, Mrs. A. L	Minnehaha	Eureka	11125		$ 637	20	$ 10	70	$ 13	52	1913
Cotton, Mrs. A. L	Part of Minnehaha No. 2	Eureka	11125	8 00	509	76	8	56	10	90	1913
Cotton, Mrs. A. L	Minnehaha No. 3	Eureka	16271	3 47	251	88	1	27	5	63	1913
Cotton, Mrs. A. L	McMillan	Animas	15166	8 61	573	18	9	63	12	21	1913
Cotton, Mrs. A. L	Immatchock	Eureka	18819	9 75	637	20	10	70	13	52	1913
Cotton, Mrs. A. L	Tip Top	Eureka	18819	10 33	637	20	10	70	13	52	1913
Cotton, Mrs. A. L	Red	Eureka	18819	6 12	146	01	1	50	9	60	1913
Cotton, Mrs. A. L	Treasure	Eureka	18819	6 93	146	01	1	50	9	60	1913
Cotton, Mrs. A. L	Rosso	Eureka	18819	7 67	569	76	8	56	10	90	1913
Cotton, Mrs. A. L	Rock	Eureka	18819	10 33	637	20	10	70	13	52	1913
Cotton, Mrs. A. L	Joe	Eureka	18819	10 33	637	20	10	70	13	52	1913
Cotton, Mrs. A. L	Yankee Boy	Eureka	18819	10 33	637	20	10	70	13	52	1913
Cotton, Mrs. A. L	Ama	Eureka	18819	10 33	637	20	10	70	13	52	1913
Cotton, Mrs. A. L	Rosa	Eureka	18819	10 33	637	20	10	70	13	52	1913
Cotton, Mrs. A. L	Blue Heel	Eureka	18819	10 33	637	20	10	70	13	52	1913
Gold Prince Mines Co	Tramway from Gold Prince mine to Animas Forks	Eureka			1,500	00	180	00	383	26	1907
Gold Prince Mines Co	Tramway from Gold Prince mine to Animas Forks	Eureka			1,500	00	171	00	522	17	1908
Gold Prince Mines Co	Tramway from Gold Prince mine to Animas Forks	Eureka			1,500	00	139	50	238	82	1909
Gold Prince Mines Co	Tramway from Gold Prince mine to Animas Forks	Eureka			1,500	00	157	50	261	52	1910
Gold Prince Mines Co	Tramway from Gold Prince mine to Animas Forks	Eureka			1,500	00	157	50	210	00	1911
Gold Prince Mines Co	Tramway from Gold Prince mine to Animas Forks	Eureka			1,500	00	165	75	232	76	1912
Gold Prince Mines Co	Tramway from Gold Prince mine to Animas Forks	Eureka			1,500	00	160	57	197	11	1913
Herr, Estate of Samuel	An und 1-3 of Expansion	Animas	11073	10 331	212	10	3	06	1	67	1913
Herr, Estate of Samuel	An und 1-3 of Ione	Animas	11073	10 331	212	10	3	06	1	67	1913
Herr, Estate of Samuel	An und 1-3 of Parthenope	Animas	11063	1 305	300	20	1	75	2	56	1913
Sherman, Henry	An und 1-2 of Silverton Girl	Animas	14119	8 295	286	71	1	82	6	31	1913
Sherman, Henry	An und 1-2 of Little Kate	Animas	18735	7 151	251	88	1	28	5	65	1913
Sherman, Henry	An und 1-2 of Buckeye	Animas	18735	8 238	286	71	1	82	6	31	1913
Sherman, Henry	An und 9-20 of Smuggler	Animas	10655	9 760	286	71	1	82	6	31	1913
Sherman, Henry	An und 9-20 of Smuggler No. 2	Animas	10655	10 092	286	71	1	82	6	31	1913
Sherman, Henry	An und 9-20 of Grand View	Animas	18739	6 29	201	78	1	30	1	57	1913
Sherman, Henry	An und 9-20 of Sherman	Animas	18752	10 326	286	71	1	82	6	31	1913
Sherman, Henry	An und 9-20 of Forgotten	Animas	18752	9 272	286	71	1	82	6	31	1913
Wason, Henry B	An und 1-4 of Shenandoah	Animas	241	9 0	159	30	2	68	3	65	1913

REAL ESTATE

TAXES FOR THE YEAR 1914 (Except as Otherwise Designated)

NAME OF OWNER OR OWNERS.	LOT	BLOCK	TOWN	ADDITION	VALUATION Dollars	VALUATION Cents	AMOUNT TAX Dollars	AMOUNT TAX Cents	Total Tax, Penalties and Interest Dollars	Total Tax, Penalties and Interest Cents
Aveline, James O	19, 20, 21 and 22	12	Silverton		$ 820	00	$ 13	12	$ 11	92
Bell, Marion E	7 feet of 11 and all of 12	15	Silverton		1,620	00	26	85	29	15
Benson, Helen K	1	11	Silverton		50	00		80	1	03
Benson, Helen K	2	11	Silverton		10	00		61		89
Benson, Helen K	3	11	Silverton		10	00		61		89
Benson, Helen K	4	11	Silverton		10	00		61		89
Benson, Helen K	5	11	Silverton		10	00		61		89
Benson, Helen K	6	11	Silverton		10	00		64		92
Benson, Helen K	10	72	Silverton		10	00		16		36
Benson, Helen K	11	72	Silverton		10	00		16		36

REAL ESTATE

TAXES FOR THE YEAR 1914 Except as Otherwise Designated)

NAME OF OWNER OR OWNERS	LOT	BLOCK	TOWN	ADDITION	VALUATION Dollars	VALUATION Cents	AMOUNT TAX Dollars	AMOUNT TAX Cents	Total Tax, Penalties and Interest Dollars	Total Tax, Penalties and Interest Cents
Benson, Helen K	12	72	Silverton		10	00		16		36
Benson, Helen K	13	72	Silverton		10	00		16		36
Benson, Helen K	14	72	Silverton		10	00		16		36
Benson, Helen K	15	72	Silverton		10	00		16		36
Benson, Helen K	16	72	Silverton		10	00		16		36
Benson, Helen K	17	72	Silverton		10	00		16		36
Benson, Helen K	18	72	Silverton		10	00		16		36
Benson, Helen K	1, 2, 3 and 4	55	Silverton		880	00	14	08	15	96
Bodfish, F V	17	37	Silverton		500	00	8	96	10	05
Clifford, Mrs. Anna	20	5	Silverton		1,050	00	16	96	18	45
Clifford, Mrs. Anna	21	5	Silverton		160	00	2	56	2	95
Clifford, Mrs. Anna	22	5	Silverton		760	00	12	16	13	29
Fedel, Louis	All of Block E		Silverton	Blague	30	00		48		70
Fedel, Louis	All of Block 5		Silverton	Blague	30	00		48		70
Hollingsworth, Mary	21	70	Silverton		10	00		16		36
Hollingsworth, Mary	22	70	Silverton		10	00		16		36
Hughes, Estate of Isaac	8	23	Silverton		250	00	3	68	4	15
Luke, William	21	20	Silverton		1,180	00	23	68	25	70
Martin Mining & Power Co	5	16	Eureka		10	00		16		36
Martin Mining & Power Co	6	16	Eureka		10	00		16		36
Martin Mining & Power Co	7	16	Eureka		10	00		16		36
Martin Mining & Power Co	8	16	Eureka		10	00		16		36
Martin Mining & Power Co	9	16	Eureka		10	00		16		36
Martin Mining & Power Co	10	16	Eureka		10	00		16		36
Mayger, May E	23 and 24	40	Silverton		730	00	11	68	13	00
Miller, H. A	21 and 22	43	Silverton		1,010	00	16	16	17	80
Niegold, G. F. et al	16	22	Silverton		600	00	9	60	10	54
O'Brien, J. J	11 and 12	1	Silverton	Reese	210	00	3	84	1	54
Schaat, Mrs. May	North 1-2 of 17 and all of 18	54	Silverton		1,080	00	17	28	19	01
Smith, W. A	1 and 2	15	Eureka		440	00	7	04	7	98
Smith, W. A	3 and 4	15	Eureka		40	00		64	1	09
Smith, W. A	5, 6 and 7	15	Eureka		860	00	13	76	15	41
Smith, W. A	13	16	Eureka		10	00		16		36
Smith, W. A	14	16	Eureka		10	00		16		36
Smith, W. A	15	16	Eureka		10	00		16		36
Smith, W. A	16	16	Eureka		10	00		16		36
Smith, W. A	17	16	Eureka		10	00		16		36
Smith, W. A	18	16	Eureka		20	00		32		54
Smith, W. A	19	16	Eureka		20	00		32		51
Smith, W. A	20	16	Eureka		20	00		32		51
Smith, W. A	21	16	Eureka		20	00		32		54
Smith, W. A	22	16	Eureka		20	00		32		54
Smith, W. A	23	16	Eureka		20	00		32		51
Smith, W. A	24	16	Eureka		20	00		32		51
Smith, W. A	25	16	Eureka		20	00		32		51
Smith, W. A	1-2 of 11	13	Silverton		70	00	1	12	1	40
Smith, W. A	15	43	Silverton		730	00	11	68	12	78
Smith, W. A	16	43	Silverton		130	00	2	08	2	14
Smith, W. A	17	43	Silverton		830	00	13	28	11	50
Smith, W. A	18	43	Silverton		130	00	2	08	2	44
Watson, Josiah	13	B	Silverton	Reese	10	00		16		36
Watson, Josiah	14	B	Silverton	Reese	10	00		16		36
Watson, Josiah	17	B	Silverton	Reese	10	00		16		36
Watson, Josiah	18	B	Silverton	Reese	10	00		16		36
Watson, Josiah	15	D	Silverton	Reese	10	00		16		36
Watson, Josiah	16	D	Silverton	Reese	10	00		16		36
Watson, Josiah	17	D	Silverton	Reese	10	00		16		36
Watson, Josiah	18	D	Silverton	Reese	10	00		16		36
Watson, Josiah	9	H	Silverton	Reese	10	00		16		36
Watson, Josiah	10	H	Silverton	Reese	10	00		16		36
Watson, Josiah	11	H	Silverton	Reese	10	00		16		36
Watson, Josiah	12	H	Silverton	Reese	10	00		16		36
Watson, Josiah	13	I	Silverton	Reese	10	00		16		36
Watson, Josiah	14	I	Silverton	Reese	10	00		16		36
Welsh, Mrs. Celia	3	1	Silverton	Reese	40	00	6	41	8	89
Welsh, Mrs. Celia	4	1	Silverton	Reese	40	00	6	41	8	89
Unknown	3	9	Eureka		10	00		16		36
Unknown	4	9	Eureka		10	00		16		36
Unknown	13	33	Eureka		1	00		06		26
Unknown	14	33	Eureka		1	00		06		26
Unknown	15	33	Eureka		1	00		06		26
Unknown	16	33	Eureak		1	00		06		26
Unknown	17	33	Eureka		1	00		06		26
Unknown	18	33	Eureka		1	00		06		26
Unknown	19	33	Eureka		1	00		06		26
Unknown	9	2	Eureka		10	00		16		36
Unknown	10	2	Eureka		10	00		16		36
Unknown	3	7	Eureka		20	00		32		54
Unknown	4	7	Eureka		20	00		32		54
Unknown	23	2	Eureka		10	00		16		36
Unknown	21	23	Eureka		10	00		16		36

TAXES FOR LAST HALF OF YEAR 1914

Carroll, Paddy	17	45	Silverton	320	00	4	16	4	58
Koenneker, C. C	7	29	Silverton	3,040	00	21	32	27	77
Koenneker, C. C	8	29	Silverton	3,140	00	17	12	18	20
Koenneker, C. C	18	29	Silverton	100	00	3	20	3	36
Koenneker, C. C	7	10	Silverton	120	00	3	36	3	72
Koenneker, C. C	8	10	Silverton	20	00		16		36
Koenneker, C. C	9	10	Silverton	20	00		16		36
Koenneker, C. C	16 and 17	10	Silverton	1,000	00	8	00	8	72
Koenneker, C. C	19	15	Silverton	730	00	5	84	6	31

REAL ESTATE

TAXES FOR THE YEAR 1913 (Except as Otherwise Designated.)

NAME OF OWNER OR OWNERS	LOT	BLOCK	TOWN	ADDITION	VALUATION Dollars	VALUATION Cents	AMOUNT TAX Dollars	AMOUNT TAX Cents	Total Tax, Penalties and Interest Dollars	Total Tax, Penalties and Interest Cents
Cotton, Mrs. A. L	21 and S. W. 1 ft of 22	12	Silverton		1,080	00	17	28	19	01
Cotton, Mrs. A. L	1	12	Silverton		440	00	7	04	7	98
Cotton, Mrs. A. L	2	12	Silverton		80	00	1	28	1	69
Cotton, Mrs. A. L	3	12	Silverton		860	00	13	76	15	41
Cotton, Mrs. A. L	4	12	Silverton		212	10	3	39	3	92
Cotton, Mrs. A. L	5	12	Silverton		1,168	20	18	68	21	52
Cotton, Mrs. A. L	6	12	Silverton		212	10	3	39	3	92
Cotton, Mrs. A. L	10	12	Silverton		1,271	10	20	34	23	55
Cotton, Mrs. A. L	9	12	Silverton		212	10	3	56	4	15

(CONTINUED ON PAGE SIX.)

Town Topics

Louis Fritz, is out again after a severe illness.

Mr and Mrs. William Lyle are visiting in Delta.

Willie Maguire is now completely recovered from his illness.

Henry Laughurst is back from his bunny hunt in the valley.

Louis Lashmet returned Monday night from his ranch in the valley.

Frank Soans came up from Durango the early part of this week.

Attorney F. L. Ross is in Montrose attending the federal court.

Karl Thompson spent a few days of this week with the folks on the ranch.

J. M Hyde returned from his business trip to Denver Wednesday evening,

Mr. and Mrs. William Jones returned Friday from Trimble Springs.

W. A. Smith came up from the valley to spend Thanksgiving with frends in the city.

Leonard Foy is confined to his home with a severe attack of tonsolitis.

Orzon Reynolds was a visitor in the Smelter City during the latter part of last week.

George Muggler has returned from San Francisco, where he spent the summer months.

Jimmy Brown has returned to Silverton after an absense of two years spent in Central America.

E.A. Ritter consulting engineer for the Hamlet mine, was among the arrivals Wednesday evening.

Charles McMillan of the Sunnyside was a visitor to the lower country the fore part of this week

M. J. Heller, one of the principal owners of the Buffalo Boy mine, was an arrival Thursday evening.

Jack Hickey has been ill the past week being forced to remain in doors. A bad cold is the cause of it all.

Arthur Payne, who has been confined at his home the past two weeks with bronchitis, is reported much better

Miss Grace Hardin, of Alamosa is visiting in Silverton this week, the house guest of Mr. and Mrs. Hugh Allen.

W. C. Pochon left Sunday for Denver were he will meet Mrs. Pochon, at which city they intend to make their future home.

General Manager R. J. Walter, of the Kittimac mines, departed last Friday morning on a hurried business trip to Denver.

See that instructive "Gold Rooster" drama, the Closing Net, Tuesday night, at the Gem Theatre. Admission 15 and 25c.

All interested in Indoor Base Ball are requested to attend the meeting Sunday November 28th at the City Hall at 2:30 p. m.

Mrs. Ed Lewis has returned from a long visit with relatives and friends in Delta and other western slope points

C. C. Heath. Eureka's live merchant went down to Durango Wednesday to meet Mrs. Heath returning from an eastern trip.

Mr. and Mrs. Frank B. Brown returned early in the week from a very pleasant trip to the Panama Exposition at San Francisco.

St. John's Guild will meet at the home of Mrs. John Brown, Wednesday afternoon, December 1st, at 2.30 o'clock

Captain James Smith, mining editor of the Denver News and Times, is in the city today gathering mining statistics for the big New Year edition.

Mrs. R C Byers, son Porter and daughter Ruth returned Friday evening from San Francisco, where they have been visiting the Panama exposition.

Be sure and get in on the big wonderful 5 reel "Gold Rooster" feature, called the Closing Net, at the Gem Theatre Tuesday night, November 30.

Mrs. Ed Bain is now prepared to do all kinds of dressmaking at her home on Reese street, the 4th house below the Congregational church. 2-t

Subscribe for the Standard.

Real Worth *vs.* Low Cost

If you asked your butcher for a porterhouse steak and he handed you a cut of the flank and said, "This doesn't cost as much and is just as good," you wouldn't believe him, would you?

Yet the butcher's statement is just as truthful as an assertion that inferior baking powders made of alum or phosphate of lime are as good as Dr. Price's, which is made from cream of tartar.

Alum is a mineral acid salt, declared by many medical authorities unsafe to use in food.

Dr. Price's Cream Baking Powder is as pure and wholesome as the grapes in the vineyard, from which cream of tartar is derived.

The only reason for using such substitutes as alum and lime phosphate is because their cost is less to the manufacturer.

DR. PRICE'S CREAM BAKING POWDER
Made from Cream of Tartar

The Cunningham Drug and Jewelry, store with its exquisite floral decorations for Thanksgiving gave out a sort of Tiffiny feeling during the great festival. Dave is an expert in good decorative tastes and arrangements.

The Thaksgiving ball given by the Women of Woodcraft Thursday evening was largely attended and a grand success in every way. As usual the ladies easily retained their reputation as excellent entertainers.

Lee Grimes of the Silverton Supply company, who has been quite ill with a hard attack of la grippe, left Tuesday for Denver, where he will remain until after the holidays with his family.

George Haskell returned last Saturday from several days spent at Aztec, while recuperating from his recent attack of typhoid. He is now completely recovered and glad to be back at work at his old position with "Billy" Crooke.

Mayor Berky, of Eureka, was among the merry crowd who enjoyed the Women of Woodcraft ball Thanksgiving evening. There are none who can give thanks in a more enjoyable way than Eureka's genial mayor.

Mr and Mrs. Andrew Falk, returned from Cripple Creek early in the week. Mr. Falk is interested in some very promising tungsten properties in the county and as the recent sharp advance in the price of the metal has added value to them he has returned to give them attention.

On Thursday of last weed Oscar Johnson of Ouray was accidently killed while working in the Congress mine at Red Mountain by a heavy cave of ground and his partner, who was working with him had a very narrow escape. The funeral was held at Ouray Thursday of last week.

Miss Thelma Walter, one of Silverton's most popular young ladies and a graduate of our high school last year, is a member of the Girls Glee Club of Colorado College at Colorado Springs which she is attending. She recently took a prominent part in the club's annual concert which it gave at Perkins Hall, Colorado Springs last week. The Denver Times last Tuesday published a fine half tone cut of the members of the club, among which Miss Walter could be easily detected by those who knew her. The STANDARD warmly congratulates the young lady on the excellent progress she has thus far made in her freshman year at the College.

There is more Catarrh in this section of the country than all other diseases put together, and until the last few years was supposed to be incurable For a great many years doctors pronounced it a local disease and prescribed local remedies, and by constantly failing to cure with local treatment, pronounced it incurable. Science has proven catarrh to be a constitutional disease and therefore requires constitutional treatment. Hall's Catarrh cure, manufactured by F. J. Cheney & Co., Toledo, Ohio, is the only constitutional cure on the market. It is taken internally in doses from 10 drops to a teaspoonful. It acts directly on the blood and mucous surfaces of the system. They offer one hundred dollars for any case it fails to cure. Send for circulars and testimonials.
Address: F. J. Cheney & Co., Toledo Ohio.
Sold by Druggists, 75c.
Take Hall's Family Pills for constipation.

Additional Mining.

Louis O. Bastian superentendent of the Gold King mill who was in the city Sunday, states that the new flotation units recently installed at the mill are all doing excellent work, and that the percentage in saving has been materially increased The mine is looking fine once more and furnishing plenty to keep the mill in constant operation.

Installing Flotation at Sunnyside Mill.

Nothing escapes the progressive management of the big Sunnyside which is now installing flotation units to its mills. The Sunnyside had concentration down to the finest point, and it was generally known but very little of the ore values were getting away, but as nominal as that loss was it is now proposed to catch it by the newest successful process for slimes treatment known to science. With the installation of these units every mill in the county will be using or is preparing to use flotation.

Completes Contract on Columbus.

Phil Newman and Joe Warner during the week completed their 500 foot contract on the Columbus tunnel. The drill work was done by the new Waugh Dreadnaught drill No 60, a recent improvement over stoping drills manufactured by the Waugh people with a special aim to supply a light drill of extraordinary strength and durability for tunnel, shaft sinking and all kinds of drill work. A long felt necessity that this new drill seems to most satisfactorily meet in every particular. Another 500 feet will reach the vein and it is quite likely that it will be let at once. A resurvey of the line between the Columbus and Hermes groups to recheck a former survey, has confirmed the latter and now that this is all settled we may look for some sort of a combination that will ultimately benefit both properties.

Special Sale Of CANNED GOODS

CASH ONLY

Pears, Gallon cans, 15° syrup........ can 50c;
Case $5.75
Apples, Gallon cans, Pie, the best, can 40c;
Case $1.25
Peaches, quart cans, 20° Syrup, 6 cans 1$;
Case $3.85

Wholesale Prices on Application

Only a Limited Quantity and Must be Sold at Once.

On Sale at City Market

Come Early Before they are all Gone
W. A. PTOLEMY,
Terms Strictly Cash.

WARREN G. PROSSER

U. S. Mineral Surveyor

General Engineering in Mining.

Opposite School Building.
PHONE SILVER 86.

NOTICE.

Notice is hereby given that the undersigned Trustee will offer at public sale at the front door of the building formerly occupied by The Silverton National Bank, on Main street, in Silverton, San Juan County, Colorado; at ten o'clock in the forenoon on Saturday, the 27th day of November, 1915, and sell to the highest and best bidder for cash all his right, title and interest, as Trustee of the estate of Laura G Prosser, Bankrupt, in and to all accounts and bills receivable and belonging to said estate, and in and to the balance of the furniture and personal property which he has on hand as Trustee, a list of which will be submitted to anyone interested upon request at that time The undersigned reserves the right to reject any or all bids made if it is considered for the best interests of the estate to do so

Dated: Silverton, Colorado, Nov 18, 1915.
W A SMITH, Trustee in Bankruptcy
2-2t

NOTICE OF APPLICATION FOR U. S. PATENT.

MINING APPLICATION No 05462. MINERAL SURVEY No. 19638.

U S LAND OFFICE, DURANGO, COLO., Nov. 3, 915

Notice is hereby given that Andy Scher for himself and co claimant Robert Smit whose post office is Silverton, Colorado, has made application for patent for the Hagedy lode, in Uncompahgre Mining District, San Juan County, Colorado, and forming a portion of Suspended T. 42 N. R. 7 W. of the N M. P M.

Beginning at Cor. No. 1 whence U. S L. M No. 1 Poughkeepsie Gulch bears N. 50° 59 10' E 2713.3 feet.
Thence S 51° W. 1500 feet to Cor. No. 2;
Thence N 39° W 300 feet to Cor No 3,
Thence N 51° E 1500 feet to Cor No 4;
Thence S 39° E. 600 feet to Cor No 1 the place of beginning, and containing an area of 18 78 acres exclusive of conflict with survey No 186, Digger Indian No 2 lode and Survey No 176 Tyrol lode The vein runs N 51° E 361 feet and S 51° W 13 9 feet from the entrance of Discovery Cut

G H CHARLTON Register
First Pub. Nov 27, 1915 Last Pub Jan. 29

NOTICE OF APPLICATION FOR U. S. PATENT

MINING APPLICATION No. 05494 MINERAL SURVEY No. 1566[illegible]

U. S. LAND OFFICE, DURANGO, COLO, NOV, 2, 15.

Notice is hereby given that Joseph Bordeleau, whose Post Office is Silverton, Colorado, has made application for patent for the Gold Bond lode, in Animas Mining District, San Juan County, Colorado, being 1500 feet in length and three hundred feet in width and forming a portion of Suspended Township 41 N. R 6 W of the N M. P. M

Beginning at cor. No. 1 whence U. S. M M. Green Mountain bears S. 86° 22 W. 1120 feet.
Thence S 22° E. 1500 feet to cor. No. 2;
Thence N. 68° E 300 feet to cor No. 3,
Thence N. 22 W. 1500 feet to cor. No 4;
Thence S 68° W. 300 feet to cor. No. 1 the place of beginning, and containing an area of 9.119 acres, exclusive of conflict with the Old Abe lode unsurveyed. The conflict with Sur No. 1167 Alice lode is not excluded from this application The vein runs N. 22 W. 650 feet and S. 22 E. 850 feet from the discovery cut. The adjoining claims are the Old Abe, Alice and Silver Queen and Arrow Head lodes

G. H. CHARLTON, Register
First Pub. Nov 27, '15 Last Pub Jan 29, '16

SUMMONS.

STATE OF COLORADO, County of San Juan. } ss. In the County Court.

Mattie A. Hamilton, Plaintiff, vs. Robert A Hamilton Defendant } SUMMONS.

THE PEOPLE OF THE STATE OF COLORADO.

To Robert A Hamilton, the defendant above named, Greeting

You are hereby required to appear in an action brought against you by the above named plaintiff, in the County Court of San Juan County, State of Colorado, and answer the complaint therein within thirty days after the service hereof, if served within the State of Colorado, or, if served out of the State of Colorado, or by publication, within fifty days after the service hereof, exclusive of the day of service, or said action may be regularly set for trial the same as though such appearance had been made and issue had been joined on such complaint.

The said action is brought by plaintiff to obtain a decree of divorce, dissolving the bonds of matrimony now existing between plaintiff and defendant, on the ground of desertion and non-support of plaintiff for a period of more than one year last past, as will more fully appear from complaint in said action to which reference is here made

And you are hreby notified that if you fail to appear, and to answer the said complaint as above required, the said plaintiff will apply to the Court for the relief therein demanded.

Given under my hand and the seal of said Court, at Silverton in said County, this 29th day of October, A D 1915

(COURT SEAL) WM PALMQUIST, Judge and Clerk

E. E Wheeler, Ouray. Colo., Attorney for Plaintiff.
First pub Nov 29. Last pub Dec. 18 1915.

Treasurer's Notice on Request for Tax Deed

To every person in actual possession or occupancy of the hereinafter described land, lot or premises, and to the person in whose name the same was taxed or especially assessed, and to all persons having an interest or title of record in or to the same

Notice is hereby given that on the twenty-third day of October A. D. 1912, the following described property, situate in the County of San Juan and State of Colorado, to-wit. the following named and described lode mining claims, all situated in Animas Mining District, in said County and State, to-wit: Augustus Begole, U. S. Survey No. 379; the Midland, U. S. Survey No 612; the Clifford Pemberton U. S. Survey No, 387; the Cimmaron, U. S. Survey No. 381, the Campbell, U. S. Survey No. 16,529, the Grace, U S Survey No. 383, the Henry Ashurst, U. S Survey No. 385, the John Lee, U. S. Survey No 380, the Maxwell U. S Survey No. 16,532; the New Departure, U. S. Survey No. 16,832; the O. Roedel, U. S. Survey No 377, the R. Niegold, U. S. Survey No. 378; the Thouron, U. S. Survey No 391, and the Little Johnny, U. S. Survey No 17,541 Also the tramway from the Old Hundred Mine to the mill, situated on the Galena Placer Mining Claim, known as Old Hundred Tramway, was sold for the taxes for the year 1911, and purchased by said San Juan County, Colorado.

That the said San Juan County has duly assigned the certificate of purchase issued on account of such purchase to Frank B Brown, who hath made request upon the Treasurer of said County for a deed.

That the said premises were taxed for said year 1911 in the name of Midland Mining Company.

That the time of redemption of said real estate from such tax sale will expire on the fifteenth day of March A. D 1916, and unless redeemed on or before said day a deed will be issued therefor.

Dated this 24th day of November A D 1915
(SEAL) F. J. BAWDEN.
Treasurer of the said County of San Juan.
First pub. Nov 27, 1915. Last pub Dec. 11, '15

Treasurer's Notice on Request for Tax Deed.

To every person in actual possession or occupancy of the hereinafter described land, lot or premises, and to the person in whose name the same was taxed or specially assessed, and to all persons having an interest or title of record in or to the same.

Notice is hereby given that on the 23rd day of October A. D. 1912, the following described property, situate in the County of San Juan and State of Colorado, to wit: The following named and described lode mining claims, all situated in Animas Mining District, said County and State, to-wit the Commancho, patented, known and described as U. S. Survey No 15,111, the Forest, U. S. Survey No. 15,115, the Iron Chancellor, U. S. Survey No. 15,125; the Lizzie, U. S. Survey No 15,119, the Number Ten, U. S. Survey No 15,110, the Old Hundred, U. S. Survey No. 15,228; and the Queen, U. S. Survey No, 15,113. Also the Galena Placer Mining claim, U. S. Survey No. 16,862, situated in said Mining District, County and State, was sold for the taxes for the year 1911 and purchased by said San Juan County, that the said San Juan County has duly assigned the certificate of purchase issued on account of such purchase to Frank B Brown, who hath made request upon the Treasurer of said County for a deed

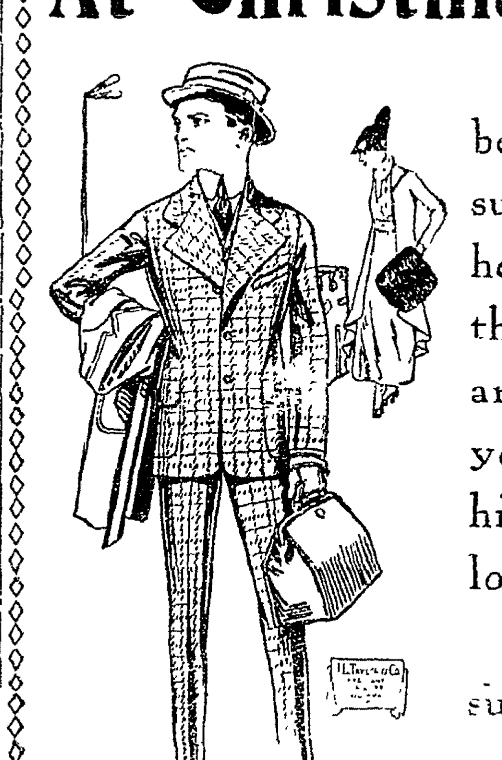
That the said premises were taxed for said year 1911 in the name of G J. Niegold et al.

That the time of redemption of said real estate from such tax sale will expire on the fifteenth day of March, A. D. 1916, and unless redeemed on or before said day a deed will be issued therefor

Dated this 24th day of November, A. D. 1915.
(SEAL) F. J. BAWDEN,
Treasurer of the said County of San Juan.
First pub. Nov. 27, 1915. Last pub. Dec. 11, '15

Clason maps of the San Juan Triangle for sale at the Standard office. $1.00 each.

At Christmas Time



You will feel better in a new suit, and it will help push you to the front. We are ready to help you along with high quality and low prices.

Also expect a supply of useful ... Holiday Trade.

At Van Slyck's

W. R. STEWART

Ford Agent

Ford Touring Cars, $510.00 F. O. B. Silverton.
Roadster $460.00 F. O. B. Silverton.

Firestone, Goodrich and Goodyear tires.
Ford Parts and Accessories.
Queen Automobile Insurance.

TEMPORARY OFFICE AT R. E. McLEOD'S.
Silverton, Colorado.

Nobby Hats for Silverton Ladies

ALLEN & LYLE'S MILLINERY AND ART STORE

MINERS' UNION HALL BUILDING

Call and see our elegant display of fall and winter styles. They will please and so will our prices.

THE BEST COAL AND FULL WEIGHT

Don't delay getting in your winter's supply of coal. Buy it now and avoid a short age or blockade.

We carry on hand: Hesperus, Perin's Peak, C. K. and Sunshine coal. and Crested Butte in hard coal.

The Fred Goble Lumber Co. Phone Silver 93.

Subscribe for Standard

NEWS-00047
p. 5 of 6

The Standard Dairy

Fresh Milk and Cream delivered at your door every morning. o o

OUR MOTTO

"Cleanliness is next to Godliness."

BEN TOMASI

Phone Silver 103.

Chas. Scheer

PLUMBING, STEAM AND HOT WATER FITTING

Orders Given Prompt Attention

Bordelean Phone, Silver 120
Residence Phone, Red 1115.

1108 Greene Street.

Notice of Final Settlement and Determination of Heirship.

Notice is hereby given that on Saturday, the 4th day of December, A. D. 1915, Mrs. C. S. Rogers, administratrix of the estate of Charles S. Rogers deceased; Gilio Fanti, the administrator of the estate of John Fanti, deceased, will appear before the Judge of the County Court at the Court House in Silverton in the County of San Juan, Colorado, at 10 o'clock in the forenoon of said day and present their accounts for final settlement and pray the approval of the same and ask to be discharged, at which time and place any person in interest may appear and present objections, if any there be.

Notice is also hereby given that application for the determination of heirship of said John Fanti and of Charles S. Rogers, deceased has been made and that the Court will on said date hereinbefore mentioned, or at any time to which the hearing may be continued, proceed to ascertain and determine who are the heirs of said Charles S. Rogers and John Fanti, deceased, and as such entitled to inherit any lands, tenements, hereditaments or other property, real or personal, constituting all or a part of the estate of the said Charles S. Rogers and John Fanti, deceased, and enter a Decree accordingly, at which hearing all persons claiming to be heirs at law of said deceased may appear and present their proof.

Witness Wm Palmquist, Clerk of the County Court within and for the County of San Juan, in the State of Colorado and the seal of said Court this 1st day of November, A. D. 1915.

WM PALMQUIST,
SEAL Judge and Clerk.

First Pub Nov. 6. Last Pub Nov. 27, 1915

Notice of Final Settlement.

Notice is hereby given that on Monday, the 6th day of December A. D. 1915, W. H. Mullin, the administrator of the estate of M. S. Mullin, deceased; John B Orella, the administrator of the estate of J. Dominic Orella, deceased, Ruth Shugart, the administratrix of the estate of C. A. Shugart, deceased, will appear before the Judge of the County Court at the Court House in Silverton in the County of San Juan, Colorado, at 10 o'clock in the forenoon of said day and present their accounts for final settlement and pray the approval of the same and ask to be discharged, at which time and place any person in interest may appear and present objections if any there be.

Witness Wm Palmquist, Clerk of the County Court within and for the County of San Juan in the State of Colorado and the seal of said Court this 1st day of November, A. D. 1915.

WM. PALMQUIST,
Judge and Clerk.

First Pub Nov 6 Last Pub. Nov. 27, 1915.

Notice of Stockholders Meeting

Silverton, Colorado, November 1st, 1915.

Notice is hereby given that we, the undersigned, stockholders owning at least ten per cent of the entire capital stock, do hereby call a special meeting of the stockholders of the Iowa Gold Mining & Milling Company, to be held at the office of said Company in Silverton, Colorado, on Wednesday, the 8th day of December A. D. 1915, at the hour of two o'clock p. m.

The objects and purposes of said meeting are to submit to the votes of the stockholders the question whether or not said company shall renew its term of existence for another term of twenty years from the date of the expiration of its present charter.

John M. Gundry,
J Horace Jones,
Laura M Stolber,
Helen E Stolber,
By L D Desoto, Secretary.

Subscribe for the Standard. Read Neal of the Navy Then see it in the pictures at the Gem the following Monday night.

FRANK L. ROSS

Attorney-at-Law

Office in Benson Block.

Subscribe for the Standard.

REAL ESTATE

TAXES FOR THE YEAR 1913 (Except as Otherwise Designated)

NAME OF OWNER OR OWNERS.	LOT	BLOCK	TOWN	ADDITION	VALUATION Dollars Cents	AMOUNT TAX Dollars Cents	Total Tax, Penalties and Interest Dollars Cents
Cotton, Mrs. A. L.	11 and 12	12	Silverton		1,961 70	32 99	10 67
Cotton, Mrs. A. L and S. R Walker	13 and 14	2	Silverton		520 38	8 71	11 12
Ford, Estate of J. W.	17, 18, 19 and 20	8	Silverton	Reese	118 68	2 19	3 85
Ford, Estate of J. W.	21	8	Silverton	Reese	10 62	17	40
Ford, Estate of J. W.	22	8	Silverton	Reese	10 62	17	40
Leslie, Lillian	13 and 14	16	Silverton		913 32	15 31	19 22
Sherman, Henry	6 and 7	21	Silverton		1186 80	21 96	31 02
Sherman, Henry	18	21	Silverton		3658 28	61 37	75 50
Sherman, Henry	16, 17 and 1-2 of 15	39	Silverton		2929 59	49 06	60 79

TAXES FOR LAST HALF OF THE YEAR 1913.

NAME OF OWNER OR OWNERS.	LOT	BLOCK	TOWN	ADDITION	VALUATION	AMOUNT TAX	Total Tax, Penalties and Interest
Johnson, Estate of Mary	3	55	Silverton		1,614 24	13 56	16 17

Witness my hand and seal this 5th day of November, A. D. 1915.

F. J. BAWDEN, (Seal)
County Treasurer.

DELINQUENT SPECIAL ASSESSMENT NOTICE

STATE OF COLORADO, } SS. TREASURER'S OFFICE.
SAN JUAN COUNTY. }

Public notice is hereby given that I will, according to law, offer at Public Sale at the office of the Treasurer of the County of San Juan, State of Colorado, on the 6th day of December, A. D. 1915, and succeeding days, commencing at the hour of 10.00 a. m of each day, so much of the following described real estate, situate in the Town of Silverton, in said County and State, as may be necessary to pay the amount of the delinquent special assessment, with interest thereon and penalties, according to law, which were certified to the undersigned by the proper officers of said Town of Silverton as the amount due for unpaid assessments for sidewalks constructed in said Town, by said Town, for, in front of and adjacent to the property hereinafter described, to-wit:

DELINQUENT SPECIAL ASSESSMENT AND TAX

Levied by the Town of Silverton for the construction of cement sidewalks in said Town

Lot	Block	Assessment	Interest and Penalties.	Total assessment, Interest and Penalties.
21	12	$136 72	.20	$136 92
8	15	16 16	.20	16 36
11	27	111 95	.20	112 15
17	15	25 12	.20	25 32
18	15	20 22	.20	20 42

Witness my hand and seal this 5th day of November, A. D. 1915.

F. J. BAWDEN, (Seal.)
County Treasurer.

First Pub. Nov. 6th, 1915. Last Pub. Dec. 4th, 1915

St. Patrick's Church.

SUNDAYS:

8:00 a. m. First mass and short instruction.

10:00 a. m Second mass and sermon Benediction of the Most Blessed Sacrament after 10 o'clock mass.

2:00 p. m. Sunday school.

3:00 p. m. Baptisms

WEEK DAY MASSES:

7:30 a. m. Tuesdays and Thursdays.

8:00 a. m. Mondays, Wednesdays, Fridays and Saturdays.

CONFESSIONS:

Saturday afternoon, evening, and Sunday morning.

First Sunday of the month: Communion day for adults.

Second Sunday of the month: Communion day for children of the parish.

Confessions for the children, Saturday before the second Sunday 3:00 to 5:00 p. m.

First Friday of the month. Devotions at 7:30 a m.

D. A. BARRY, Pastor.

BALL FOUNDRY & MACHINE WORKS

At Durango, Colo.

Is equipped to make IRON and BRASS CASTINGS of all kinds and of all sizes, and does First Class MACHINE WORK of all kinds. o o o

Telephone No. Durango 42.

DURANGO, COLO.

... rent. I have ... at present. Several houses ... cheap. Two boarding ... of all kinds

MISS LIZZA LONERGAN.
1015 Mineral St.

Large Crowds Expected

to witness the splendid baking and perfect operation of

Cole's High Oven Range

Hot Blast Exhibition Days Only—Remember the Dates

See this remarkable range bake biscuit quicker than a gas range. You and your friends are invited to see this great feature accomplished.

The tremendous popularity of this modern range is the result of *merit* and *value*. It represents the greatest advancement in range construction and the *greatest* value ever offered to this community.

An expert will exhibit the many Labor Saving, Time Saving and Money Saving features that are ***built into*** the ***everyday*** service it renders its thousands of enthusiastic users.

Sold! Sold! Sold!

Yes—that's the way they are going all over the country—on ... *value* and *service*.

Bake, Cook, Heat

At the same time—with one Fire.

Saves the cost of two stoves. Saves the expense of ... Only one fire to build each winter. ... cooks breakfast with last night's fuel.

Perfect baking in Large Sanitary Oven. Easy to keep ... bright, ... best materials ...

While They Last!

Through our special arrangement with the Cole Mfg. Co., we give each High Oven Range purchaser this beautiful set of guaranteed Pure Aluminum Ware.

FREE!!

During the Hot Blast Days Only.

They are having an enormous sale on this deservedly popular range. We jumped at the chance to give this community the benefit of this great bargain.

THE Wm. H. CROOKE HARDWARE CO.

Demonstration Nov. 29th and 30th

THE SILVERTON STANDARD

VOLUME XXVIII | SILVERTON, COLORADO, SATURDAY, SEPTEMBER 9. 1916. | NO 44

MINE AND MILL SUPPLIES

Agents for Repauno Gelatin Powder, Z. L. German Fuse and Canton Drill Steel. Electrical Supplies

Shelf & Heavy Hardware

We carry in stock Queensware, Paints, Oils, Window Glass, Guns and Ammunition, Kodaks and Photographic Supplies

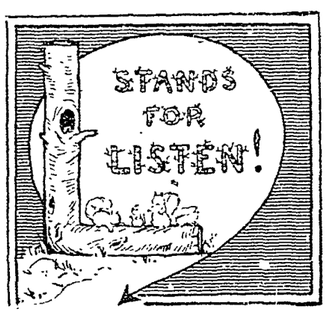
THE WM. H. GROOKE HARDWARE COMPANY

GEO. SNEER, the Tinner

PLUMBING AND STEAM FITTING

Store, Phone Silver 19. Residence, Phone Silver 17.

THE Clifford Mer. Co.



That's What
We'd Have You Do
To the Facts about
Our Bakery Goods
We're always telling You.
We tell you here naught but the truth,
And, reading what we say,
We hope you will not hold aloof
But Come Here Every Day.

The Clifford Mer. Co.

Joseph Bordeleau

WHOLESALE AND RETAIL DEALER IN

Hardware, mining supplies, Giant and Dupont powder, German fuse, hose and belting, crockery and plumbing goods, electrical goods.

Tin Shop in Connection with Store.

JOSEPH BORDELEAU

THE SILVERTON SUPPLY CO.

WHOLESALE AND RETAIL GROCERS
BAKERY IN CONNECTION
Warehouse on track.

A full stock at all times of staple Groceries. Well fixed to handle heavy orders; also an exceptionally well selected stock of fancy groceries

Sole Agents. Diamond C. Hams and Bacon.
Chase & Sanborn Tea and Coffee.
Sprague Warner Richelieu.
Baurs' Candy.

SUBSCRIBE FOR STANDARD

LATEST PHOTOGRAPH
OF PRESIDENT WILSON

"In the bloodiest crucible of all history he has kept the stainless banner of the Republic flying above 100,000,000 of the people in peace and in honor. During these years of great trial, of difficulties, and complications crowding upon each other like waves of an angry sea, with enemies powerful from without and critics and traducers from within, with abuse cruel as it was cowardly, he emerges as majestic and powerful as a mountain after a storm, loved by all who believe in justice, and feared by those who temporize with wrong."
—SENATOR OLLIE JAMES.

August Ore Shipments

Below we give the ore shipments for the month of August from the various mines of this district, the total cars shipped being 333. At an average of 22 tons to the car the production in tonnage of ore shipped from the San Juan district was 7326 tons for the month ending August 31st. This is the largest shipment that San Juan has enjoyed for a number of years, if not for all time, and proves beyond a doubt that mining in our district has revived to the extent that most every property, old and new, is shipping. Clip out the table below and mail it to your friends, who may be interested in what the San Juan is doing.

To Outside Mills and Smelters

Mine.	No. of Cars.
Davey Leasing Co....	61
Sunnyside.....	35
Gold King.....	32
S. D. & G Leasing Co	25
Silver Lake.....	25
Iowa-Tiger.....	18
St Paul.....	10
Mears-Willfley	8
Whale Lease.....	6
Highland Mary.....	5
Barstow.....	1
Barstow Leasing Co..	1
Silver Ledge.....	3
Gennessee.....	3
Kopel Leasing Co....	3
Dives Lease.....	2
Congress.....	2
John Morgan & Co. .	2
Andrene & Jackson .	2
Joker Tunnel.....	1
Reno Leasing Co.....	1
Hudson.....	1
Carbonate King.....	1
Pride of the West....	1
Big Giant	1
Intersection.....	1
Total.	257

To Silver Lake Custom Mill.

Little Dora.....	26
Congress.....	16
Green Mountain ...	10
S D & G Leasing Co	7
Genessee.....	4
Champion.....	3
Atlantic Leasing Co..	3
Detroit and Colorado.	2
St. Paul.....	2
Barstow.....	1
Total.	74

To Yukon Mill.

Cascade T. Co.....	1

To North Star Mill.

L. F Carothers.....	1

The Ledge mill, located at Chattanooga, is making some rich concentrates for the present leasers. Lead and zinc concentrates are being shipped to the Durango smelter almost daily. Under the management of Philip Sartore the mill is working one shift, but in all probability another shift will be added soon. About 25 cars of zinc concentrates are ready for shipment as soon as Mr. Sartore is informed where to place the same.

Another test run on ore from the Dora mine was made this week at the Dora mill. Under the management of Mr. Gillett with the assistance of W. R. Case, mine foreman, and John Hughes, of the mill, the Dora is keeping a large force of men employed, and work is progressing very rapidly at this property.

The Kittimac Mine and Mill

Operations have been resumed at the Kittimac mill under control of the company that has taken over the Kittimac property—The Kittimac Mine and Mill Company, recently incorporated under Colorado laws.

Important changes and improvements have been installed in the mill and the new flotation process, being installed by Mr. J. M. Hyde, will be in operation next week A demonstrating flotation machine is now in operation for determination of the various points involved in successfully treating the ores by flotation.

Shipments from the mill are expected to begin this week.

At the mine good milling ore continues to be developed and the situation there is reported to be entirely satisfactory.

A complete overhauling of the crushing plant at the mine is under put way and everything is being in shape to insure a continuous winter run, including extensive cribbing to prevent damage to the tramway from snowslides

Under the present control and management it looks as if the Kittimac has finally come into its own and can be depended upon for steady and substantial production

Report of Metal Market

Copper:—Demand from the Allies for copper continues to be heavy and the metal is pretty well sold up to December

Lead:—Lead is sold out for September and demand continues to be heavy.

Zinc:—The spelter market at present is of a nervous character. When the price goes down to about 8c, sellers withdraw, and when it gets up to about 9c, buyers disappear. The feeling, however, in general, is that prices will be better.

Silver:—Continued buying for coinage, together with orders from India and smaller arrivals of spot silver in London, have tended to raise the price.

QUOTATIONS.

Silver, Sept. 6, 68½c per oz
Lead. do 6.50 per 100 lbs
Copper (Closing Electrolytic Cathodes quotation for week) 27.55 per 100 lbs.
Zinc (Ave. for week) 8.666 per 100 lbs.

Yours truly,
F. C. Gilbert,
Manager-Durango Plant

Manager Phil Flynn, of the Garryowen property, spent the latter part of last week in Telluride on mining business.

Jim Fox and William Lonergan are pushing work on their lease on the Lackawana. Both of these prominent mining men are very much encouraged over the property that they are now working.

Manager Slattery, of the Gold King, is keeping work at this property on a progressive basis and is devoting a great deal of time to the Gold King workings, and making great headway while the good weather permits.

Messrs. Hoffman and Flinn, who have been doing considerable repair work on their property known as the Rewville group in the Red Mountain mining district, have completed their new boarding house building.

J. J Cusick, who recently returned from an extended visit in the east, and who is managing the Elk property, is making preparations to work several other old properties in the county. Mr. Cusick is going to operate in our fields on a large scale.

The Highland Mary is working a couple of shifts and shipping ore to the North Star mill. This property is being operated by J H. Slattery and associates.

R. E. McLeod

Funeral Director
— AND —
EMBALMER
Monuments and Flowers
Phone Silver 137.

James Dyson

Civil and Mining Engineer
U. S. Mineral Surveyor
1437-1447 Reese street, near the county offices. P O Box 33

MACHINE SHOP

Why send away for your machine work and castings.

The Planing Mill and Machine shop is fully equipped to do any class of work that can be done. They make your patterns, order your castings and do all the machine work necessary.

Leave your orders for work with
FRED GOBLE.

BALL FOUNDRY & MACHINE WORKS

At Durango, Colo.

Is equipped to make IRON and BRASS CASTINGS of all kinds and of all sizes, and does First Class MACHINE WORK of all kinds o o o

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DURANGO, COLO.

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GNERAL TRANSFER
— AND —
EXPRESS BUSINESS

Baggage to and from all trains. Call me up at
TELEPHONE RED 142

WARREN G. PROSSER

U. S. Mineral Surveyor
General Engineering in Mining!
Opposite School Building.
PHONE SILVER 86

WAY & CURRAN

ATTORNEYS - AT - LAW
Silverton, Colorado.
Offices over First National Bank

FRANK L. ROSS
Attorney-at-Law
Office in Benson Block.

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No tinkering with your valuable time piece.

WE GUARANTEE Our Work

Let our expert man examine your watch or clock. He will tell you what is needed and what the cost will be.

When your watch has been repaired by us, you can depend upon it every time to keep the correct time. Large assortment of watches, clocks and regulators at correct prices.

Dealers in Diamonds, Watches, Clocks, Silverware, Cut Glass, and Hand-Painted China.

Cunningham & Crocker

Silverton. - Colorado.

"DON'T SEND A BOY TO MILL"

If you want a man's work done, is an old saying. You can send anyone to our market for meat, and your order will be filled just as well as if you came yourself. We are handling but the very choicest meats, the prime, tender and juicy, and we cut them from your standpoint, to suit your particular taste.

The City Market Company

R. W. PIGLEHY, Prop. Telephone, Silver 4.

THIS BEING THE "CLEAN UP" TIME

Do you Know, that

CHI NAMEL

for your Inside and Furniture Varnish. Chinesay for Furniture Polish, and Chi Namel

Drill Wall Paint can't be beat? We also carry a full line of the best Outside Paints, Oils and Colors

KINDLY CALL FOR COLORS. BEST.

Fred Goble Lumber Co. Phone 63.

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YOUNG men's suits and overcoats, smart new colorings, styles full of life and snap, things that will delight the young fellows. Made special by

Hart Schaffner & Marx.

WILLIAM COLE

This store is the home of Hart Schaffner & Marx clothes.

SILVERTON STANDARD

Entered at the Silverton, Colo., postoffice for transmission through the mails as second class matter

OFFICIAL COUNTY PAPER

"AMERICA FIRST"
Woodrow Wilson.

FOR PRESIDENT
WOODROW WILSON

FOR VICE PRESIDENT
THOMAS R. MARSHALL

Sixth Judicial District.

FOR DISTRICT ATTORNEY
JOHN J. DOWNEY
GEORGE W. LANE

County Ticket

FOR REPRESENTATIVE
METZ RODGERS

FOR COUNTY CLERK
C. E. DEESBACK

FOR COUNTY SHERIFF
JAMES PEARSON

FOR COUNTY TREASURER
F. J. BAWDEN

FOR COUNTY ASSESSOR
A. S. BERKEY

COUNTY JUDGE
WILLIAM PALMQUIST

FOR COUNTY SUPT. OF SCHOOLS
MRS. C. W. MONTGOMERY

FOR COUNTY SURVEYOR
FINNEY JONES

FOR COUNTY CORONER
DR. R. C. O'HALLORAN

FOR COMMISSIONER, FIRST DISTRICT
EDWARD MEYER

FOR COMMISSIONER, SECOND DISTRICT
ERNEST SHAW

President Wilson's Mexican policy is a dangerous thing for Republican orators to play with. There are a great many Republicans who endorse it as thoroughly as do Democrats.

Vote at the primary election on Tuesday September 12th. Every Democrat should appear at the polls on Tuesday and give Edward T. Taylor, Julius C. Gunter and the Democratic candidates solid support on the Democratic primary ticket.

The sacrifice of the "honor and dignity of the bench of the United States Supreme Court," by former Justice Hughes, for a-swing-around-the-circle and retirement to private life, is looked upon by the Philadelphia Record "as one of the saddest tragedies of American politics."

Ty Cobb may be only a ball player, but he is particular about his company and reputation. No sooner did Hughes succeed in getting himself photographed shaking hands with the famous ball player, than Ty wired Washington that he was for Wilson, first, last and always. No closing "bunch" for Ty Cobb.

School Notes.

During the past summer the largest number of teachers attended universities in the history of the schools. Miss Lucile McNaw spent six weeks at the Silver Burdett School of Music, Chicago, Ill., Mr. Gurby was at Chicago University, Chicago, Ill., Misses Nell Epperson and Alice Powers and Mr. Barrett attended the University of Colorado, Boulder, Colo., and Superintendent Greene spent six weeks at Columbia University, New York City. All took work that will be applied directly in their teaching during the year.

The enrollment of the schools for the first day totalled 301 for Silverton and 9 for Eureka. A large number of children have not yet enrolled.

Miss Cathryn Ledge, teacher of home economics, will supervise the playground on school days during the morning recess, from 12.55 to 1.15 during the noon period and from 1.00 to 1.30 after school. Miss Ledge had charge of this work in one of the Denver schools for a number of years. From 8.30 to 9.00 in the morning and at the afternoon recess other teachers will have charge. Parents are notified that the play grounds are unsupervised before 8.30 a. m. and after 1.30 p. m. and on Saturdays and Sundays. Accidents are liable to happen when the grounds are not supervised.

The enrollment in the high school commercial work is large. Inasmuch as some commercial work has been offered for the past two years a commercial class will be graduated at the close of next year. These graduates will be equipped in stenography and bookkeeping according to the requirements of the best business colleges.

The senior class for the year 1916-17 numbers 11, the largest in the high school's history.

Classes for mid year promotions are being organized in the grades. These will naturally be small for the first promotion.

The San Juan County Courses of Study are for school patrons and may be had at any time at the office of the Superintendent.

Subscribe for the Standard.

Motor Column.

Monday morning about ten machines reached Silverton from Montrose, Ouray and other cities on the western slope. Owing to the bad weather many who had decided to enter into the run withdrew. The visitors were entertained in the afternoon by ball games between Eureka and Silverton and Ouray and Eureka. The boys from Eureka winning both games by scores of 5 to 3 and 11 to 7, respectively. While a number of machines left Silverton early in the evening, a number of visitors remained over to attend the dance given by the Miners' Union.

While we expected a larger crowd from across the range, still we were not disappointed as the roads were made slippery and muddy from recent storms, causing a number to postpone their trip until later. Raymond Jeffers, secretary of our local motor club, made the day very enjoyable for the visitors and deserves much credit for the success of our first motor run.

Mr. and Mrs. W. N. Haas, Miss Ida Lundberg and Gene Grimes motored to Montrose last Saturday returning to Silverton Sunday evening.

Mr. and Mrs. J. T. Joyce, Sr., Gerald Joyce and Mr. and Mrs. J. M. Hyde motored to Ouray Sunday.

Miss Nellie Holladay motored to her home in Ouray last Saturday after a weeks visit in Silverton as the guest of Mr. and Mrs. C. W. Montgomery.

Messrs. Frank A. Rice and Gordon Rice motored over from Ouray last Saturday. They were accompanied by Miss Jessie Kramer, who had been visiting with Mrs. E. Haskins for the past month.

Among the Montrose and Ouray visitors to Silverton Labor Day were noticed Mr. and Mrs. T. R. Ralcord, Mrs. C. J. Moynihan, Miss R. Ayres, Mr. and Mrs. T. J. Posey, Mr. and Mrs. A. R. McCrimmon, A. L. Anderson, Mr. and Mrs. C. E. Adams, Mr. and Mrs. J. Van Page, Mr. and Mrs. C. B. Akard, Mrs. E. J. Hartman, S. C. Hartman, Lester Routh, Madaline Krebs, J. H. Wilke, H. E. Fair, Lena Elbe, Chas. Elbe, D. J. McHan, Mr. and Mrs. H. H. Meredith, Bryan McCarroll and W. C. Crofton.

A. T. Olischlager, who was a noted mill expert and early pioneer of the San Juan, died at Lovelock, Nevada, August 31st. Mr. Olischlager was known far and wide in mining circles and his services were always in demand. The famous Silver Lake mill, also the Veranilla mill in this county, were built by him as were the Camp Bird and Atlas mills at Ouray and many others throughout this and other mining states.

Oct. 3-6, 1916

Will be the time to show what can be produced in the San Juan Basin.

There will be a large attendance from the outside. One fare for the round trip. 41-2t-c.

Catarrhal Deafness Cannot be Cured by local applications, as they cannot reach the deceased portion of the ear. There is only one way to cure deafness, and that is by constitutional remedies. Deafness is caused by an inflamed condition of the mucous lining of the Eustachian Tube. When this tube is inflamed you have a rumbling sound or imperfect hearing, and when it is entirely closed, Deafness is the result. Unless the inflammation can be reduced and this tube restored to its normal condition, hearing will be distroyed forever. Many cases of deafness are caused by Catarrh, which is nothing but an inflamed condition of the mucous surfaces. Hall's Catarrh Cure acts through the blood on the mucous surfaces of the system.

We will give One Hundred Dollars for any case of Deafness (caused by catarrh) that cannot be cured by Hall's Catarrh Cure. Circulars, free. All druggists 75c
F. J. CHENEY & CO., Toledo, O.

GET BUSY

FOR THE BIG TIME

Oct. 3-6, 1916

Colorado-New Mexico Fair, Durango

Good Sport and Lots of it

Railroad rates—One fare for the Round Trip.

HIS NEW ISSUE. —From New York World.

Eureka Won Both Games

The Labor Day ball games between Eureka and Silverton and Ouray and Eureka, respectively, were won by the boys from the city of "I have found it" by scores of 5 to 3 and 11 to 7.

The game between Eureka and Silverton was called at the end of the seventh inning by agreement. Silverton presented an old time battery in the persons of Fred Patterson as catcher and Bart Beckwith, pitcher, while Eureka used G. Hagel and Strauser. Beckwith and Patterson gave way to Law and Brayden in the fourth, one having a sore arm and the other a split thumb. Silverton started in to score in the first inning by shoving two runs across, while Eureka was blanked until the third, when they secured two tallies. Silverton put up a very creditable game, considering that many of the players had not had a base ball in their hands for three or four years. Following is the score by innings:

	1	2	3	4	5	6	7	R	H	E
Silverton	2	0	1	0	0	0	0	3	6	5
Eureka	0	0	2	0	0	1	2	5	7	3

Umpire Colby.

Immediately after the Eureka-Silverton game the Ouray team took the field against Eureka, and started the game with Sonza in the box and Thistle on the receiving end while Eureka used Martin as their twirler and G. Hagel as catcher. The final score was Eureka 11 and Ouray 7. Following is the score by innings:

	1	2	3	4	5	6	7	8	9	R	H	E
Ouray	2	0	0	0	2	3	0	0	0	7	12	7
Eureka	6	2	0	2	0	0	0	x		11	10	3

Umpires Lonergan and Colby.

GET BUSY

FOR THE BIG TIME

Oct. 3-6, 1916

Colorado-New Mexico Fair, Durango

Good Sport and Lots of it

Railroad rates—One fare for the Round Trip

Is a public office a business proposition with you, Mr. Taxpayer, or do you regard it as a reward for political services? This is a question which you must answer in casting your vote for district attorney next Tuesday. George W. Lane has probably had more experience in the preparation and trial of criminal cases than any other lawyer in the district. Thus, he knows the jurors in every county and the witnesses who will testify before them. His experience has taught him the rulings of the court in criminal cases and the contentions of the lawyers, together with the defense of the culprits. Moreover his large personal acquaintance enables him to secure testimony which might be withheld from a stranger. These are all advantages which weigh heavily with you in choosing your private lawyer and you should consider them in your choice of a public prosecutor. The expenses of a criminal trial are not subject to the discretion of your board of county commissioners, and a mistake may easily cost you hundreds of dollars. 41-1t-c

NOTICE OF FORFEITURE.

To M. M. BLAIR, his heirs and assigns and legal representatives.

You are hereby notified that the undersigned have expended one Hundred Dollars in labor and improvements upon the following lode mining claims, situate in Animas Mining District, San Juan County, Colorado, for each of the years 1912, 1913, 1914, and 1915, respectively, Beulah A, Emma S, Brooklyn, New York, Mayflower, Maid of Erin, Keystone, Sunshine, Silverton, Pittsburgh and Denver lode mining claims, the location certificates of said mining claims being of record in the office of the Clerk and Recorder of San Juan County in the following books and pages respectively to wit: Beulah A Book 15, Page 197, Emma S, Book 1, Page 61, Brooklyn Book 111, Page [illegible], New York Book 111, Page [illegible], Mayflower, Book 111 Page 221, Maid of Erin, Book 111 Page [illegible], Keystone Book 111, Page [illegible], Sunshine, Book 111, Page [illegible], Silverton, Book 117 Page [illegible], Pittsburgh, Book 117, Page [illegible], Blue Bird, Book 117, Page 502; Denver Book 117 Page [illegible], in order to hold said claims under the provisions of Section 2324 of the Revised Statutes of the United States and the amendments thereto approved January 22, 1880 concerning annual labor on mining claims, being the amount required to hold said lode mining claims for the periods ending on the 31st day of December, A. D. 1912, 1913, 1914 and 1915 respectively.

And you are hereby further notified that if within ninety days after this publication of this notice you fail or refuse to contribute your portion of said expenditure as co-owner your interest in said claims will become the property of the undersigned, Nora Coughlin, Elene Coughlin, your co-owners, and the estate of P. J. McDermott, deceased, J. M. Clifford, Administrator, who have made the required expenditures by the terms of said section.

NORA COUGHLIN,
ELENE COUGHLIN,
Co-owners,
J. M. CLIFFORD
Administrator of the estate of P. J. McDermott, deceased.

First Pub. September 2, 1916.
Last Pub. December 2, 1916.

COLORADO STATE FAIR

Pueblo, September 18-23

$13.70 PUEBLO AND RETURN

by way of

DENVER & RIO GRANDE

Tickets on Sale Sept. 17, 18, & 19th
Limit September 24th

$22.95 DENVER AND RETURN

Tickets on Sale Sept. 17 & 18th
Limit September 24th
account annual meeting

MASONIC BODIES INCLUDING O. E. S.

September 18-23

Continuous Passage in Each Direction

For train schedules and detailed information, call on

J. J. Graves, Agent. Silverton — F. A. Wadleigh, P. T. M. Denver

SUBSCRIBE FOR STANDARD

NEWS-00048
p. 2 of 6

Primary Election Notice Continued From Page 3

DEMOCRATIC COUNTY TICKET

N. C. MAXWELL,	Howardsville, Colo.	Precinct Committeeman, No. 5.	Democratic
ANNA NELSON,	Howardsville, Colo.	Precinct Committeewoman, No. 5.	Democratic
M. LONGWELL,	Eureka, Colo.	Precinct Committeeman, No. 7.	Democratic
IDA KUNZ,	Eureka, Colo.	Precinct Committeewoman, No. 7.	Democratic
	Gladstone, Colo.	Precinct Committeeman, No 8.	Democratic
	Gladstone, Colo.	Precinct Committeewoman, No. 8.	Democratic

REPUBLICAN PARTY

LIST OF CANDIDATES AND OFFICES TO BE FILLED

UNITED STATES OFFICES

REPRESENTATIVE IN CONGRESS

NAME	ADDRESS	OFFICE TO BE FILLED	PARTY
HENRY J. BAIRD	Garnet Heights. Delta	Representative in LXV Congress, 4th Congressional District	Republican

STATE OFFICES

NAME	ADDRESS	OFFICE TO BE FILLED	PARTY
WILLIAM H. GABBERT	Telluride	Judge of the Supreme Court	Republican
CHARLES CAVENDER	311 Harrison Ave., Leadville	Judge of the Supreme Court	Republican
GEORGE W. ALLEN	207 So. Broadway, Denver	Judge of the Supreme Court	Republican
SAMUEL D. NICHOLSON	Deleware Block, Leadville	Governor	Republican
GEORGE A. CARLSON	510 West Myrtle St., Fort Collins	Governor	Republican
MOSES E. LEWIS	413 E. 2d St., Florence	Lieutenant Governor	Republican
JOHN E. RAMER	Hotchkiss	Secretary of State	Republican
OLIE THORSON	732 Grand Ave., Glenwood Springs	Auditor of State	Republican
H. H. HARBAUGH	1503 Ninth Ave, Greeley	Auditor or State	Republican
ARTHUR M. STONG	212 State Ave., Alamosa	Auditor of State	Republican
HARRY E. MULNIX	1663 Lafayette St., Denver	State Treasurer	Republican
SAMUEL G. McMULLIN	627 Grand Ave., Grand Junction	Attorney General	Republican
WILLIAM C. ROBINSON	16 E. Willamette, Colorado Springs	Attorney General	Republican
GRANT E. HALDERMAN	1012 Spruce St., Boulder	Attorney General	Republican
ARTHUR R. MORRISON	325 Franklin St., Denver	Attorney General	Republican
REES D. REES	1049 Humboldt St., Denver	Attorney General	Republican
MARTIN HERBERT KENNEDY	2713 Boulevard F, Denver	Attorney General	Republican
HELEN M. WIXSON	1560 Downing, Denver	Superintendent of Public Instruction	Republican
GRACE ELLEN SHOE SMITH	1130 York St., Denver	Superintendent of Public Instruction	Republican
WILLIAM J. KING	Villa Grove	Regent of the University of Colorado	Republican
ANNA WOLCOTT VAILE	Hotel Metropole, Denver	Regent of the University of Colorado	Republican
WM. P. HARLOW	541 Highland Ave., Boulder	Regent of the University of Colorado	Republican

JUDICIAL OFFICES

NAME	ADDRESS	OFFICE TO BE FILLED	PARTY
ALONZO M. EMIGH	Pagosa Springs	District Attorney Sixth Judicial Dist.	Republican
FREDERICK C. PERKINS	1931 East 2d Ave., Durango	District Attorney Sixth Judicial Dist.	Republican

LEGISLATIVE OFFICES

NAME	ADDRESS	OFFICE TO BE FILLED	PARTY
E. J. HOLMAN	Silverton, Colo.	Representative 21st General Assembly	Republican

COUNTY OFFICES

NAME	ADDRESS	OFFICE TO BE FILLED	PARTY
....	....	County Judge	Republican
JENNIE M. ALLEN	Silverton, Colo.	County Clerk and Recorder	Republican
OSCAR ADRIANSON	Silverton, Colo.	Sheriff	Republican
O. W. NYBERG	Silverton, Colo.	Treasurer	Republican
JOHN GLANVILLE	Silverton, Colo.	Assessor	Republican
MARY E. HODGES	Silverton, Colo.	Superintendent of Schools	Republican
A. L. BURNETT	Silverton, Colo.	Coroner	Republican
....	....	Surveyor	Republican
WM. L. TERRY	Eureka, Colo.	Commissioner First District	Republican
JAMES DYSON	Silverton, Colo.	Commissioner Second District	Republican
W. A. PTOLEMY	Silverton, Colo.	Justice of the Peace, Silverton Precinct	Republican
....	Silverton, Colo.	Justice of the Peace, Silverton Precinct	Republican
....	Silverton, Colo.	Constable, Silverton Precinct	Republican
....	Silverton, Colo.	Constable, Silverton Precinct	Republican
....	Eureka, Colo.	Justice of the Peace, Eureka Precinct	Republican
....	Eureka, Colo.	Constable, Eureka Precinct	Republican

PARTY PRECINCT OFFICES

NAME	ADDRESS	OFFICE TO BE FILLED	PARTY
E. J. HOLMAN	Silverton, Colo.	Precinct Committeeman, No. 1	Republican
JEANNETTE BROWN	Silverton, Colo.	Precinct Committeewoman, No. 1	Republican
R. E. McLEOD	Silverton, Colo.	Precinct Committeeman, No. 2	Republican
KATHERINE GOBLE	Silverton, Colo.	Precinct Committeewoman, No. 2	Republican
WM. LYLE	Silverton, Colo.	Precinct Committeeman, No. 3	Republican
MRS. A. W. HARRISON	Silverton, Colo.	Precinct Committeewoman, No. 3	Republican
KARL T. THOMPSON	Silverton, Colo.	Precinct Committeeman, No. 4	Republican
MERCY GARRETT	Silverton, Colo.	Precinct Committeewoman, No. 4	Republica
THEO GRABOWSKY	Howardsville, Colo.	Precinct Committeeman, No. 5	Republican
MRS. O. D. KIMBALL	Howardsville, Colo.	Precinct Committeewoman, No. 5	Republican

Continued on Page Six

FARMERS WISE TO "HERD LAW" DANGER--- CITY DWELLER IN DARK

Fight Against Disguised Fence-measure Turned to City and Town. Eleventh Hour Petitions for Bill Circulated in Pettish Anger by Backers, and Disclose Strange Things

In the cities and towns of Colorado, rather than on the rural districts, is to be centered the continued fight of farmers' organizations and civic and commercial clubs of the state against the so-called "herd-law," petitions for the initiating of which were filed last week with the secretary of state at Denver. With surprising facts gleaned from a careful checking of the signatures attached to the petitions, opponents of the measure say they are convinced the farmers and cattlemen thruout the state are almost unanimously opposed to the proposed law, and that it is the unthinking city dweller that must be appealed to to circumvent its backers' purposes.

A checking of the 20,000 names on the petitions disclosed the fact that 12,000 of the number were names of persons living in Denver, persons who it is safe to say have little direct interest in laws affecting the agricultural districts of the state, and whom it was easy to mislead with specious statements that they were giving their support to a measure patterned after the herd laws of other states, and beneficial to the new settlers and the small farmers. And the further somewhat startling fact that the 12,000 names were added to the petitions in two days—July 6 and July 7 --many weeks after the first 8,000 were obtained, by a whirlwind campaign of hired circulators operating from the office of the Denver Post and its auxiliary organ, the Great Divide, strengthens the contention that the farmers of the state have awakened to the real truth, to the realization that the measure is not in reality in any way a herd law, but a fence law—which repeals the efficacious fence law already on the statute books—with dangerous potentialities, with certain assurance of harmful effect on tillers of the soil large and small, on the state's future promise of settlement, on the raisers of stock little and big.

Farmers Awake to Danger.

The petitions containing the first 8000 names were sprinkled liberally, it is pointed out, with the signatures of dwellers in the small towns of farming communities and farmers, particularly in the irrigating districts. But that was when the measure, with its plausibly perpetrated appeal as a proposed law aimed at predatory cattle barons and a sanctuary of safety for the struggling small farmer, was first sprung on the unsuspecting public. It was pictured a measure patterned after excellent herd laws of other states. It promised to drive grasping cattle barons out of business. Painted in glowing colors that are a habit of life with the propagandist campaigns of the Denver Post was the future of the farmer in Colorado once he had taken the child of the Great Divide to suckle and sustain.

But thinking farmers of the state did not long delay in studying the seemingly satisfactory measure. And they made discoveries. Within a short time every organization of the state made up of and representing the best interests of the farmer and cattlemen came out in unalterable opposition to what it was plainly evident was only another log rolling scheme of the Post and its weekly mouthpiece. Within a short time the measure stood, but wabbled on weak legs, with the Denver Post championing it, and against it——

The Farmers' Grange, The Farmers' Union, The Colorado Stockgrowers' Association, The Colorado State Dairymen's Association, The Denver Civic and Commercial Association, Commercial Organizations of Cities and Towns in Every Part of Colorado, Business Men and Stock Farmers In Every Section of the State.

Appeal Proved Fallacious.

Those organizations had not been slow to perceive the iniquitous possibilities of the proposed law. They were not long in coming to the conviction that irreparable injury to the state was sure to follow its enactment. Punctured was the bombastically blown bubble of the Post's appeal for a rally against the cattle baron--it was disclosed that instead of terrifying and predatory barons owning great herds and driving to limbo of poverty the small rancher and small stock grower, the average herd of cattle in Colorado numbers only fifty head. The proposed measure was shown up not a herd law, not a law similar to the herd law of any state in the union, but a fencing law that would compel every struggling settler, every owner of a small farm in the state to fence his lands or to hire a herder to protect himself from unscrupulous men who by the measure's provisions could take advantage of him. The cunningly worded bill makes the farmer liable for damage if his stock strays on the property of another--and it opens up a dismal vista of things that could happen to the farmer unable to fence or to hire herders should an unscrupulous neighbor choose to drive that farmer's cattle onto his own property.

It was shown to be a measure that, rather than being beneficial to the small and struggling farmer, would rob him of his greatest source of sustenance. The average rancher of Colorado can raise on his acres only feeding crops. His one, or two or three cows—which James J. Hill declared the salvation of the country in the future-- are that which stand between him and his family and hard times thru periods of stress and planting, and failure of crops. Deprive him of the opportunity to feed those cattle on the public domain and he is robbed of his greatest farming asset. He is forced to build fences about his own acres, on which he cannot properly feed his own cattle, to keep them off the lands untilled, lands that in a Western state only partially settled are the God-given property of the man who is struggling to make himself a home, so long as they remain open.

They Turn Deaf Ear.

And as those things were realized by the farmers, business men and stockmen of the state, together with the fact that the proposed law would mean that 50,000,000 acres of unfenced lands in the state would be closed to grazing; that it would drive from the state live-stock growers and in consequence deprive the rancher of his market for hay and forage crops; that it would [illegible] remained a state law [illegible] turning [illegible] face [illegible] that depreciation in land values, and constant rancor and discord between neighbors would fall to the lot of the state, these things were realized and the agriculture farmer, big and little, turned a deaf ear to the [illegible] of the measure's backers.

There was a lapse of interest—a hiatus during which no petitions were circulated, and the Great Divide stilled its clamorous noise. And then —July 6 there appeared in a Denver newspaper an editorial of warning, a calling attention to the fact that, leaving all other considerations [illegible] of it, the sinister influence [illegible] the herd law should have for its [illegible] sition. The editorial [illegible] unselfish purpose of Volney [illegible] --he whose record on the state land board has [illegible] desire to thwart the big cattle owner or big land owner--and his masters, Bon and Tam. It pointed out the dangerous possibilities of the bill.

In Babyish Anger Renew Fight.

And that morning the [illegible] of The Post were summoned [illegible] scoured Denver for signers, beginning with the employees of The Denver Post. It is easy to get signers in cities to petitions proposing a law of any kind, no matter [illegible] how ridiculous [illegible] two days The Post and Great Divide seeking for selfish interests to foist on the state a law disastrous to the state's greatest promise of future wealth, continuing that effort in a petulant and pettish fit of anger over a competitor's honest criticism, garnered its majority of signatures--which can by no means be termed supporters to its petitions. After the farmers, dairymen and live-stock raisers of the state, those who alone will be affected directly by the law--had turned down the dangerous fencing measure, the city dweller was turned to as a means of saving it from the limbo of forgotten things. And by that same ingenious process [illegible] tion on the voters of city and town who, it is hoped by them, will continue a negative lethargy concerning the truth about the measure. The Post and The Great Divide plan to force the law on the statute books.

Those opposed to the measure declare all they ask of the voters of Colorado is an impartial study of the so-called herd law, a study based only on a desire to cast their ballots to the end that the greatest good to the greatest number be done. That kind of study will convince, they contend, those who have given little attention to the matter and those who are honestly the measure's adherents that the bill is an iniquitous one, designed and supported for selfish reasons. Misled by specious argument, by false statement, by confusing clothing of verbiage in which the backers have [illegible] tered their measure to the public, some are sincere in their belief it is in reality a herd law beneficial, if passed, to the state. It is to the [illegible] the unthinking and careless the opponents appeal.

As in other campaigns waged by the Denver Post, it is well that particular attention be paid to a consideration of what already has been mentioned - The Denver Post for it. Against it Every Organization Made Up of and Representing the Best Interest of the Farmer, the Dairyman, the Stockmen, the Coming Settler, in the State.

Democratic Candidate for Auditor of State.

Charles H. Leckenby, whose name appears first on the Democratic primary ballot for auditor of state, is widely known and popular throughout all of Colorado, as he has been prominent in party councils for many years. He is 47 years old and has lived for twenty-eight years in Routt county, where he has taken an important part in the development of that section, being always at the fore front in everything tending toward the upbuilding of Colorado in general and his own section in particular.

His energy and force may be gathered from the fact that he has brought his newspaper, The Steamboat Springs Pilot, into the front rank of the papers of Colorado.

During all his years in Colorado, Mr Leckenby has consistently and faithfully upheld the cause of Democracy and stood for good citizenship and the ideals of good government.

He has served as secretary of the Democratic state central committee, as president of the Colorado State Editorial Association, twice as president of the Democratic Editorial Association, has been for ten years clerk of the District Court in Routt county and has held many other positions of honor and trust. He is a member of Typographical Union No 49 of Denver.

If nominated and elected, Mr Leckenby pledges his best efforts toward a careful and economical administration of the important duties coming under his charge.

Adv.

Notice of Registration

Meeting days for the Board of Registration, in the Various Precincts of the County:

You are hereby notified that a meeting of the Board of County Commissioners of San Juan County, Colorado, held on the 12th day of July, 1916, you were appointed one of the Judges of Election and a Member of the Board of Registry in and for the various Election Precincts. Under the law you hold this office for the term of ONE YEAR or until your successor is duly appointed.

You are required by law to meet and sit as a member of the Board of Registry at the various Precincts on the following days, to-wit: on Tuesday, September 5th 1916, being one week before the Direct Primary Election from seven o'clock A. M. until seven o'clock P. M., on Monday, September 11th 1916, being the day before the Direct Primary Election, from seven o'clock A. M. until seven o'clock P. M., on Tuesday, October 24th 1916, being two weeks before the General Election, from seven o'clock A. M. until seven o'clock P. M., and on Monday, November 6 1916, being the day before the General Election, from seven o'clock A. M. until seven o'clock P. M.

You are also required by law to meet at seven o'clock A. M. at the same place and act as a Judge of Election on the following days, to-wit: on Tuesday, September 12th 1916, the day of the Direct Primary Election, and on Tuesday, November 7th, 1916, the day of the General Election.

Before entering upon your duties as a member of the Board of Registry and as a Judge of Election, you will qualify by taking the oath required by law.

NOTICE OF PRIMARY ELECTION

Office of the Secretary of State }
of the State of Colorado }

To Hon. Carrie I. Dresback, County Clerk of San Juan County, Silverton, Colorado,

Sir, In accordance with the Provisions of Sections 19 and 20 of Chapter XXXIV of the General Statutes of 1883 of the State of Colorado, being the same as Section 2142, Revised Statutes of Colorado, 1908, and in accordance with Provisions of Section 15 Primary Election Law, 1910, Page 34, Election Laws, 1916, notice is hereby given that a Direct Primary Election will be held in the several wards and voting precincts in the state aforesaid on Tuesday, the Twelfth day of September, A. D. 1916 for the nomination of the following officers, to wit:

One Representative in the LXV Congress of the United States for the Fourth Congressional District.

Two Judges of the Supreme Court for the state of Colorado for the term of ten years.

One Governor of the State of Colorado.

One Lieutenant Governor of the State of Colorado.

One Secretary of State.

One Auditor of State.

One State Treasurer.

One Attorney General.

One Superintendent of Public Instruction.

Two Regents of the University of Colorado.

One Member of the House of Representatives to represent the County of San Juan to succeed Hon. John S. Fox.

One District Attorney for the Sixth Judicial District.

[illegible]

[illegible] ... in accordance with the Provisions of the General Election Laws and the Primary Election Laws of 1910.

FRANKLIN E. CARRINGER

Of Jefferson County, former Representative and State Senator, Asks Your Vote and Support

FOR LIEUTENANT GOVERNOR

On the Democratic Ticket

His legislative record proved his real worth and ability in every way and won him organized labor's support. Helped originate the Initiative and Referendum, was a big factor in the enactment of Colorado's Good Roads law, author of the County High School law, helped advance the bill to make smelters public utilities, stands for everything to make better times, better working conditions and better people.

With your help he will be nominated at the Primaries September 12 by a large majority.

Vote For F. E. CARRINGER For Lieutenant Governor

Adv.

HON. MORTON S. BAILEY

Candidate for nomination to succeed himself as Justice of the Supreme Court at the Democratic Primary, September 12th, 1916. There are TWO candidates to be selected.

Judge Bailey is in the widest sense a sound and trained jurist, with 25 years experience as District and Supreme Court Judge. Experience counts. Why change?

Adv

In testimony whereof I have hereunto set my hand and affixed the Great Seal of the State of Colorado, at the City of Denver, this Fourteenth day of August A. D. 1916.

SEAL JOHN E. RAMER, Secretary of State

County and Precinct Officers to be nominated as follows:

One County Judge.

One County Clerk.

One County Treasurer.

One County Assessor.

One County Superintendent of Schools.

One County Sheriff.

One County Coroner.

One County Surveyor.

One County Commissioner, First Commissioner's District, Term four years.

One County Commissioner, Second Commissioner's District. Term four years.

Two Justices of the Peace, Silverton Precinct.

One Justice of the Peace, Eureka Precinct.

Two Constables, Silverton Precinct.

One Constable, Eureka Precinct.

One Committeeman and one Committeewoman for each of the Voting Precincts of the County.

In Testimony Whereof, I have hereunto set my hand and affixed the seal of the County of San Juan at Silverton, this 8th day of August A. D. 1916.

SEAL C. I. DRESBACK, County Clerk

For Sale

Central Hotel, also a ten room furnished house with steam heat. Cheap if taken at once.

Mrs. Geo. Noll.

Finney Jones

Civil Engineeer

Corner Reese and 13th

SILVERTON, COLO

PRIMARY ELECTION NOTICE

TO THE ELECTORS OF SAN JUAN COUNTY:

In accordance with the provisions of Section Seven, Primary Election Law, 1910, (page 34, Election Laws 1916,) notice is hereby given that a Direct Primary Election will be held in the lawful polling places in each of the voting precincts of the county, between the hours of 7 a. m. and 7 p. m., on Twelfth (12) day of September, A. D. 1916, at which election the following named persons, for whom nomination papers have been filed, affecting the electors of said county, together with their addresses, the offices to be filled and the political party each one represents, are to be voted for at said Primary Election:

DEMOCRATIC PARTY

LIST OF CANDIDATES AND OFFICES TO BE FILLED

UNITED STATES OFFICES

REPRESENTATIVES IN CONGRESS.

NAME	ADDRESS	OFFICE TO BE FILLED	PARTY
EDWARD T. TAYLOR,	903 Bennett avenue, Glenwood Springs	Representative in LXV Congress, 4th Cong Dist.	

STATE OFFICES.

NAME	ADDRESS	OFFICE TO BE FILLED	PARTY
SAMUEL N. WHEELER	1118 Main street, Grand Junction	Judge of Supreme Court	Democratic
GEORGE W. MUSSER	2211 Eudora st., Denver	" " "	Democratic
MORTON S. BAILEY	2186 Dexter st., Denver	" " "	Democratic
ROBERT G. STRONG	1732 11th avenue, Greeley	" " "	Democratic
JULIUS C. GUNTER	1365 Josephine street, Denver	Governor	Democratic
JAMES A. PULLIAM	1339 Boulevard, Durango	Lieutenant Governor	Democratic
FRANKLIN E. CARRINGER	2517 Benton st., Edgewater	" "	Democratic
WILLIAM F. ALLEN	631 Downing, Denver	Secretary of State	Democratic
CHARLES H. LECKENBY	Oak street, Steamboat Springs	Auditor of State	Democratic
ROY M. DAVIS	1235 Pine st., Boulder	" "	Democratic
ROBERT H. HIGGINS	1501 Court street, Pueblo	State Treasurer	Democratic
LESLIE E. HUBBARD	Pagosa Springs	Attorney General	Democratic
MARY C. C. BRADFORD	1735 Bellaire street, Denver	Supt. of Public Instruction	Democratic
THOMAS T. BARNARD	131 South 6th street, Victor	Regent of University of Colorado	Democratic
CLIFFORD W. MILLS	2321 Holly street, Denver	" " "	Democratic

JUDICIAL OFFICES.

NAME	ADDRESS	OFFICE TO BE FILLED	PARTY
GEORGE W. LANE	150 E. Park avenue, Durango	District Attorney, Sixth Judicial District	Democratic
JOHN J. DOWNEY	Cortez	" " " " "	Democratic

LEGISLATIVE OFFICE.

NAME.	ADDRESS.	OFFICE TO BE FILLED.	PARTY.
METZ RODGERS.	Silverton, Colo.	Representative, 21st General Assembly.	Democratic

COUNTY OFFICES.

NAME.	ADDRESS.	OFFICES TO BE FILLED.	PARTY.
WM. PALMQUIST,	Silverton, Colo,	County Judge.	Democratic
C. E. DRESBACK.	Silverton, Colo.	Clerk and Recorder.	Democratic
JAMES W. PEARSON,	Silverton, Colo.,	Sheriff.	Democratic
F. J. BAWDEN,	Silverton, Colo.	Treasurer.	Democratic
A. S. BERKEY,	Silverton, Colo.	Assessor.	Democratic
ANTOINETTE MONTGOMERY,	Silverton, Colo.,	Superintendent of Schools.	Democratic
E. C. O'HALLORAN,	Silverton, Colo.,	Coroner.	Democratic
FINNEY JONES.	Silverton, Colo.,	Surveyor.	Democratic
J. ERNEST SHAW,	Silverton, Colo., Howardsville, Colo.	Commissioner, First District.	Democratic
EDWARD MEYER.	Silverton, Colo.	Commissioner, Second District.	Democratic
	Silverton, Colo.	Justice of Peace, Silverton Precinct.	Democratic
	Silverton, Colo.	Justice of Peace, Silverton Precinct	Democratic
	Silverton, Colo.	Constable, Silverton Precinct.	Democratic
	Silverton, Colo.	Constable, Silverton Precinct.	Democratic
	Eureka, Colo.	Justice of Peace, Eureka Precinct.	Democratic
	Eureka, Colo.	Constable, Eureka Precinct.	Democratic

PARTY PRECINCT OFFICES.

NAME.	ADDRESS.	OFFICES TO BE FILLED.	PARTY.
J. M. BOYCE.	Silverton, Colo.	Precinct Committeeman, No. 1.	Democratic
GERTRUDE HIGGINS,	Silverton, Colo.	Precinct Committeewoman, No. 1.	Democratic
WILLIAM SCHULZ,	Silverton, Colo.	Precinct Committeeman, No. 2.	Democratic
ANTOINETTE MONTGOMERY,	Silverton, Colo.	Precinct Committeewoman, No. 2.	Democratic
CHARLES LEONARD,	Silverton, Colo.	Precinct Committeeman, No. 3.	Democratic
NINA PETERSON,	Silverton, Colo.	Precinct Committeewoman, No. 3.	Democratic
GEORGE D. BROWN,	Silverton, Colo.	Precinct Committeeman, No. 4.	Democratic
ELLEN PLANTZ,	Silverton, Colo.	Precinct Committeewoman, No. 4.	Democratic

Continued on Page Four

Town Topics

M. M. Marsh, of Durango, spent Friday in our city.

Floyd Cooper and James Burns spent Thursday at Lake Electra.

Louis Wyman and son spent the latter part of last week in Ouray.

Mrs. Elizabeth Brayden returned this week from a visit in California.

Col. B. B. Galvin spent Labor Day at Durango and Trimble Springs.

J. J. Musser, of Durango, was a guest at the Imperial Thursday evening.

Jack Hickey left Thursday morning for the La Platas on mining business.

E. E. Wheeler, of Ouray, was a visitor in Silverton the first part of the week.

District Attorney Geo. Lane, of Durango, was a visitor in Silverton Friday.

Mr and Mrs. E J. Holman spent the first part of the week at Lake Electra.

Mrs. S. D. Cunningham and daughter spent Wednesday of last week in Ouray

A. S. Berkey, of Eureka, was a visitor in the city during the first part of the week

Fred Bonner, of the Intersection mine, was a visitor in the city on Wednesday of this week.

Dan B Carey, of the Kittimac Mine and Mill company, left for Denver yesterday morning

Thomas Higgins left Tuesday for Boulder where he will enter the law school of the state university.

F. C. Gilbert, of the Durango smelter, spent the first part of the week in Silverton on mining business.

The Ladies' Union will meet Wednesday, September 13th at 2:30 o'clock with Mrs. Frank B. Brown.

Mr. and Mrs. Raymond Jeffers left Thursday morning for Denver where they will locate for the future.

James O'Kelly is working on his lease in the Ophir district and is reported to have some very rich ore in sight.

Mr. and Mrs. B. J Beckwith left for Denver Wednesday morning where they intend to make their future home.

Frank Gercher of Ouray, has accepted a position at the Imperial Hotel, and will attend our high school this year.

Mrs. W. A Triplett, son James and daughter, Miss Alice White have been visiting friends in Ouray the past week

Mr. and Mrs. J. T. Joyce, Sr., and son Gerald are now located in Durango. They left Silverton Monday afternoon.

Gene Grim s who was ill at his home the first part of the week, is again stationed behind the counter at the Silverton Supply store.

Misses Nell and Mary Epperson, local high school teachers, were arrivals from their home in Aspen, Colorado, last Friday evening.

Under the management of Louis O. Bastian, the North Star mill on Sultan is running on ores from different properties of the county

Miss Lillian Johnson, of Ouray, was an arrival Sunday. Miss Johnson has accepted a position as a teacher in our public schools.

Monday evening the Miners' Union gave their annual Labor Day dance. The crowd was large and all enjoyed a pleasant evening

Miss Mary Bell, of Bell's Spur, has accepted a position as nurse at the Miners' Union hospital. Miss Bell arrived on Wednesday evening's train

Miss Helen Thompson left Thursday morning for Griffith and later she will go to Boulder where she will enter upon her senior year at the state university.

The Sunnyside base ball team will journey to Ouray tomorrow where they will play the boys of that city. Our money is on Eureka.

Mrs. R. W. Niedheiser and daughter of Larimer, Wyoming, are visiting in Silverton as the guests of Dr. E. C. Condit and family.

William Cole spent Monday in Durango attending the funeral of the late Patrick Hughes. Master Billy Mullen accompanied him on the trip.

Phil Brown left for Boulder Sunday morning. He will enter his freshman year in the medical department of the University of Colorado.

At the Congregational church Friday evening, September 15, a "spelling bee" for everyone who wishes to take part will be held. Admission 15 cents.

Dave Barrett, our popular and genial high school principal, was an arrival Monday evening from Boulder. Mrs. Barrett, Dave's mother, will join him here in a few weeks.

At the Star Theatre Tuesday evening W. A. Ptolemy was the winner of the handsome hand tinted picture of Silverton. The picture was recently taken by John V Lorenzon of this city.

William Koebler, Jr., of the Bismark, spent a few days in town this week. "Bill" reports the property as looking very encouraging and is pushing work at the mine rapidly before the snow falls.

Mrs. Frank Thompson, who spent a few days this week visiting in Silverton returned to her home at Griffith Thursday morning accompanied by Mrs Jack Joyce, Jr., and little daughter, Jacqueline.

At the Star Theatre next week Messrs Haas and Lorenzon will show some features in which the stars of the film world are taking part. Watch for next week's announcements and then see your favorites on the screen at the Star.

Saturday evening, September 16, the Silverton Band and Orchestra will give their first dance of the season A six piece orchestra will furnish the music for the evening under the direction of Joe Estabrook. Admission $1.00.

A small force of men is employed at the Champion mine cleaning up and also sorting ore and shipping to the Silver Lake custom mill. Under the management of Mr Frank L Ross, the Champion is making ready to operate on a larger scale before long

Subscribe for the Standard.

Raymond Jeffers, who left for Denver Wednesday morning, has accepted a position in that city in connection with the state highway commission. Mr. and Mrs. Jeffers will locate in Denver for the winter.

Paul Sternow, of Akron, Colorado, died at the Miners' Union hospital last Sunday morning from typhoid fever, The deceased was 23 years of age and had resided here but a short time. The remains were taken to Akron for burial by Robert Sternow, brother of the deceased.

Silverton was visited last Friday evening by a number of Harvard students who are touring Colorado and making use of her wonderful formations and characteristics found to be so helpful to the geological student. The visitors were very much pleased with their visit in Silverton.

Frank A. Kitner, of Victor, has accepted a position with the City Market as meat cutter. Mr. Kitner is a man of wide experience in the market business, having worked for some of the largest firms in the west. The City Market made a ten-strike in landing such a man as Mr. Kitner. He is obliging and courteous to all.

At the Gem Theatre next week the Lubin, Selig, Triangle and Fox films will be shown. All these pictures have just recently been released from the above companies and are of high class. Messrs. Brown and Maguire are securing only late pictures. Mutt and Jeff will be shown at the Gem tomorrow evening.

Frank M. Jackson, of Ouray, a noted mining man of the San Juan district, was an arrival in Silverton Tuesday afternoon. Mr. Jackson is getting the Ben Butler property near Animas Forks in shape for operation and expects to be pushing work at that mine in a few weeks. New machinery has been installed and the mine is almost ready for work. Mr. Jackson returned to Ouray during the latter part of the week.

Last Friday evening District Attorney Lane was in Silverton for the purpose of conducting the preliminary hearing of William Feigel who is charged with assault and attempt to commit murder Mr. Feigel was bound over to the district court, his bond being fixed at $500 by Justice W. A Ptolemy. Some two weeks ago Mr. Feigel took a shot at J. B. Warner, after the latter had been successful in having him removed as active trustee in the Silver Ledge affairs by the district court.

Subscribe for the Standard.

A number of Silverton people enjoyed Labor Day at Lake Electra, among them were Mr. and Mrs. Fred Goble, Mr. and Mrs. F. C. Grimes, Mr. and Mrs. E. J Holman, Mr. and Mrs. Lew Parcell, Dr. and Mrs. C. F. Keyser, Mr. and Mrs. John Glanville and family, Sam Wittow and Arthur Doud.

T. V. R. QUINN—OPTICIAN Silverton and mining camps during September. Leave word at New Windsor Hotel. 11-3t-p

LOST.—Lawyer's brief case containing valuable papers. Return to Ray Cooper and receive reward.

FOR SALE:—A 5-room modern furnished house and two lots. Apply at STANDARD office. Cheap if taken at once. 11-tf-c.

Oct. 3-6, 1916

Will be the time to show what can be produced in the San Juan Basin.

There will be a large attendance from the outside. One fare for the round trip. 44-2t c.

General Musical Services

The following is the program of the general musical service which will be held Sunday evening at the Episcopal church, the Congregational church uniting in the services:

Organ Prelude.....Mr. DeCamp
Scripture Sentences.....
Lord's Prayer.....
Address of Welcome, Mr. DeCamp
Hymn—All Hail the Power.....
.....Mrs E J. Holman
Apostles' Creed.....
Prayers .....
Scripture Lesson—Psalm 95-6....
.....Rev. Byers
Singing Psalm 95 6.....Choir
Hymn—Rock of Ages.....
.....Mrs. Robert Pearson
Solo—Selected..Mrs. F. C. Grimes
Hymn—O Thou from Whom All Goodness Flows....Mrs. Root
Offertory Solo.....Mr. Barrett
Hymn—My God My Father.....
..... Mr. Greene
Cornet Solo.....Mrs Byrd
Prayer.....Rev. McIlveen
Hymn—Guide Me O Thou Great Jehovah.....Mr. Curran
Closing Prayers.....Mr. DeCamp

All are invited to attend this service

Congregational Church.

Sunday, September 10th.

10:30 a. m.—Bible lesson from Acts 21 17-40

Sermon Subject:—"The Great Fight."

In place of the usual evening service we will unite with the Episcopalian church, in their place of worship in a sacred song service at 7:30 p. m.

R. C. BYERS, Pastor.

Warren C. Prosser motored to Ouray Tuesday.

EASE AND COMFORT

Are the Delightful Experiences of All Who Ride in the Cars of

Doud Bros. Garage

OPPOSITE IMPERIAL HOTEL

Careful add Reliable Drivers. Motto, "SAFETY FIRST." Prepared to Make Trips to ALL POINTS in the District, Ouray and Montrose on Short Notice.

Choice of Velie, Maxwell, Dodge, Dart

TWO TRIPS DAILY, SILVERTON-EUREKA
Auto-Stage Line. Reasonable Passenger and Baggage Rates. Book your orders ahead.

LIVERY and FEED STABLE in Connection

QUICK SERVICE. Phone 21 J

SHEARER, THE TAILOR

Select your suit or overcoat from the large and elegant assortment of fall and winter samples now on display. Also get your clothes cleaned by our new French Dry Cleaning machine and Tailor pressed, at one door North of Post Office.

Chas. Scheer

PLUMBING, STEAM AND HOT WATER FITTING

Orders Given Prompt Attention

Bordeleau Phone, Silver 120.
Residence Phone, Red 1115.

1108 Greene Street.

Root & Norton

ASSAYERS AND CHEMISTS

ACCURATE WORK AT
REASONABLE PRICES.
TUNGSTEN DETERMINATIONS
CYANIDE TESTS

Fourteenth street near Greene

PHONE 44 W - Silverton, Colorado.

GEM THEATRE
SILVERTON'S BRIGHTEST SPOT

IT TAKES EXCITEMENT sometimes to stir up the blood and put in circulation a normal condition. Nothing better for the purpose than our excellent show this week.

Beats medicine all to pieces. If you need a good tonic, come here. Save money and get better results. The doctor will charge you $2.00 for a prescription and the druggist 75 cents to fill it. We do the whole job for the small sum of 10 and 15 cents.

SUNDAY, 10th. "WHO'S GUILTY?" No. 12, in 2 reels "LAW OF SUCCESS," in 2 reels. "FLORENCE ROSE FASHIONS," in 1 reel. "LUKE LAUGHS LAST," in 1 reel. "MUTT AND JEFF," Cartoon in 1 reel.

MONDAY and TUESDAY, 11th and 12th.—V. L. S. E. presents in 5 reels "FOR A WOMAN'S FAIR NAME," with an all star cast, and a FRANK DANIELS Comedy.

Wednesday 13th—William Fox presents in 5 reels "THE SONG OF HATE." "ELLA WANTED TO ELOPE," a Comedy in 1 reel.

Thursday 14th—Triangle presents "THE PRICE OF POWER," in 4 reels, featuring Orrin Johnson, Sam DeGrasses, Gladys Brockwell and Margurite Marsh: and a Keystone comedy in 2 reels entitled "A MOVIE STAR," featuring Mack Swain and Polly Moran.

Friday 15th—"GRIP OF EVIL" No. 4, in 2 reels. "FLOODED WITH TROUBLES," in 1 reel "LOOKING FOR HIS GOOSE," in 1 reel. "BORD BILL DODGERS," in 1 reel.

Saturday 16th—"FIFTH ACE," in 2 reels. "SALLY'S SCANDALOUS SCHEMES," in 2 reels. "BATTLE OF WALRUS AND AMBROSE," in 2 reels.

Fulton Market and Grocery

JOHN MORGAN, Prop.

Wholesale and Retail
Groceries, Fresh and Smoked Meats and Produce

Fruits and Vegetables.

Telephone - 85

SILVERTON, COLO.

SUBSCRIBE FOR STANDARD

HOLSTEIN! HOLSTEIN!

The sign in which we conquer the joy and pride of every home. It stands for Quality and Economy.

We sell no other kind and are ready to fill all orders promptly, big or little. Watch for the Green Wagon with the Yellow Wheels. It brings the purest Holstein milk to your door every morning.

SILVERTON DAIRY KARL THOMPSON, Prop. Phone King 58.

We Bind

[illegible]

SILVERTON CONSOLIDATED MEAT & PRODUCE CO

Nobby Hats for Silverton Ladies

ALLEN MILLINERY STORE

[illegible]

Call and see our elegant display of spring and summer styles. They will please and so will our prices.

Monte Carlo Livery

Calls received day and night. Safe drivers for teams and saddle horses for any part of the county.

PRICES REASONABLE.
Mattive Bros. Props. Phone 161

Be Prompt and Safety First. Motto of

SILVERTON GARAGE AND AUTO CO.

[illegible], Props.

Reasonable Rates. Careful Drivers. Auto Repair Work.

Phone 12. 10th and Greene Streets.

Waiting Room in Connection.

Main Ave., Opp. Depot Baggage Handled Free

The Palace Hotel

W. S. McNEELY, Prop.

Well Ventilated Steam Heated Rooms. Single or Ensuite Table First Class and Excellent Service.

[illegible] Rate ... Week or Month
SILVERTON, COLORADO

Republican County Ticket

Continued from Page 4

Continued from Page 4

C. C. HEATH	Eureka, Colo.	Precinct Committeeman, No. 7	Republican
MRS. H B WAGONSCHIFFER	Eureka, Colo.	Precinct Committeewoman, No. 7	Republican
W. W. TAYLOR	Gladstone, Colo.	Precinct Committeeman, No. 8	Republican
LUCILE AIRY	Gladstone, Colo.	Precinct Committeewoman, No. 8	Republican

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the Seal of the County of San Juan, this 19th day of August, A. D. 1916.

(Seal) C. E. DRESBACK,
County Clerk and Recorder of San Juan County.

Notice of Registration

Meeting days for the Board of Registration, in the Various Precincts of the County:

You are hereby notified that a meeting of the Board of County Commissioners of San Juan County, Colorado, held on the 12th day of July, 1916, you were appointed one of the Judges of Election and a Member of the Board of Registry in and for the various Election Precincts. Under the law you hold this office for the term of ONE YEAR or until your successor is duly appointed.

You are required by law to meet and sit as a member of the Board of Registry at the various Precincts on the following days, to-wit: on Tuesday, September 5th, 1916, being one week before the Direct Primary Election, from seven o'clock A. M. until seven o'clock P. M., on Monday, September 11th, 1916, being the day before the Direct Primary Election, from seven o'clock A. M. until seven o'clock P. M., on Tuesday October 24th, 1916, being two weeks before the General Election, from seven o'clock A. M. until seven o'clock P. M., and on Monday, November 6, 1916, being the day before the General Election, from seven o'clock A. M. until seven o'clock P. M.

You are also required by law to meet at seven o'clock A. M. at the same place and act as a Judge of Election on the following days to-wit: on Tuesday, September 12th, 1916, the day of the Direct Primary Election, and on Tuesday, November 7th, 1916, the day of the General Election.

Before entering upon your duties as a member of the Board of Registry and as a Judge of Election, you will qualify by taking the oath required by law.

NOTICE OF PRIMARY ELECTION

Office of the Secretary of State }
of the State of Colorado }

To Hon. Carrie L. Dresback, County Clerk, of San Juan County, Silverton, Colorado:

Sir: In accordance with the Provisions of Sections 19 and 20 of Chapter XXXIV of the General Statutes of 1891 of the State of Colorado, being the same as Section 2162, Revised Statutes of Colorado, 1908, and in accordance with Provisions of Section 13 Primary Election Law, 1910, Page 3, Election Laws, 1913, notice is hereby given that a Direct Primary Election will be held in the several wards and voting precincts in the State aforesaid, on Tuesday, the Twelfth day of September, A. D. 1916 for the nomination of the following officers, to wit:

One Representative to the LXV Congress of the United States for the Fourth Congressional District.

Two Judges of the Supreme Court for the State of Colorado for the term of ten years.

One Governor of the State of Colorado.

One Lieutenant Governor of the State of Colorado.

One Secretary of State.

One Auditor of State.

One State Treasurer.

One Attorney General.

One Superintendent of Public Instruction.

Two Regents of the University of Colorado.

One Member of the House of Representatives, to represent the County of San Juan, to succeed Hon. John S. Fox.

One District Attorney for the Sixth Judicial District.

[illegible] County and Precinct Officers as are to be nominated in the several Counties, in accordance with the Provisions of the General Election Laws and the Primary Election Laws of 1910.

In testimony whereof I have hereunto set my hand and affixed the Great Seal of the State of Colorado, at the City of Denver, this Fourth day of August, A. D. 1916.

SEAL JOHN E. RAMER,
Secretary of State.

County and Precinct Officers to be nominated as follows:

One County Judge.

One County Clerk.

One County Treasurer.

One County Assessor.

One County Superintendent of Schools.

One County Sheriff.

One County Coroner.

One County Surveyor.

One County Commissioner, First Commissioner's District. Term four years.

One County Commissioner, Second Commissioner's District. Term four years.

Two Justices of the Peace, Silverton Precinct.

One Justice of the Peace, Eureka Precinct.

Two Constables, Silverton Precinct.

One Constable, Eureka Precinct.

One Committeeman and one Committeewoman for each of the Voting Precincts of the County.

In Testimony Whereof, I have hereunto set my hand and have affixed the Seal of the County of San Juan at Silverton, this [illegible] day of August A. D. 1916.

[illegible] C. E. DRESBACK
County Clerk.

The bath pools at Trimble Springs have been thoroughly cleaned and are now ready for the summer season. 23tf

Bring your job work to the Standard office. Nothing too big for us to handle.

Subscribe for the Standard.

For Justice of Supreme Court

ROBERT G. STRONG | X |

Of Greeley, Weld County.

Democratic Candidate

At the Primary September 12

Mark X after his name as one of your choices from the four named.

After twenty-one years of active law practice, in 1912 was elected District Judge for Weld, Larimer, Boulder and Jackson counties, the strong Republican Eighth Judicial District of 120,000 population.

Pledges every effort to be faithful to the oath of office and impartial for the whole state and people.

Adv.

Carpenters' Union No. 1257

SILVERTON, COLORADO

Meets 1st and 3rd Saturdays of each month at Wyman's Hall.

GEO. T. MURPHY

District Manager.

COLUMBIAN NATIONAL LIFE

AND

UNION HEALTH & ACCIDENT CO

If you have a policy of any kind and don't understand it I will explain it so you will.

Patronize a Home Man.

Office Corner W. 13th & Reese St.
P. O. Box 171.

On Your Democratic Primary Ballot

SEPTEMBER 12, 1916

Place X after the name of John J. Downey for District Attorney, Sixth Judicial District.

John J. Downey | X |

Wm. Palmquist

Insurance of all Kinds

Real Estate, Rentals

Finney Jones

Civil Engineeer

Corner Reese and 15th

SILVERTON, COLO

For Sale

Central Hotel, also a ten room furnished house with steam heat. Cheap if taken at once.

Mrs. Geo. Noll.

Subscribe for the Standard.

Public Trustee's Sale.

WHEREAS, The Auburn Consolidated Gold Mining Company, a corporation organized under the laws of the State of Colorado, by its trust deed, dated the 20th day of July, A. D. 1915, and recorded on the 29th day of December, A. D. 1915, in Book 119 at page 159 of the records in the office of the County Clerk and Recorder of said San Juan County, Colorado, duly conveyed to the Public Trustee in said San Juan County the following described real estate, to wit:

The Bradford, Victoria, Victor, Bay State, Catherine, Plymouth, Nathalie, South Slope, Skyscraper, Hub, Rex, Leviathan, Leviathan No. 2, Czar, Eclipse, and Auburn, Lode Mining Claims, and Bradford Mill Site, as described in General Land Office Mining Certificate No. Durango 0571. The Bradford Lode Claim located October 2, 1903, and certificate thereof being recorded in office of the County Clerk of San Juan County in Book 121, page 66, the Victoria and Victor lodes located June 15, 1901, and recorded in Book 121, pages 381 and 380, the location of the Bay State lode and Catherine lode being recorded in Book 121, page 388 and 389 of said records; the Plymouth, Nathalie and South Slope lodes being recorded in Book 123, pages 319, 320 and 321, the Skyscraper, Hub, Rex, Leviathan, Leviathan No. 2, Czar, being recorded in Book 120, pages 223, 221, 220, 222, 225, 219, respectively; the Eclipse Lode being recorded in Book 92A, page 130; the Auburn lode being situated on Tower Mountain in said Eureka Mining District, more particularly described in records of General Land Office No. 9726 and lot No. 1109, to which reference may be had, and the Bradford Mill Site, the location of which is recorded in Book D-2, page 116, to which records reference may be had for complete descriptions, together with all improvements constructed for the developement of mining claims and buildings as described in notes of Survey No. 18306-A and B. Together with all rights, privileges and appurtenances thereto in anywise belonging, located in Township 12 N. of Range 6 W., and Township 12 N. of Range 7 W., of the New Mexico Meridian, in the Animas and Eureka Mining Districts, designated by Surveyor General as Survey No. 18305A and 18,95B.

In trust to secure the payment of one certain promissory note, bearing even date with said trust deed, for the sum of Ten thousand, five hundred fifty-eight dollars twenty-six cents ($10,558.26), payable to the order of Benjamin F. Spinney, Francis T. Akin and Samuel Shaw two months after the date thereof, with interest thereon, from the date thereof until paid, at the rate of six per cent per annum; and

WHEREAS, default has been made by the said grantor in said trust deed in the performance of the covenants and conditions imposed upon it by the terms of said trust deed in this, to wit: Said grantor has failed to pay the said note, or the interest thereon, and the same is now past due and payable, and

WHEREAS, the legal holder of the indebtedness represented by said note has filed with said public trustee notice and demand in writing declaring said default and electing to declare the whole debt represented by the note due and payable, and demanding a sale of said land under said trust deed;

Now THEREFORE, PUBLIC NOTICE IS HEREBY GIVEN, That, pursuant to said notice, election and demand, and under and by virtue of the authority vested in me by said trust deed and by law, I, F. J. Bawden, Public Trustee of said San Juan County, will sell the above described real estate for cash, at public auction, to the highest and best bidder, at the east front door of the County Court House in Silverton, in said County of San Juan, on the 19th day of September, A. D. 1916, at two o'clock in the afternoon of said day, for the purpose of paying said note, interest to the date of sale, and the expenses of this sale, and will give to the purchaser thereof a certificate of purchase therefor, as provided by law.

Dated, August 11th, 1916.

F. J. BAWDEN,
Public Trustee in San Juan County, Colorado
First Publication August 19, 1916.
Last Publication September 16, 1916

NOTICE OF THE MEETING OF THE BOARD OF EQUALIZATION.

Notice is hereby given, that the first meeting of the County Board of Equalization of San Juan County for the year 1916, will be held in the County Commissioner's Room, in the Court House at Silverton, Colorado, on Tuesday, the 5th day of September, 1916, at 10:00 o'clock A. M., for the Adjustment and Equalization of the Assessment among the Taxpayers of the County of San Juan.

Said meeting will continue from day to day, for not less than three (3) days, nor more than ten (10) days.

Given this 18th day of August, 1916.

C. L. DRESBACK,
Clerk of the Board of County Commissioners of San Juan County, Colorado. 12 tt

NOTICE OF ADJUSTMENT DAY.

Notice is hereby given that on Monday, the 2nd day of October A. D. 1916, Louis Pedroni, the administrator of the estate of Charles Pasternak, deceased; W. T. Black, the administrator of the estate of Lizzie Stockel, deceased, Carl Bleick, the administrator of the estate of William Barkow, deceased, will attend before the Judge of the County Court at the Court House in Silverton, in the County of San Juan, Colorado, at 10 o'clock in the forenoon of said day for the purpose of settling and adjusting claims, at which time all persons having claims and demands against either of said estates are notified and requested to present the same to the Court. All persons indebted to either of said estates are requested to make immediate payment.

Witness Wm. Palmquist, Clerk of the County Court within and for the County of San Juan in the State of Colorado, and the seal of said Court this 1st day of September A. D. 1916.

(SEAL) WM. PALMQUIST, Judge and Clerk
First publication September 2, 1916.
Last publication September 23, 1916.

Joe Estalrock is ready to give lessons in music on violin, piano and any brass instrument. Tuning pianos a specialty. 42-tf

Treasurer's Notice on Request for Tax Deed

To every person in actual possession or occupancy of the hereinafter described land, lot or premises and to the person in whose name the same was taxed or specially assessed, and to all persons having an interest or title of record in or to the same.

Notice is hereby given that on the 23rd day of October, A. D. 1912, the following described property, situate in the County of San Juan and State of Colorado, to-wit: An undivided one-eighth (1-8) of the Leviathan lode mining claim, survey No. 16282, an undivided one-eighth (1-8) of the Parallel lode mining claim, survey No. 16282 and an undivided one twenty fourth (1-24th) of the Hoosier Boy lode mining claim, survey No. 16282 all situate in the Red Mountain mining district, in San Juan County, Colorado, were sold for the taxes for the year 1911 and purchased by the County of San Juan.

That the said County of San Juan has duly assigned the certificate of purchase issued on account of such purchase to Margaret Geany who hath made request upon the Treasurer of said County for a deed.

That the said premises were taxed for said year 1911 in the name of Mrs. May Dwyer.

That the time of redemption of said real estate from such tax sale will expire on the 11th day of December A. D. 1916, and unless redeemed on or before said day a deed will be issued therefor.

Dated this 22nd day of August A. D. 1916.

(SEAL) F. J. BAWDEN.
Treasurer of the said County of San Juan
First publication August 26, 1916.
Last publication September 9, 1916.

Public Trustee's Sale.

WHEREAS, HENRY SHERMAN by his certain trust deed, dated September 21, 1915, which trust deed was recorded in Book 139 at page 113, of Records in the office of the County Clerk and Recorder of San Juan County, Colorado, on the 27th day of September, 1915 did convey to the Public Trustee of San Juan County, Colorado, the following described property, to wit:

All of Lots numbered Nine (9), Ten (10), Eleven (11) and Twelve (12) in Block numbered Eleven (11), in the townsite of Silverton, as per the official and recorded plat thereof; together with all improvements thereon situate.

IN TRUST, to secure to James B. Lazear, Receiver, the payment of the principal sum of Twenty-seven Hundred, Nineteen Dollars and Sixty Cents ($2719.60), with interest thereon at the rate of eight (8) per cent. per annum from date until paid, said principal indebtedness being evidenced by two promissory notes, being one note for $2600 dated Sept. 21, 1915 and due and payable six months after date, and one note dated September 21, 1915 for $119.60 and due and payable three months after date.

AND, WHEREAS, said Trust deed provides that in case of the default in the payment of said notes or in the payment of the interest thereon, according to the tenor and effect of said notes, or in the payment of taxes and assessments on said premises, or in case of the violation or breach of any of the terms, conditions, covenants or agreements therein contained: then, upon notice and demand in writing, filed with the party of the second part by the beneficiary therein or by the legal holder of said indebtedness secured thereby, that such beneficiary or legal holder has declared a violation of any of the covenants therein contained and has elected to advertise said premises, and demands said sale, it shall and may be lawful for the party of the second part to sell and dispose of said premises en masse or in separate parcels as the Public Trustee may think best all the right, title and interest of the said Henry Sherman, party of the first part, his heirs and assigns, therein at Public Auction, at the main front door of the County Court House in Silverton, in the County of San Juan and State of Colorado, or on said premises or any part thereof, as may be specified in said notice of sale, for the highest and best price the same will bring in cash, four weeks notice having previously been given of the time and place of sale by advertisement in some newspaper of general circulation at the time published in said San Juan County.

AND, WHEREAS, default has been made in the payment of said principal note for $2600 and interest thereon from the date thereof and in the payment of the said principal note for $119.60 and in the payment of the interest thereon from the date thereof, and that said principal notes are now wholly due and unpaid, except in the sum of $19.60 paid on said note of $119.60 on September 29, 1915.

AND, WHEREAS, James B. LAZEAR, Receiver, the legal holder of said notes secured by said trust deed has declared a violation of the covenants in said trust deed contained and a default in the payment of the indebtedness secured thereby, and has demanded of the undersigned Public Trustee the foreclosure of said trust deed.

NOW, THEREFORE, By virtue of the power in me vested by law and the terms of said trust deed, I will, on the 19th day of September 1916, at the hour of Ten o'clock in the forenoon of said day, at the main front door of the County Court House in Silverton, San Juan County, Colorado, expose for sale and sell the above described premises, and property, en masse, at public auction for the highest and best price the same will bring in cash, for payment of said notes and the interest due thereon at the time of said sale and for all costs and expenses of said trust.

Dated at Silverton, San Juan County, Colorado, this 11th day of August A. D. 1916.

F. J. BAWDEN,
Public Trustee of San Juan County, Colorado
First Publication August 19, 1916.
Last Publication September 16, 1916.

FOR SALE —2 full patented mining claims, covering 20 full acres, completely covered with heavy growth of mining timber. Mineral in two tunnels. A short distance from and in view of town, close to railroad. A snap for mining timbers. Will sell cheap for cash. Inquire at STANDARD office. tf c 30

1 OF 1 RECORD(S)

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Date:2/1/2017
Report processed by:
Toeroek Associates Inc||

Full Name	Address	County	Phone
CLARK, JACK E JR	912 N SHANNON CIR MESA, AZ 85205-5826 MARICOPA COUNTY	MARICOPA	(480) 854-2040

ADDITIONAL PERSONAL INFORMATION

SSN	DOB	Gender	LexID(sm)
524-58-XXXX	9/1948 (Age:68)	Male	000453556970

Subject Summary

Name Variations

1: CLARK, JACK
2: CLARK, JACK JR
3: CLARK, JACK E JR
4: CLARK, JACK EUGENE
5: CLARK, JACK EUGENE JR
6: CLARK, JACK J JR
7: JACK, CLARK
8: JACK, CLARK JR

SSNs Summary

No.	SSN	State Iss.	Date Iss.	Warnings
		Most frequent SSN attributed to subject:		
1:	524-58-XXXX	Colorado	1961-1962	

DOBs

Reported DOBs:
9/1977
9/1948

Possible E-Mail Addresses

JACK.CLARK@COMCAST.NET
JC1HARDROCK@AOL.COM
J12B06@AOL.COM
JACK.CLARK@PACBELL.NET

Others Using SSN - 0 records found

Address Summary - 35 records found

No.	Address
1:	912 N SHANNON CIR MESA, AZ 85205-5826 MARICOPA COUNTY
2:	PO BOX 296 SILVERTON, CO 81433-0296

SAN JUAN COUNTY

3: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

4: PO BOX F
OURAY, CO 81427-0686
OURAY COUNTY

5: 3815 COUNTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY

6: 3815 COUNTY ROAD 2
SILVERTON, CO 81433
SAN JUAN COUNTY

7: 314 S 11TH ST APT 3
GUNNISON, CO 81230-3483
GUNNISON COUNTY

8: 314 S 11TH ST APT 1
GUNNISON, CO 81230-3483
GUNNISON COUNTY

9: 3815 COUNTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY

10: 100 HILLTOP DR APT 19
REDDING, CA 96003-2817
SHASTA COUNTY

11: 100 7TH AVE
OURAY, CO 81427
OURAY COUNTY

12: PO BOX 1162
OURAY, CO 81427-1162
OURAY COUNTY

13: 3815 CTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY

14: PO BOX 79
OURAY, CO 81427-0079
OURAY COUNTY

15: PO BOX 3329
PALMER, AK 99645-3329
MATANUSKA-SUSITNA COUNTY

16: PO BOX 21449
MESA, AZ 85277-1449

MARICOPA COUNTY

17: 950 W CAMERON AVE APT 104
KELLOGG, ID 83837-2029
SHOSHONE COUNTY

18: PO BOX 284
KELLOGG, ID 83837-0284
SHOSHONE COUNTY

19: 209 S BISBEE AVE APT 8
WILLCOX, AZ 85643-2406
COCHISE COUNTY

20: 500 E MALEY ST
WILLCOX, AZ 85643-2228
COCHISE COUNTY

21: F
OURAY, CO 81427
OURAY COUNTY

22: 209 S BISBEE AVE APT 4
WILLCOX, AZ 85643-2406
COCHISE COUNTY

23: 507 SECOND
OURAY, CO 81427
OURAY COUNTY

24: 6601 VICTORA F 130
HIGHLAND, CA 92346
SAN BERNARDINO COUNTY

25: 1915 S 39TH ST UNIT 17
MESA, AZ 85206-3814
MARICOPA COUNTY

26: PO BOX 385
OURAY, CO 81427-0385
OURAY COUNTY

27: PO BOX 131
OURAY, CO 81427-0131
OURAY COUNTY

28: 419 4TH ST
OURAY, CO 81427
OURAY COUNTY

29: 4975 GLASGOW DR
FAIRBANKS, AK 99709-2913
FAIRBANKS N. STAR COUNTY

30: 4975 GLASGOW
ANCHORAGE, AK

31: 790 OAK ST APT
OURAY, CO 81427
OURAY COUNTY

32: 1660 PEGER RD APT
FAIRBANKS, AK 99709-5129
FAIRBANKS N. STAR COUNTY

33: PO BOX 142
OURAY, CO 81427-0142
OURAY COUNTY

34: 790 OAK ST APT
OURAY, CO 81427
OURAY COUNTY

35: 950 W CAMERON AVE APT 108
KELLOGG, ID 83837-2029
SHOSHONE COUNTY

Address Details

1: 912 N SHANNON CIR MESA, AZ 85205-5826

Address	**Dates**	**Phone**
912 N SHANNON CIR MESA, AZ 85205-5826 MARICOPA COUNTY	10/1988 - 1/2017	(480) 854-2040

Census Data for Geographical Region

Median Head of Household Age: 39
Median Income: $92,500
Median Home Value: $243,123
Median Education: 14 years

Household Members

CLARK, BARBARA J

Other Associates

LUTHER, DARREN EUGENE

2: PO BOX 296 SILVERTON, CO 81433-0296

Address	**Dates**	**Phone**
PO BOX 296 SILVERTON, CO 81433-0296 SAN JUAN COUNTY	7/2004 - 1/2017	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

CLARK, BARBARA J
CLARK, JACK E SR
CLARK, MARCELLA RENAE

Other Associates

LUTHER, DARREN EUGENE

3: PO BOX 767 SILVERTON, CO 81433-0767

Address	Dates	Phone
PO BOX 767 SILVERTON, CO 81433-0767 SAN JUAN COUNTY	12/1993 - 1/2017	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

CLARK, BARBARA J

Other Associates

None Listed

4: PO BOX F OURAY, CO 81427-0686

Address	Dates	Phone
PO BOX F OURAY, CO 81427-0686 OURAY COUNTY	10/1988 - 1/2016	

Census Data for Geographical Region

Median Head of Household Age: 45
Median Income: $64,296
Median Home Value: $372,917
Median Education: 14 years

Household Members

CLARK, JACK E SR
CLARK, JACQUELINE RUTH
CLARK, JARROD EUGENE

Other Associates

WILLIAMS, JASON

5: 3815 COUNTY RD 2 SILVERTON, CO 81433

Address	Dates	Phone
3815 COUNTY RD 2 SILVERTON, CO 81433 SAN JUAN COUNTY	9/2009 - 8/2014	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

None Listed

Other Associates

None Listed

6: 3815 COUNTY ROAD 2 SILVERTON, CO 81433

Address	Dates	Phone
3815 COUNTY ROAD 2 SILVERTON, CO 81433 SAN JUAN COUNTY	11/2007 - 4/2013	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299

Median Home Value: $291,250
Median Education: 14 years
Household Members
CLARK, BARBARA J
Other Associates
LUTHER, DARREN EUGENE

7: 314 S 11TH ST APT 3 GUNNISON, CO 81230-3483

Address	Dates	Phone
314 S 11TH ST APT 3 GUNNISON, CO 81230-3483 GUNNISON COUNTY	11/2010 - 2/2012	

Census Data for Geographical Region
Median Head of Household Age: 33
Median Income: $51,122
Median Home Value: $188,426
Median Education: 13 years
Household Members
None Listed
Other Associates
None Listed

8: 314 S 11TH ST APT 1 GUNNISON, CO 81230-3483

Address	Dates	Phone
314 S 11TH ST APT 1 GUNNISON, CO 81230-3483 GUNNISON COUNTY	2/2010 - 2/2011	(970) 387-5243

Census Data for Geographical Region
Median Head of Household Age: 33
Median Income: $51,122
Median Home Value: $188,426
Median Education: 13 years
Household Members
None Listed
Other Associates
None Listed

9: 3815 COUNTY RD 2 SILVERTON, CO 81433

Address	Dates	Phone
3815 COUNTY RD 2 SILVERTON, CO 81433 SAN JUAN COUNTY	9/2007 - 2/2008	

Census Data for Geographical Region
Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

10: 100 HILLTOP DR APT 19 REDDING, CA 96003-2817

Address	Dates	Phone

100 HILLTOP DR APT 19
REDDING, CA 96003-2817
SHASTA COUNTY

10/2001 - 5/2005

Census Data for Geographical Region
Median Head of Household Age: 46
Median Income: $42,201
Median Home Value: $292,073
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

11: 100 7TH AVE OURAY, CO 81427

Address	Dates	Phone
100 7TH AVE OURAY, CO 81427 OURAY COUNTY	6/2004 - 6/2004	

Census Data for Geographical Region
Median Head of Household Age: 47
Median Income: $64,886
Median Home Value: $396,721
Median Education: 14 years
Household Members
CLARK, JACK E SR
CLARK, JACQUELINE RUTH
Other Associates
None Listed

12: PO BOX 1162 OURAY, CO 81427-1162

Address	Dates	Phone
PO BOX 1162 OURAY, CO 81427-1162 OURAY COUNTY	10/1999 - 5/2004	

Census Data for Geographical Region
Median Head of Household Age: 45
Median Income: $64,296
Median Home Value: $372,917
Median Education: 14 years
Household Members
WILLIAMS, CLARK LEE
Other Associates
None Listed

13: 3815 CTY RD 2 SILVERTON, CO 81433

Address	Dates	Phone
3815 CTY RD 2 SILVERTON, CO 81433 SAN JUAN COUNTY	10/2003 - 10/2003	

Census Data for Geographical Region
Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years
Household Members

None Listed

Other Associates
None Listed

14: PO BOX 79 OURAY, CO 81427-0079

Address	Dates	Phone
PO BOX 79 OURAY, CO 81427-0079 OURAY COUNTY	1/1990 - 5/2003	

Census Data for Geographical Region
Median Head of Household Age: 45
Median Income: $64,296
Median Home Value: $372,917
Median Education: 14 years
Household Members
CLARK, JACK E SR
CLARK, JACQUELINE RUTH
Other Associates
None Listed

15: PO BOX 3329 PALMER, AK 99645-3329

Address	Dates	Phone
PO BOX 3329 PALMER, AK 99645-3329 MATANUSKA-SUSITNA COUNTY	7/1982 - 5/2003	

Census Data for Geographical Region
Median Head of Household Age: 30
Median Income: $77,797
Median Home Value: $221,279
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

16: PO BOX 21449 MESA, AZ 85277-1449

Address	Dates	Phone
PO BOX 21449 MESA, AZ 85277-1449 MARICOPA COUNTY	1/1998 - 3/2003	

Census Data for Geographical Region
Median Head of Household Age: 40
Median Income: $51,290
Median Home Value: $187,963
Median Education: 13 years
Household Members
None Listed
Other Associates
None Listed

17: 950 W CAMERON AVE APT 104 KELLOGG, ID 83837-2029

Address	Dates	Phone
950 W CAMERON AVE APT 104 KELLOGG, ID 83837-2029	7/1982 - 11/2000	

SHOSHONE COUNTY

Census Data for Geographical Region

Median Head of Household Age: 47
Median Income: $35,918
Median Home Value: $120,000
Median Education: 12 years

Household Members

None Listed

Other Associates

None Listed

18: PO BOX 284 KELLOGG, ID 83837-0284

Address	Dates	Phone
PO BOX 284 KELLOGG, ID 83837-0284 SHOSHONE COUNTY	2/1998 - 10/1999	

Census Data for Geographical Region

Median Head of Household Age: 45
Median Income: $34,386
Median Home Value: $117,083
Median Education: 12 years

Household Members

None Listed

Other Associates

None Listed

19: 209 S BISBEE AVE APT 8 WILLCOX, AZ 85643-2406

Address	Dates	Phone
209 S BISBEE AVE APT 8 WILLCOX, AZ 85643-2406 COCHISE COUNTY	9/1995 - 4/1999	

Census Data for Geographical Region

Median Head of Household Age: 45
Median Income: $37,794
Median Home Value: $91,400
Median Education: 12 years

Household Members

None Listed

Other Associates

None Listed

20: 500 E MALEY ST WILLCOX, AZ 85643-2228

Address	Dates	Phone
500 E MALEY ST WILLCOX, AZ 85643-2228 COCHISE COUNTY	2/1997 - 2/1997	

Census Data for Geographical Region

Median Head of Household Age: 46
Median Income: $33,939
Median Home Value: $92,500
Median Education: 12 years

Household Members

None Listed

Other Associates

None Listed

21: F OURAY, CO 81427

Address	Dates	Phone
F OURAY, CO 81427 OURAY COUNTY	10/1996 - 10/1996	

Census Data for Geographical Region

Median Head of Household Age: 47
Median Income: $64,886
Median Home Value: $396,721
Median Education: 14 years

Household Members

None Listed

Other Associates

None Listed

22: 209 S BISBEE AVE APT 4 WILLCOX, AZ 85643-2406

Address	Dates	Phone
209 S BISBEE AVE APT 4 WILLCOX, AZ 85643-2406 COCHISE COUNTY	12/1993 - 12/1993	

Census Data for Geographical Region

Median Head of Household Age: 45
Median Income: $37,794
Median Home Value: $91,400
Median Education: 12 years

Household Members

None Listed

Other Associates

None Listed

23: 507 SECOND OURAY, CO 81427

Address	Dates	Phone
507 SECOND OURAY, CO 81427 OURAY COUNTY	12/1993 - 12/1993	

Census Data for Geographical Region

Median Head of Household Age: 47
Median Income: $64,886
Median Home Value: $396,721
Median Education: 14 years

Household Members

None Listed

Other Associates

None Listed

24: 6601 VICTORA F 130 HIGHLAND, CA 92346

Address	Dates	Phone
6601 VICTORA F 130 HIGHLAND, CA 92346 SAN BERNARDINO COUNTY	12/1990 - 12/1992	

Household Members

None Listed

Other Associates

None Listed

25: 1915 S 39TH ST UNIT 17 MESA, AZ 85206-3814

Address	Dates	Phone
1915 S 39TH ST UNIT 17 MESA, AZ 85206-3814 MARICOPA COUNTY	7/1982 - 12/1992	

Census Data for Geographical Region
Median Head of Household Age: 31
Median Income: $66,935
Median Home Value: $221,747
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

26: PO BOX 385 OURAY, CO 81427-0385

Address	Dates	Phone
PO BOX 385 OURAY, CO 81427-0385 OURAY COUNTY	6/1992 - 6/1992	

Census Data for Geographical Region
Median Head of Household Age: 45
Median Income: $64,296
Median Home Value: $372,917
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

27: PO BOX 131 OURAY, CO 81427-0131

Address	Dates	Phone
PO BOX 131 OURAY, CO 81427-0131 OURAY COUNTY	8/1990 - 8/1990	

Census Data for Geographical Region
Median Head of Household Age: 45
Median Income: $64,296
Median Home Value: $372,917
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

28: 419 4TH ST OURAY, CO 81427

Address	Dates	Phone
419 4TH ST OURAY, CO 81427 OURAY COUNTY	1/1990 - 1/1990	

Census Data for Geographical Region
Median Head of Household Age: 47

Median Income: $64,886
Median Home Value: $396,721
Median Education: 14 years

Household Members
None Listed
Other Associates
None Listed

29: 4975 GLASGOW DR FAIRBANKS, AK 99709-2913

Address	Dates	Phone
4975 GLASGOW DR FAIRBANKS, AK 99709-2913 FAIRBANKS N. STAR COUNTY	2/1987 - 2/1987	

Census Data for Geographical Region
Median Head of Household Age: 32
Median Income: $78,168
Median Home Value: $200,702
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

30: 4975 GLASGOW ANCHORAGE, AK

Address	Dates	Phone
4975 GLASGOW ANCHORAGE, AK	11/1986 - 11/1986	

Household Members
None Listed
Other Associates
None Listed

31: 790 OAK ST APT OURAY, CO 81427

Address	Dates	Phone
790 OAK ST APT OURAY, CO 81427 OURAY COUNTY	5/1985 - 5/1985	

Census Data for Geographical Region
Median Head of Household Age: 47
Median Income: $64,886
Median Home Value: $396,721
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

32: 1660 PEGER RD APT FAIRBANKS, AK 99709-5129

Address	Dates	Phone
1660 PEGER RD APT FAIRBANKS, AK 99709-5129 FAIRBANKS N. STAR COUNTY	4/1984 - 4/1984	

Census Data for Geographical Region
Median Head of Household Age: 35

Median Income: $94,727
Median Home Value: $247,877
Median Education: 13 years
Household Members

None Listed
Other Associates
None Listed

33: PO BOX 142 OURAY, CO 81427-0142

Address	**Dates**	**Phone**
PO BOX 142 OURAY, CO 81427-0142 OURAY COUNTY		

Census Data for Geographical Region
Median Head of Household Age: 45
Median Income: $64,296
Median Home Value: $372,917
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

34: 790 OAK ST APT OURAY, CO 81427

Address	**Dates**	**Phone**
790 OAK ST APT OURAY, CO 81427 OURAY COUNTY		(970) 325-4418

Census Data for Geographical Region
Median Head of Household Age: 47
Median Income: $64,886
Median Home Value: $396,721
Median Education: 14 years
Household Members
CLARK, JACQUELINE RUTH
Other Associates
None Listed

35: 950 W CAMERON AVE APT 108 KELLOGG, ID 83837-2029

Address	**Dates**	**Phone**
950 W CAMERON AVE APT 108 KELLOGG, ID 83837-2029 SHOSHONE COUNTY		

Census Data for Geographical Region
Median Head of Household Age: 47
Median Income: $35,918
Median Home Value: $120,000
Median Education: 12 years
Household Members
None Listed
Other Associates
None Listed

Voter Registrations - 12 records found

1: Colorado Voter Registration

Registrant Information

Name: CLARK, JACK E
Residential Address: 3815 CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information

Registration Date: 9/29/2004
Last Vote Date: 11/5/2013
Party Affiliation: NONE DECLARED
Active Status: ACTIVE
Status: VOTE BY MAIL

2: Colorado Voter Registration

Registrant Information

Name: CLARK, JACK E
Residential Address: 3815 CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information

Registration Date: 9/29/2004
Last Vote Date: 11/6/2012

3: Colorado Voter Registration

Registrant Information

Name: CLARK, JACK E
Residential Address: 3815 CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
Home Phone: None Listed
SSN: 524-58-XXXX
Date of Birth: 9/1948

Voter Information

Registration Date: 9/29/2004
Last Vote Date: 11/4/2014
Active Status: ACTIVE

4: Colorado Voter Registration

Registrant Information

Name: CLARK, JACK E
Residential Address: 3815CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information

Registration Date: 9/29/2004

Last Vote Date: 11/4/2014
Party Affiliation: NONE DECLARED
Active Status: ACTIVE

5: Colorado Voter Registration

Registrant Information

Name: CLARK, JACK E
Residential Address: 3815 CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information

Registration Date: 9/29/2004
Last Vote Date: 11/8/2016
Party Affiliation: NONE DECLARED
Active Status: ACTIVE

6: Colorado Voter Registration

Registrant Information

Name: CLARK, JACK E
Residential Address: 3815 COUNTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information

Registration Date: 9/29/2004
Last Vote Date: 11/1/2011
Active Status: ACTIVE

7: Colorado Voter Registration

Registrant Information

Name: CLARK, JACK E
Residential Address: 3815 COUNTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information

Registration Date: 9/29/2004
Last Vote Date: 11/2/2010
Party Affiliation: NONE DECLARED
Active Status: ACTIVE
Status: VOTED EARLY

8: Colorado Voter Registration

Registrant Information

Name: CLARK, JACK E
Residential Address: 3815 COUNTY RD 2
SILVERTON, CO 81433

SAN JUAN COUNTY
SSN: 524-58-XXXX

Date of Birth: 9/1948
Gender: Male

Voter Information
Registration Date: 9/29/2004
Active Status: ACTIVE

9: Colorado Voter Registration

Registrant Information
Name: CLARK, JACK E
Residential Address: 3815 COUNTY ROAD 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information
Registration Date: 9/29/2004
Active Status: ACTIVE

10: Colorado Voter Registration

Registrant Information
Name: CLARK, JACK E
Residential Address: 3815 COUNTY ROAD 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information
Registration Date: 9/29/2004
Active Status: ACTIVE

11: Colorado Voter Registration

Registrant Information
Name: CLARK, JACK E JR
Residential Address: 00507 SECOND ST
OURAY, CO 81427
OURAY COUNTY
Home Phone: (970) 325-4442
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information
Registration Date: 7/14/1988
Party Affiliation: REPUBLICAN
Active Status: INACTIVE

12: Colorado Voter Registration

Registrant Information
Name: CLARK, JACK E JR
Residential Address: 507 SECOND ST
OURAY, CO 81427

OURAY COUNTY
Home Phone: (970) 325-4442
SSN: 524-58-XXXX
Date of Birth: 9/1948
Gender: Male

Voter Information

Registration Date: 7/14/1988
Party Affiliation: REPUBLICAN

Driver Licenses - 3 records found

1: Colorado Driver License

Driver Information

Name: CLARK, JACK EUGENE JR
Address: PO 142 425 7TH ST
OURAY, CO 81427-0142
OURAY COUNTY
Data source: Governmental: CO

Personal Information

SSN: 524-58-XXXX
DOB: 1948
Gender: Male
Height: 5'10"
Weight: 175 lbs.

Additional Driver Information

DOB: 1948
Gender: Male
Height: 5'10"
Weight: 175 lbs.

2: Arizona Driver License

Driver Information

Name: CLARK, JACK E
Address: 209 S BISBEE AVE APT 8
WILLCOX, AZ 85643-2406
COCHISE COUNTY
Data source: Non-Governmental: AZ

Personal Information

SSN: 524-58-XXXX
DOB: 09/1948

Additional Driver Information

DOB: 09/1948

3: Idaho Driver License

Driver Information

Name: CLARK, JACK E JR
Address: 950 W CAMERON AVE APT 108
KELLOGG, ID 83837-2029
SHOSHONE COUNTY
Data source: Non-Governmental: ID

Personal Information

SSN: 524-58-XXXX

License Information

License Type: NON-OPERATOR - ID ONLY
License Class: Non-operator - ID only

Additional Driver Information

Professional Licenses - 3 records found

1: Professional License

Licensee Information

Name: CLARK, JACK
SSN: 524-58-XXXX
Address: PO BOX 767 SILVERTON, CO 81433-0767
County: SAN JUAN

License Information

Profession or Board: MASTER PLUMBER
License Type: MASTER PLUMBER
License Number: 179899
Issue Date: 07/12/1993
Expiration Date: 08/31/2009
Last Renewal Date: 07/23/2007
Status: ACTIVE
State: Colorado

2: Professional License

Licensee Information

Name: CLARK, JACK
SSN: 524-58-XXXX
Address: PO BOX F OURAY, CO 81427-0686
County: OURAY
Phone: (970) 325-0112

License Information

Profession or Board: EXAMINING BOARD OF PLUMBERS
License Type: MASTER PLUMBER
License Number: MP-179899
Issue Date: 07/12/1993
Expiration Date: 08/31/2005
Last Renewal Date: 09/01/2003
Status: ACTIVE

State: Colorado

3: Professional License

Licensee Information

Name: CLARK, JACK
SSN: 524-58-XXXX
Address: PO BOX F OURAY, CO 81427-0686
County: OURAY
Phone: (970) 325-4418

License Information

Profession or Board: EXAMINING BOARD OF PLUMBERS
License Type: MASTER PLUMBER
License Number: MP-179899
Issue Date: 07/12/1993
Expiration Date: 08/31/2003
Last Renewal Date: 09/01/2001
Status: ACTIVE

State: Colorado

Health Care Providers - 0 records found
Health Care Sanctions - 0 records found
Pilot Licenses - 0 records found
Sport Licenses - 0 records found
Real Property - 11 records found

1: Deed Record for OURAY County

Buyer Information

Name: CLARK , JACK E
Address: PO BOX F OURAY, CO 81427-0686
County/FIPS: OURAY

Seller Information

Name: OURAY TRAIL GROUP
Address: 212 9TH AVE OURAY, CO 81427
County/FIPS: OURAY

Property Information

Data Source: B

Legal Information

Contract Date: 01/20/2016
Recording Date: 01/26/2016
Document Number: 215586
Document Type: BARGAIN AND SALE DEED

Mortgage Information

Loan Type: THIS CODE IS USED ONLY FOR BKFS LEGACY
Title Company: NONE AVAILABLE

2: Assessment Record for MARICOPA County, AZ

Owner Information

Name: CLARK JACK & BARBARA
Address: 912 N SHANNON CIR MESA, AZ 85205-5826
County/FIPS: MARICOPA

Property Information

Address: 912 N SHANNON CIR MESA, AZ 85205-5826
County/FIPS: MARICOPA
Data Source: B

Legal Information

Assessor's Parcel Number: 141-78-747
Recording Date: 05/03/1994

Assessment Information

Assessed Value: $20130
Market Land Value: $40200
Market Improvement Value: $161100
Total Market Value: $201300

3: Assessment Record for OURAY County, CO

Owner Information

Name: CLARK JACK E SR
Address: PO BOX F OURAY, CO 81427-0686
County/FIPS: OURAY

Property Information

Data Source: B

Legal Information

Assessor's Parcel Number: 456735100001
Recording Date: 10/21/1988
Book/Page: 212/670

Sale Information

Sale Price: $13000

Assessment Information

Assessed Value: $2250
Market Land Value: $7750
Total Market Value: $7750

4: Assessment Record for OURAY County, CO

Owner Information

Name: CLARK JACK E JR
Name: CLARK BARBARA J
Address: PO BOX 767 SILVERTON, CO 81433-0767
County/FIPS: SAN JUAN

Property Information

Data Source: B

Legal Information

Assessor's Parcel Number: 477701200004
Recording Date: 08/19/1998

Sale Information

Sale Price: $13000

Assessment Information

Assessed Value: $4750
Market Land Value: $16380
Total Market Value: $16380

5: Assessment Record for OURAY County, CO

Owner Information

Name: CLARK JACK E SR
Address: PO BOX F OURAY, CO 81427-0686
County/FIPS: OURAY

Property Information

Data Source: B

Legal Information

Assessor's Parcel Number: 477701200003
Recording Date: 06/03/1991
Book/Page: 217/488

Sale Information

Sale Price: $39700

Assessment Information

Assessed Value: $1510
Market Land Value: $5190
Total Market Value: $5190

6: Assessment Record for OURAY County, CO

Owner Information

Name: CLARK JACK E

Name: CLARK JACQUELINE

Address: PO BOX F OURAY, CO 81427-0686
County/FIPS: OURAY

Property Information

Data Source: B

Legal Information

Assessor's Parcel Number: 451531200006
Recording Date: 08/08/2003

Assessment Information

Assessed Value: $30
Market Land Value: $120
Total Market Value: $120

7: Deed Record for SAN JUAN County

Buyer Information

Name: CLARK , JACK
Name: CLARK , BARBARA
Address: 3815 COUNTY RD 2 SILVERTON, CO 81433
County/FIPS: SAN JUAN

Seller Information

Name: BUFFALO BOY MINING CO
Address: 1600 N OAK ST APT 1225 ARLINGTON, VA 22209-2767
County/FIPS: ARLINGTON

Property Information

Data Source: B

Legal Information

Contract Date: 08/01/2014
Recording Date: 08/18/2014
Document Number: 149647
Document Type: DEED

Sale Information

Sale Price: $10000

Mortgage Information

Loan Type: THIS CODE IS USED ONLY FOR BKFS LEGACY
Title Company: NONE AVAILABLE

8: Assessment Record for SAN JUAN County, CO

Owner Information

Name: CLARK JACK E & BARBARA J
Address: PO BOX 767 SILVERTON, CO 81433-0767
County/FIPS: SAN JUAN

Property Information

Address: 3815 CR 2 ANIMAS MNG DIST
Data Source: B

Legal Information

Assessor's Parcel Number: 47730310050022
Recording Date: 03/16/2004

Assessment Information

Assessed Value: $147827
Market Land Value: $297076

Market Improvement Value: $212672
Total Market Value: $509748

9: Mortgage Record for SAN JUAN County

Borrower Information
Name: CLARK JR , JACK E
Name: CLARK , BARBARA J

Property Information
Address: 3815 COUNTY RD 2 SILVERTON, CO 81433
County/FIPS: SAN JUAN
Data Source: B

Legal Information
Recording Date: 09/29/2009
Document Number: 147118

Lender Information
Name: THE CITIZENS STATE BANK OF OURAY

Mortgage Information
Loan Amount: $350,000
Loan Type: UNKNOWN

10: Assessment Record for SHASTA County, CA

Owner Information
Name: CLARK JACK JR
Address: PO BOX 767 SILVERTON, CO 81433-0767
County/FIPS: SAN JUAN

Property Information
Data Source: B

Legal Information
Assessor's Parcel Number: 860-001-344

Assessment Information
Assessed Value: $31420

11: Deed Record for MARICOPA County

Buyer Information
Name: CLARK, JACK
Name: CLARK, BARBARA
Address: 912 N SHANNON CIR MESA, AZ 85205-5826
County/FIPS: MARICOPA

Seller Information
Name: CORRAL, ERNEST C
Name: CORRAL, KIM M

Property Information
Address: 912 N SHANNON CIR MESA, AZ 85205-5826
County/FIPS: MARICOPA
Data Source: B

Lender Information
Name: ERNEST C CORRAL

Legal Information
Assessor's Parcel Number: 141-78-747
Contract Date: 04/29/1994
Recording Date: 05/03/1994

Document Number: 94-0358825
Document Type: JOINT TENANCY DEED

Sale Information

Sale Price: $120000

Mortgage Information

Loan Amount: $60
Loan Type: ASSUMPTION
Title Company: CHICAGO TITLE INSURANCE CO

Motor Vehicle Registrations - 44 records found

1: CO MVR

Registrant Information

Registrant: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 3/13/2012
Registration Date: 9/20/2016
Registration Expiration Date: 9/30/2017

Vehicle Information

VIN: 05A88671C12512549
Class: UNKNOWN
Model Year: 1971
Body Style: PICKUP
Secondary Colo: Camouflage

Plate Information

License Plate Type: Private
Previous Plate Number: 185THA
Previous Plate State: CO
License Plate Number: 185THA
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

2: CO MVR

Vehicle Information

VIN: 05A88671C12512549
Class: UNKNOWN
Model Year: 1971
Body Style: PICKUP
Secondary Colo: Camouflage

Owner Information

Name: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E015918
Title Transfer Date: 3/13/2012
Title Issue Date: 3/13/2012

Source Information

Data Source: GOVERNMENTAL

3: CO MVR

Registrant Information

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 4/5/2012
Registration Date: 9/13/2016
Registration Expiration Date: 9/30/2017

Vehicle Information

VIN: 1D61003283C0
Class: UNKNOWN
Model Year: 1998
Make: HOMEMADE
Series: FLA
Body Style: TILT TANDEM

Plate Information

License Plate Type: Trailer
Previous Plate Number: 220YJX
Previous Plate State: CO
License Plate Number: 220YJX
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

4: CO MVR

Vehicle Information

VIN: 1D61003283C0
Class: UNKNOWN
Model Year: 1998
Make: HOMEMADE
Series: FLA
Body Style: TILT TANDEM

Owner Information

Name: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E015937
Title Transfer Date: 4/5/2012
Title Issue Date: 4/5/2012

Source Information

Data Source: GOVERNMENTAL

5: CO MVR

Registrant Information

Registrant: CLARK, JACK EUGENE

DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 7/22/2004
Registration Date: 9/13/2016
Registration Expiration Date: 9/30/2017

Vehicle Information

VIN: VBKEXL2352M522286
Class: MOTORCYCLE
Model Year: 2002
Make: KTM
Model: 380
Series: EXC
Body Style: Enduro

Plate Information

License Plate Type: Motorcycle
Previous Plate Number: 506JJO
Previous Plate State: CO
License Plate Number: 506JJO
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

6: CO MVR

Vehicle Information

VIN: VBKEXL2352M522286
Class: MOTORCYCLE
Model Year: 2002
Make: KTM
Model: 380
Series: EXC
Body Style: Enduro

Owner Information

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E013873
Title Transfer Date: 7/22/2004
Title Issue Date: 7/22/2004

Source Information

Data Source: GOVERNMENTAL

7: CO MVR

Registrant Information

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 7/2/2014

Registration Date: 9/13/2016
Registration Expiration Date: 9/30/2017

Vehicle Information

VIN: WB10597028ZN47884
Class: MOTORCYCLE
Model Year: 2008
Make: BMW
Model: K1200GT
Series: BASE
Body Style: Road/Street
Color: Blue

Plate Information

License Plate Type: Motorcycle
Previous Plate Number: 782YKC
Previous Plate State: CO
License Plate Number: 782YKC
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

8: CO MVR

Vehicle Information

VIN: WB10597028ZN47884
Class: MOTORCYCLE
Model Year: 2008
Make: BMW
Model: K1200GT
Series: BASE
Body Style: Road/Street
Color: Blue

Owner Information

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E016016
Title Transfer Date: 7/23/2012
Title Issue Date: 7/23/2012

Source Information

Data Source: GOVERNMENTAL

9: CO MVR

Registrant Information

Registrant 1

Registrant: CLARK, BARBARA J
DOB: 8/1950
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registrant 2

Registrant: CLARK, JACK E JR
DOB: 9/1948

Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 5/24/2005
Registration Date: 9/13/2016
Registration Expiration Date: 9/30/2017

Vehicle Information

VIN: XTB3764A811206117
Class: MOTORCYCLE
Model Year: 2001
Make: URAL
Model: URAL TOURIST (W/SIDECAR)
Series: BASE
Body Style: SIDECAR

Plate Information

License Plate Type: Motorcycle
Previous Plate Number: 518JJO
Previous Plate State: CO
License Plate Number: 518JJO
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

10: CO MVR

Vehicle Information

VIN: XTB3764A811206117
Class: MOTORCYCLE
Model Year: 2001
Make: URAL
Model: URAL TOURIST (W/SIDECAR)
Series: BASE
Body Style: SIDECAR

Owner Information

Owner 1

Name: CLARK, BARBARA J
DOB: 8/1950
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Owner 2

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E014127
Title Transfer Date: 5/24/2005
Title Issue Date: 5/24/2005

Source Information

Data Source: GOVERNMENTAL

11: CO MVR

Registrant Information

Registrant 1

Registrant: CLARK, BARBARA J
DOB: 8/1950
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registrant 2

Registrant: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 7/21/2016
Registration Date: 7/21/2016
Registration Expiration Date: 7/31/2017

Vehicle Information

VIN: 1B7JM26Z8KS125538
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 1989
Make: Dodge
Model: W-250
Series: CUSTOM~LE
Body Style: Pickup

Plate Information

License Plate Type: Private
Previous Plate Number: 186THA
Previous Plate State: CO
License Plate Number: 186THA
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

12: CO MVR

Vehicle Information

VIN: 1B7JM26Z8KS125538
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 1989
Make: Dodge
Model: W-250
Series: CUSTOM~LE
Body Style: Pickup

Owner Information

Owner 1

Name: CLARK, BARBARA
DOB: 8/1950
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Owner 2

Name: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E015182
Title Transfer Date: 2/2/2009
Title Issue Date: 2/2/2009

Source Information

Data Source: GOVERNMENTAL

13: CO MVR

Registrant Information

Registrant: CLARK, JACK JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 8/3/2005
Registration Date: 7/21/2016
Registration Expiration Date: 7/31/2017

Vehicle Information

VIN: 1GCHK34N7RE258388
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 1994
Make: Chevrolet
Model: K3500
Series: CHEYENNE~SILVERADO
Body Style: Pickup
Weight: 8000

Plate Information

License Plate Type: Private
Previous Plate Number: 242JUN
Previous Plate State: CO
License Plate Number: 242JUN
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

14: CO MVR

Vehicle Information

VIN: 1GCHK34N7RE258388
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 1994
Make: Chevrolet
Model: K3500
Series: CHEYENNE~SILVERADO
Body Style: Pickup
Weight: 8000

Owner Information

Name: CLARK, JACK JR

DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E013893
Title Transfer Date: 8/9/2004
Title Issue Date: 8/9/2004

Source Information

Data Source: GOVERNMENTAL

15: CO MVR

Registrant Information

Registrant: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 7/2/2014
Registration Date: 6/20/2016
Registration Expiration Date: 6/30/2017

Vehicle Information

VIN: 1B9FS2020RA316319
Class: UNKNOWN
Model Year: 1994
Body Style: TILT TANDEM

Plate Information

License Plate Type: Trailer
Previous Plate Number: 555RBH
Previous Plate State: CO
License Plate Number: 555RBH
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

16: CO MVR

Vehicle Information

VIN: 1B9FS2020RA316319
Class: UNKNOWN
Model Year: 1994
Body Style: TILT TANDEM

Owner Information

Name: CLARK, JACK JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E015260
Title Transfer Date: 6/26/2009
Title Issue Date: 6/26/2009

Source Information

Data Source: GOVERNMENTAL

17: CO MVR

Registrant Information

Registrant: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 3/6/2013
Registration Date: 2/18/2016
Registration Expiration Date: 3/31/2017

Vehicle Information

VIN: 1GNKVJED3CJ358601
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 2012
Make: Chevrolet
Model: Traverse
Series: 2LT
Body Style: 4 Dr Wagon Sport Utility

Plate Information

License Plate Type: Private
Previous Plate Number: 028WIA
Previous Plate State: CO
License Plate Number: 028WIA
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

18: CO MVR

Vehicle Information

VIN: 1GNKVJED3CJ358601
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 2012
Make: Chevrolet
Model: Traverse
Series: 2LT
Body Style: 4 Dr Wagon Sport Utility

Owner Information

Name: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Lienholder Information

Name: ALLOY BK.
Address: PO BOX 8125
COCKEYSVILLE, MD 21030-8125
BALTIMORE COUNTY

Title Information

Title Number: 55E016138
Title Transfer Date: 2/4/2013
Title Issue Date: 2/4/2013

Source Information

Data Source: GOVERNMENTAL

19: CO MVR

Registrant Information

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 12/4/2012
Registration Date: 2/3/2016
Registration Expiration Date: 2/28/2017

Vehicle Information

VIN: 1WF200E17D4082321
Class: UNKNOWN
Model Year: 2013
Make: Wells Cargo
Body Style: Utility

Plate Information

License Plate Type: Trailer
Previous Plate Number: 856UGM
Previous Plate State: CO
License Plate Number: 856UGM
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

20: CO MVR

Vehicle Information

VIN: 1WF200E17D4082321
Class: UNKNOWN
Model Year: 2013
Make: Wells Cargo
Body Style: Utility

Owner Information

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E016113
Title Transfer Date: 12/4/2012
Title Issue Date: 12/4/2012

Source Information

Data Source: GOVERNMENTAL

21: CO MVR

Registrant Information

Registrant: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767

SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 12/6/2006
Registration Date: 12/30/2015
Registration Expiration Date: 1/31/2017

Vehicle Information

VIN: 1GBHK24226E129443

Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 2006
Make: Chevrolet
Model: Silverado
Series: K2500HD
Body Style: Pickup

Plate Information

License Plate Type: Private
Previous Plate Number: 757NWK
Previous Plate State: CO
License Plate Number: 757NWK
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

22: CO MVR

Vehicle Information

VIN: 1GBHK24226E129443
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 2006
Make: Chevrolet
Model: Silverado
Series: K2500HD
Body Style: Pickup

Owner Information

Name: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E014596
Title Transfer Date: 12/6/2006
Title Issue Date: 12/6/2006

Source Information

Data Source: GOVERNMENTAL

23: CO MVR

Registrant Information

Registrant: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 7/27/2015
Registration Date: 7/27/2015
Registration Expiration Date: 7/31/2016

Vehicle Information

VIN: WB10432A91ZB52092
Class: MOTORCYCLE
Model Year: 2001
Make: BMW
Model: R1100S
Series: BASE
Body Style: Road/Street

Plate Information

License Plate Type: Motorcycle
Previous Plate Number: 536JJO
Previous Plate State: CO
License Plate Number: 536JJO
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

24: CO MVR

Vehicle Information

VIN: WB10432A91ZB52092
Class: MOTORCYCLE
Model Year: 2001
Make: BMW
Model: R1100S
Series: BASE
Body Style: Road/Street

Owner Information

Name: CLARK, JACK JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E014432
Title Transfer Date: 6/12/2006
Title Issue Date: 6/12/2006

Source Information

Data Source: GOVERNMENTAL

25: CO MVR

Registrant Information

Registrant 1

Registrant: CLARK, BARBARA
DOB: 8/1950
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registrant 2

Registrant: CLARK, JACK JR
DOB: 9/1948
Address: PO BOX 767

SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 6/24/2008
Registration Date: 2/5/2014
Registration Expiration Date: 3/31/2015

Vehicle Information

VIN: 4X4TSAP292A015964
Class: UNKNOWN
Model Year: 2002
Body Style: TILT TANDEM

Plate Information

Previous Plate Number: 142PPB
Previous Plate State: CO
License Plate Number: 142PPB
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

26: CO MVR

Vehicle Information

VIN: 4X4TSAP292A015964
Class: UNKNOWN
Model Year: 2002
Body Style: TILT TANDEM

Owner Information

Owner 1

Name: CLARK, BARBARA
DOB: 8/1950
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Owner 2

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E015038
Title Transfer Date: 6/24/2008
Title Issue Date: 6/24/2008

Source Information

Data Source: GOVERNMENTAL

27: CO MVR

Registrant Information

Registrant 1

Registrant: CLARK, BARBARA
DOB: 8/1950
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registrant 2

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 5/31/2007
Registration Date: 1/3/2014
Registration Expiration Date: 1/31/2015

Vehicle Information

VIN: 4P2WB26243U037917
Class: UNKNOWN
Model Year: 2003
Make: OPEL
Model: UT2
Series: BOX
Body Style: TILT TANDEM

Plate Information

License Plate Type: Trailer
Previous Plate Number: 774HHI
Previous Plate State: CO
License Plate Number: 774HHI
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

28: CO MVR

Vehicle Information

VIN: 4P2WB26243U037917
Class: UNKNOWN
Model Year: 2003
Make: OPEL
Model: UT2
Series: BOX
Body Style: TILT TANDEM

Owner Information

Owner 1

Name: CLARK, BARBARA
DOB: 8/1950
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Owner 2

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E013704
Title Transfer Date: 1/22/2004
Title Issue Date: 1/22/2004

Source Information

Data Source: GOVERNMENTAL

29: CO MVR

Registrant Information

Registrant: CLARK, JACK E JR
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 1/20/2010
Registration Date: 1/3/2014
Registration Expiration Date: 1/31/2015

Vehicle Information

VIN: 1GCGK24U9YE189912
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 2000
Make: Chevrolet
Model: Silverado
Series: K2500
Body Style: Pickup

Plate Information

License Plate Type: Private
Previous Plate Number: 689IUD
Previous Plate State: CO
License Plate Number: 689IUD
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

30: CO MVR

Vehicle Information

VIN: 1GCGK24U9YE189912
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 2000
Make: Chevrolet
Model: Silverado
Series: K2500
Body Style: Pickup

Owner Information

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: 3815 CTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY

Title Information

Title Number: 55E013647
Title Transfer Date: 10/14/2003
Title Issue Date: 10/14/2003

Source Information

Data Source: GOVERNMENTAL

31: CO MVR

Registrant Information

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 4/27/2012
Registration Date: 4/27/2012
Registration Expiration Date: 4/30/2013

Vehicle Information

VIN: 3GNGK26G76G124268
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 2006
Make: Chevrolet
Model: K2500
Series: SUBURBAN
Body Style: 4 Dr Wagon Sport Utility

Plate Information

License Plate Type: Private
Previous Plate Number: V1L0816
Previous Plate State: CO
License Plate Number: 028WIA
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

32: CO MVR

Vehicle Information

VIN: 3GNGK26G76G124268
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 2006
Make: Chevrolet
Model: K2500
Series: SUBURBAN
Body Style: 4 Dr Wagon Sport Utility

Owner Information

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Lienholder Information

Name: WELLS FARGO DLR. SERVICE
Address: PO BOX 997517
SACRAMENTO, CA 95899-7517
SACRAMENTO COUNTY

Title Information

Title Number: 55E015910
Title Transfer Date: 3/5/2012
Title Issue Date: 3/5/2012

Source Information

Data Source: GOVERNMENTAL

33: CO MVR

Registrant Information

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 5/24/2005
Registration Date: 5/24/2005
Registration Expiration Date: 5/31/2006

Vehicle Information

VIN: 22578
Class: UNKNOWN
Model Year: 1952
Body Style: JEEP

Plate Information

License Plate Type: Private
Previous Plate Number: MCY545597
Previous Plate State: IL
License Plate Number: 777LRE
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

34: CO MVR

Vehicle Information

VIN: 22578
Class: UNKNOWN
Model Year: 1952
Body Style: JEEP

Owner Information

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Title Information

Title Number: 55E014128
Title Transfer Date: 5/24/2005
Title Issue Date: 5/24/2005

Source Information

Data Source: GOVERNMENTAL

35: ID MVR

Registrant Information

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: PO BOX 767
SILVERTON, CO 81433-0767
SAN JUAN COUNTY

Registration Information

Original Registration Date: 12/6/2004
Registration Date: 12/6/2004

Registration Expiration Date: 12/31/2005

Vehicle Information

VIN: 196K11104VATP0369
Class: TRAILER
Model Year: 1997
Make: TRAC PAC
Model: TRAILER HEAVY HAUL
Series: BASE MODEL
Body Style: UTILITY
Color: Blue

Plate Information

License Plate Type: Trailer
Previous Plate Number: 850UPJ
Previous Plate State: ID

License Plate Number: 850UPJ
Plate State: ID

Source Information

Data Source: GOVERNMENTAL

36: AZ MVR

Registrant Information

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: 912 N SHANNON CIR
MESA, AZ 85205-5826
MARICOPA COUNTY

Registration Information

Original Registration Date: 12/23/2002
Registration Date: 12/23/2002
Registration Expiration Date: 12/31/2004
Decal Number: M005231

Vehicle Information

VIN: 225788
Class: UNKNOWN
Model Year: 1980
Make: TRIUMPH
Model: FELPS
Body Style: FLAT-BED OR PLATFORM
Weight: 1600

Plate Information

License Plate Type: Antique
Previous Plate Number: H44399
Previous Plate State: ME
License Plate Number: HVCGL9
Plate State: AZ

Source Information

Data Source: GOVERNMENTAL

37: AZ MVR

Vehicle Information

VIN: 225788
Class: UNKNOWN
Model Year: 1980

Make: TRIUMPH
Model: FELPS
Body Style: FLAT-BED OR PLATFORM
Weight: 1600

Owner Information

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: 912 N SHANNON CIR
MESA, AZ 85205-5826
MARICOPA COUNTY

Title Information

Title Number: 132M002357017
Title Transfer Date: 12/23/2002
Title Issue Date: 12/23/2002

Source Information

Data Source: GOVERNMENTAL

38: AZ MVR

Registrant Information

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: 912 N SHANNON CIR
MESA, AZ 85205-5826
MARICOPA COUNTY

Registration Information

Original Registration Date: 7/2/2002
Registration Date: 7/2/2002
Registration Expiration Date: 12/31/2002

Vehicle Information

VIN: 9DWWT7H37KC004908
Class: HEAVY TRUCK
Model Year: 1989
Make: VOLKSWAGEN
Model: TRUCK
Series: BASE
Body Style: TRUCK T
Weight: 20000

Plate Information

Previous Plate Number: CA22478
Previous Plate State: AZ
Plate State: AZ

Source Information

Data Source: GOVERNMENTAL

39: AZ MVR

Vehicle Information

VIN: 9DWWT7H37KC004908
Class: HEAVY TRUCK
Model Year: 1989
Make: VOLKSWAGEN
Model: TRUCK
Series: BASE
Body Style: TRUCK T

Weight: 20000

Owner Information

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: 912 N SHANNON CIR
MESA, AZ 85205-5826
MARICOPA COUNTY

Title Information

Title Number: AL00002183004
Title Transfer Date: 7/2/2002
Title Issue Date: 7/2/2002

Source Information

Data Source: GOVERNMENTAL

40: AZ MVR

Registrant Information

Registrant 1

Registrant: CLARK, JACK E JR
DOB: 9/1948
Address: 912 N SHANNON CIR
MESA, AZ 85205-5826
MARICOPA COUNTY

Registrant 2

Registrant: CLARK, JACK EUGENE
DOB: 9/1948
Address: 209 S BISBEE AVE APT 8
WILLCOX, AZ 85643-2406
COCHISE COUNTY

Registration Information

Original Registration Date: 4/26/1999
Registration Date: 4/26/1999
Registration Expiration Date: 4/26/2000
Decal Number: T000000

Vehicle Information

VIN: JKBDXBAC9XA015754
Class: MOTORCYCLE
Model Year: 1999
Make: Kawasaki
Model: KDX220-A
Series: BASE
Body Style: Enduro

Plate Information

License Plate Number: EK07RV
Plate State: AZ

Source Information

Data Source: GOVERNMENTAL

41: AZ MVR

Vehicle Information

VIN: JKBDXBAC9XA015754
Class: MOTORCYCLE
Model Year: 1999
Make: Kawasaki
Model: KDX220-A

Series: BASE
Body Style: Enduro

Owner Information

Owner 1

Name: CLARK, JACK E JR
DOB: 9/1948
Address: 912 N SHANNON CIR
MESA, AZ 85205-5826
MARICOPA COUNTY

Owner 2

Name: CLARK, JACK EUGENE
DOB: 9/1948
Address: 209 S BISBEE AVE APT 8
WILLCOX, AZ 85643-2406
COCHISE COUNTY

Lienholder Information

Name: HRSI FOR CLOSED END LOANS
Address: PO BOX 4445
CAROL STREAM, IL 60197-4445
DUPAGE COUNTY

Title Information

Title Number: MC7199B116120
Title Transfer Date: 4/27/1999
Title Issue Date: 4/27/1999

Source Information

Data Source: GOVERNMENTAL

42: AZ MVR

Registrant Information

Registrant: CLARK, JACK E
DOB: 9/1948
Address: 912 N SHANNON CIR
MESA, AZ 85205-5826
MARICOPA COUNTY

Registration Information

Original Registration Date: 5/22/1996
Registration Date: 5/22/1996
Registration Expiration Date: 4/30/1997

Vehicle Information

VIN: 1G4AC37X1DW404472
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 1983
Make: Buick
Model: Skylark
Series: LIMITED
Body Style: Coupe

Plate Information

License Plate Number: KXY042
Plate State: AZ

Source Information

Data Source: GOVERNMENTAL

43: ID MVR

Vehicle Information

VIN: 9817861
Class: UNKNOWN
Model Year: 1998
Series: SNO

Owner Information

Name: CLARK, JACK E
DOB: 9/1948
Address: 950 W CAMERON AVE
KELLOGG, ID 83837-2029
SHOSHONE COUNTY

Lienholder Information

Name: FIRST SECURITY BANK
Address: PO BOX 7746
BOISE, ID 83707-1746
ADA COUNTY

Title Information

Title Transfer Date: 1/17/1998
Title Issue Date: 1/17/1998

Source Information

Data Source: GOVERNMENTAL

44: ID MVR

Vehicle Information

VIN: 9861979
Class: UNKNOWN
Model Year: 1998
Series: SNO

Owner Information

Owner 1

Name: CLARK, BARBARA
DOB: 8/1950
Address: 950 W CAMERON AVE
KELLOGG, ID 83837-2029
SHOSHONE COUNTY

Owner 2

Name: CLARK, JACK E
DOB: 9/1948
Address: 950 W CAMERON AVE
KELLOGG, ID 83837-2029
SHOSHONE COUNTY

Lienholder Information

Name: FIRST SECURITY BANK
Address: PO BOX 7746
BOISE, ID 83707-1746
ADA COUNTY

Title Information

Title Transfer Date: 1/17/1998
Title Issue Date: 1/17/1998

Source Information

Data Source: GOVERNMENTAL

Boats - 0 records found

Aircraft - 1 records found

1: FAA US Aircraft Registrations

Tail Number: 259

Status: Active
Date First: 12/9/2016
Date Last: 12/9/2016
Last Action Date: 11/9/2016
Certification Date: 4/9/2001
Manufacturer: CESSNA
Model/Series: T337G
Type: Fixed wing multi engine
Weight: Up to 12,499
Number of Seats: 6
Category: Land
Certification: Not Amateur
Cruising Speed: 142
Number of Engines: 2
Engine Type: Reciprocating
Engine Manufacturer: CONT MOTOR
Engine Model: IO-360 SER
Engine Horsepower: 300
Engine Fuel Consumption: 000000

Bankruptcy Information - 0 records found

Judgments/Liens - 0 records found

UCC Liens - 2 records found

1:CO UCC LIEN FILING

Debtor Information

Debtor 1

Name: CLARK, JACK EUGENE JR
SSN: 524-58-XXXX
Address: PO BOX 767
SILVERTON, CO 81433-0767

Debtor 2

Name: ANIMAS TOWING & RECOVERY LLC
Address: PO BOX 767
SILVERTON, CO 81433-0767

Debtor 3

Name: WILLIAMS, RONALD FLOYD JR
Address: PO BOX 767
SILVERTON, CO 81433-0767

Secured Party Information

Name: THE CITIZENS STATE BANK OF OURAY
Address: PO BOX A
OURAY, CO 81427-0681

Filing Information

Filing Jurisdiction: COLORADO
Original Filing Number: 2009F075241
Original Filing Date: 9/3/2009
Type: INITIAL FILING
Date: 9/3/2009
Number: 2009F075241

Filing Office Information

Filing Agency: SECRETARY OF STATE/UCC DIVISION
Address: 1560 BROADWAY
DENVER, CO 80202

Collateral Information

Description: 09/03/2009 2009F075241 - EQUIPMENT

2:ID UCC LIEN FILING

Debtor Information

Name: CLARK, JACK E
SSN: 524-58-XXXX
Address: 950 W CAMERON AVE
KELLOGG, ID 83837-2029

Secured Party Information

Name: SPECIALTY SALES & SERV., INC.
Address: 910 W KATHLEEN AVE
COEUR D ALENE, ID 83815

Assignee Information

Name: FIRST SECURITY BANK
Address: PO BOX 7746
BOISE, ID 83707-1746

Filing Information

Filing Jurisdiction: IDAHO
Original Filing Number: B783541
Original Filing Date: 1/29/1998
Type: INITIAL FILING
Date: 1/29/1998
Number: B783541

Filing Office Information

Filing Agency: SECRETARY OF STATE/UCC DIVISION
Address: 700 W JEFFERSON, RM 203
BOISE, ID 83720

Collateral Information

Description: 01/29/1998 B783541 - VEHICLES

Fictitious Businesses - 5 records found

1: Fictitious Businesses

Business Information

Name: SAN JUAN PLUMBING & HEATING
Mailing Address: 3815 COUNTY RD 2
SILVERTON, CO 81433
Jurisdiction: CO
Phone: (970) 387-0226
Type: TRADENAME; INDIVIDUAL
Filing Number: L26502130000
Filing Date: 04/01/2004
Business Description: HVAC (PLUMBING/HEATING/AIR-CON) CONTRACTORS
SIC: 2353

Contact Information

Name: JACK EUGENE CLARK JR
Address: COUNTY 38 RD - 2
CO, SI 81433
Contact Type: CONTACT

2: Fictitious Businesses

Business Information

Name: ANLS TRANSPORTATION
Office Address: HARVARD 45 W ST
CA, GL 91204-3117
Jurisdiction: CA
Phone: 502-0899
Type: DBA
Filing Number: 20071231577

Filing Date: 05/21/2007

Contact Information

Owner 1

Name: JACK CLARK JR
Address: COUNTY RD 38
CO, SI 81433
Contact Type: OWNER

Owner 2

Name: ANTON AIVAZOV
Address: HARVARD 45 W ST
CA, GL 91204-3117
Contact Type: OWNER

3: Fictitious Businesses

Business Information

Name: UNDERGROUND SPECIALTY COMPANY LLC
Office Address: PO BOX 767
CO, SI 81433-0767
Jurisdiction: CO
Type: DBA
Filing Number: 20051380909
Filing Date: 10/13/2005

Contact Information

Name: JACK E. CLARK JR
Address: COUNTY RD 38
CO, SI 81433
Contact Type: OWNER

4: Fictitious Businesses

Business Information

Name: SAN JUAN PLUMBING & HEATING
Office Address: COUNTY RD 38
CO, SI 81433
Jurisdiction: CO
Phone: 387-0226
Type: DBA
Filing Number: L26502130000
Filing Date: 04/01/2004

Contact Information

Name: JACK EUGENE CLARK JR
Address: COUNTY 38 RD - 2
CO, SI 81433
Contact Type: OWNER

5: Fictitious Businesses

Business Information

Name: NORTHWEST RAISE CONSULTING
Office Address: CAMERON 95 W AV APT 108
ID, KE 83837-2029
Mailing Address: 950 W CAMERON AVE APT 108
KELLOGG, ID 83837-2029
Jurisdiction: ID
Phone: None Listed
Filing Date: 05/19/1997
Business Description: CONSULTANTS-BUSINESS NEC
SIC: 874899

Contact Information

Name: JACK CLARK

Address: CAMERON 95 W AV APT 108
ID, KE 83837-2029

Contact Type: CONTACT

Notice Of Defaults - 0 records found

Potential Relatives - 10 records found

1st Degree: 8, 2nd Degree: 2

No.	Full Name	Address/Phone
1.	CLARK, BARBARA J • AKA CLARK, BARBARA E • AKA CLARK, BARBARA J • AKA CLARK, B SSN:523-70-XXXX DOB:8/1950 (Age: 66)	PO BOX 296 SILVERTON, CO 81433-0296 PO BOX 767 SILVERTON, CO 81433-0767 3815 COUNTY ROAD 2 SILVERTON, CO 81433 912 N SHANNON CIR MESA, AZ 85205-5826 (480) 854-2040 9815 COUNTY ROAD 2 SILVERTON, CO 81433
2.	CLARK, JACK E SR • AKA CLARK, JACK EUGENE SR • AKA CLARK, JACK E • AKA CLARK, JACK E • AKA JACK, CLARK • AKA CLARK, JACK • AKA CLARK, JACKIE • AKA CLARK, JACKLE SSN:522-28-XXXX DOB:11/1925 (Age: 91)	100 7TH AVE OURAY, CO 81427 PO BOX F OURAY, CO 81427-0686 PO BOX 296 SILVERTON, CO 81433-0296 PO BOX 79 OURAY, CO 81427-0079 PO OURAY, CO 81427
3.	CLARK, MARCELLA RENAE • AKA CLARK, RENAE • AKA CLARK, MARCELA SSN:574-72-XXXX DOB:9/1968 (Age: 48)	912 N SHANNON CIR APT 4 MESA, AZ 85205-5826 PO BOX 772 SILVERTON, CO 81433-0772 6471 W MONTEBELLO CT FLORENCE, AZ 85132-6788 PO BOX 296 SILVERTON, CO 81433-0296 1780 S BELLAIRE ST STE 828 DENVER, CO 80222-4307
3.A.	LUTHER, DARREN EUGENE • AKA EUGENE, LUTHER DARREN	PO BOX 772 SILVERTON, CO 81433-0772 912 N SHANNON CIR

	DOB:12/1983 (Age: 33)	MESA, AZ 85205-5826 (480) 854-2040 6471 W MONTEBELLO CT FLORENCE, AZ 85132-6788 PO BOX 296 SILVERTON, CO 81433-0296 3815 COUNTY ROAD 2 SILVERTON, CO 81433
4.	CLARK, JACQUELINE RUTH • AKA CLARK, JACKIE SSN:522-34-XXXX DOB:7/1930 (Age: 86)	PO BOX F OURAY, CO 81427-0686 PO BOX 79 OURAY, CO 81427-0079 100 7TH AVE OURAY, CO 81427 PO OURAY, CO 81427 790 OAK ST APT OURAY, CO 81427
5.	CLARK, JARROD EUGENE • AKA CLARK, J • AKA CLARK, JERROD E SSN:524-31-XXXX DOB:12/1967 (Age: 49)	PO BOX 110 OURAY, CO 81427-0110 338 4TH MAIN OURAY, CO 81427 338 4TH MAIN AL OURAY, CO 81427 PO BOX F OURAY, CO 81427-0686 338 MAIN ST OURAY, CO 81427-0110
6.	CLARK, HEATHER LYNN • AKA HAGLUND, HEATHER L • AKA HAGLEUND, HEATHER L • AKA HAULAND, HEATHER L • AKA CLARK, H • AKA HAULUND, HEATHER SSN:454-23-XXXX DOB:9/1971 (Age: 45)	PO BOX 163 OURAY, CO 81427-0163 700 OAK ST 704 OAK OURAY, CO 81427 700 OAK ST OURAY, CO 81427 661 OAK ST OURAY, CO 81427 PO BOX 110 OURAY, CO 81427-0110
7.	WILLIAMS, CLARK LEE	PO BOX 1162 OURAY, CO 81427-1162

• AKA WILLIAMS CLARK, L
• AKA CLARK, WILLIAMS JR
• AKA WILLIAMS, CLARK J
• AKA CLARK, L WILLIAMS

SSN:523-47-XXXX
DOB:10/1967
(Age: 49)

790 OAK ST APT 17E
OURAY, CO 81427

68146 TUMBLEWEED RD
MONTROSE, CO 81403-8680
(970) 240-1165

8791 ALLISON DR APT A
ARVADA, CO 80005-1677

3331 LANDON DR W APT 247
BULLHEAD CITY, AZ 86429-8945
(928) 299-3200

7.A. WILLIAMS, HEIDI ANN

• AKA BLETHEN, HEIDI A
• AKA KAHLE, HEIDI A
• AKA KERSEN, HEIDI A
• AKA WILLIAMS, ANN H
• AKA KAHLE, HIEDI A
• AKA WILLIAMS, HEIDI KAHLE
• AKA KAHLE WILLIAMS, HEIDI
• AKA KAHLE WILLIAMS, HED
• AKA WILLIAMS, HEIDE
• AKA KAHLE, HED
• AKA WILLIAMS, HED
• AKA WILLIAMS, HIEDI

SSN:523-13-XXXX
DOB:6/1974
(Age: 42)

12711 COLORADO BLVD UNIT L1220
THORNTON, CO 80241-2868

8625 GARLAND CT
ARVADA, CO 80005-1251
(303) 420-9333

7071 S KNOLLS WAY
CENTENNIAL, CO 80122-1734

8717 CARR LOOP
ARVADA, CO 80005-1573

PO BOX 1162
OURAY, CO 81427-1162

8. CLARK, CHELSEA L

• AKA FERGUSON, CHELSEA LORAINE
• AKA FURGESON, CHELSEA
• AKA FERGUSON, CHELSEA R
• AKA FERGUSON, CHELSE
• AKA FERGUSN, CHELSEA L

SSN:574-72-XXXX
DOB:4/1974
(Age: 42)

5455 E VIRGINIA AVE
PHOENIX, AZ 85008-1705
(602) 840-6427

601 W PIERSON ST
PHOENIX, AZ 85013-2514

5104 E VAN BUREN ST APT 2214
PHOENIX, AZ 85008-7038
(480) 203-3623

7601 E PINCHOT AVE
SCOTTSDALE, AZ 85251-6514
(480) 268-9995

902 PALM AVE
BRUNSWICK, GA 31523-1547
(912) 554-1590

Business Associates - 2 records found

1: C.W.M. AND ASSOCIATES, INC.

Name: CLARK, JACK JR
Status: PERMANENTLY REVOKED
State: NV
Corporation Number: C16938-2000

Descriptive Status: PERMANENTLY REVOKED
Title: PRESIDENT
Record Type: CURRENT
Record Date: 12/21/2016
Filing Date: 7/1/2009

2: NORTHWEST RAISE CONSULTING

Name: CLARK, JACK
Address: 950 W CAMERON AVE APT 108
KELLOGG, ID 83837-2029
Status: CURRENT
State: ID
Corporation Number: D4632
Descriptive Status: CURRENT
Title: OWNER
Record Type: CURRENT
Record Date: 1/12/2017
Filing Date: 5/20/2002

Person Associates - 4 records found

No.	Full Name	Address	SSN	Phone	DOB
1:	LAFON, MARK A LAFON, MARK ALAN CLARK, MARK A MARK, A MARK, LAFON	PO BOX 82356 FAIRBANKS, AK 99708-2356 PO BOX 80321 FAIRBANKS, AK 99708-0321 1433 BIRCHWOOD DR # DR FAIRBANKS, AK 99709-2632 7021 E EARLL DR UNIT 205 SCOTTSDALE, AZ 85251-6348 4427 CONDOR CT APT 303 FAIRBANKS, AK 99709-3458	574-72-XXXX	(602) 726-7899	1968 9/1967
2:	WILLIAMS, JASON JACK WILLIAMS, JASON WILIAMS, JASON WILLIAM, JASON J WILLIAMS, JASON A	4280 FARM DISTRICT RD FERNLEY, NV 89408-8623 PO BOX F OURAY, CO 81427-0686 1627 MEADOWS AVE FERNLEY, NV 89408-8303 68146 TUMBLEWEED RD MONTROSE, CO 81403-8680 1517 ARIZONA ST MONTROSE, CO 81401-4187	521-61-XXXX	(970) 240-1165 (970) 252-7291	11/1975 1976
3:	WILLIAMS, RONALD FLOYD JR WILLIAMS, RON JR WILLIAMS, RONALD I JR	PO BOX 774 OURAY, CO 81427-0774 68146 TUMBLEWEED RD MONTROSE, CO 81403-8680 PO BOX F	521-61-XXXX	(970) 240-1165	4/1974

		OURAY, CO 81427-0686			
		211 MARGUERITE DR OURAY, CO 81427			
		1517 ARIZONA ST MONTROSE, CO 81401-4187			
4:	LUTHER, DARREN EUGENE EUGENE, LUTHER DARREN	PO BOX 772 SILVERTON, CO 81433-0772	573-95-XXXX	(480) 854-2040	12/1983
		912 N SHANNON CIR MESA, AZ 85205-5826			
		6471 W MONTEBELLO CT FLORENCE, AZ 85132-6788			
		PO BOX 296 SILVERTON, CO 81433-0296			
		3815 COUNTY ROAD 2 SILVERTON, CO 81433			

Neighbors - 5 records found

912 N SHANNON CIR MESA, AZ 85205-5826

Name	Address	Phone
JENNINGS, JAMES H JENNINGS, MARGARET A LOMAN, MICHAEL EDWARD WHITE, MARILYN J	903 N SHANNON CIR MESA, AZ 85205-5826	
LORIA, BILL FRANCIS III LORIA, KELLY ANNE	904 N SHANNON CIR MESA, AZ 85205-5826	(480) 830-8830
CANTER, ELMIRA J CORONA, PHILIP LEWIS JR WILCHER, DALE LUNN	911 N SHANNON CIR MESA, AZ 85205-5826	
BRICE, BILL DEAN BRICE, LOIS JEAN BRICE, PRISCILLA KAREN STOCKMAL, DELORES M STOCKMAL, LEON J THOMPSON, THELMA JEAN	919 N SHANNON CIR MESA, AZ 85205-5826	(602) 396-5150
MARQUEZ, JAMES ESTES MARQUEZ, JESUS MANUE SATTLER, DARLENE H	920 N SHANNON CIR MESA, AZ 85205-5826	

Employment Locator - 20 records found

1:

Company Name: NORTHWEST RAISE CONSULTING
Name: CLARK, JACK
Title: OWNER
SSN: 524-58-XXXX
Confidence: High

2:

Company Name: C.W.M. AND ASSOCIATES, INC.

Name: CLARK, JACK JR
Title: PRESIDENT
SSN: 524-58-XXXX
Confidence: Medium

3:
Company Name: C.W.M. AND ASSOCIATES, INC.
Name: CLARK, JACK JR
Title: PRESIDENT
SSN: 524-58-XXXX
Confidence: Medium

4:
Company Name: C.W.M. AND ASSOCIATES, INC.
Name: CLARK, JACK JR
Title: SECRETARY
SSN: 524-58-XXXX
Confidence: Medium

5:
Company Name: C.W.M. AND ASSOCIATES, INC.
Name: CLARK, JACK JR
Title: SECRETARY
SSN: 524-58-XXXX
Confidence: Medium

6:
Company Name: C.W.M. AND ASSOCIATES, INC.
Name: CLARK, JACK JR
Title: TREASURER
SSN: 524-58-XXXX
Confidence: Medium

7:
Company Name: C.W.M. AND ASSOCIATES, INC.
Name: CLARK, JACK JR
Title: TREASURER
SSN: 524-58-XXXX
Confidence: Medium

8:
Company Name: ANIMAS TOWING & RECOVERY LLC
Name: CLARK, JACK JR
Address: PO BOX 767
SILVERTON, CO 81433-0767
SSN: 524-58-XXXX
Phone: (970) 387-5243
Confidence: High

9:
Company Name: ANIMAS TOWING & RECOVERY LLC
Name: CLARK, JACK JR
Title: AGENT
Address: PO BOX 767
SILVERTON, CO 81433-0767
SSN: 524-58-XXXX
Phone: (970) 387-5243
Confidence: High

10:
Company Name: ANLS TRANSPORTATION
Name: CLARK, JACK JR

Address: 456 W HARVARD ST
GLENDALE, CA 91204-3117

SSN: 524-58-XXXX
Phone: (818) 502-0899
Confidence: Medium

11:

Company Name: UPPER ANIMAS ROCK PRODUCTS
Name: CLARK, JACK JR
Address: PO BOX 767
SILVERTON, CO 81433-0767
SSN: 524-58-XXXX
Confidence: High

12:

Company Name: UPPER ANIMAS ROCK PRODUCTS
Name: CLARK, JACK JR
Title: CONTACT
Address: PO BOX 767
SILVERTON, CO 81433-0767
SSN: 524-58-XXXX
Confidence: High

13:

Company Name: UNDERGROUND SPECIALTY COMPANY LLC
Name: CLARK, JACK E JR
Address: PO BOX 767
SILVERTON, CO 81433-0767
SSN: 524-58-XXXX
Confidence: High

14:

Company Name: UNDERGROUND SPECIALTY COMPANY LLC
Name: CLARK, JACK E JR
Address: PO BOX 767
SILVERTON, CO 81433-0767
SSN: 524-58-XXXX
Confidence: High

15:

Company Name: UNDERGROUND SPECIALTY COMPANY LLC
Name: CLARK, JACK E JR
Title: CONTACT
Address: PO BOX 767
SILVERTON, CO 81433-0767
SSN: 524-58-XXXX
Confidence: High

16:

Company Name: SAN JUAN PLUMBING & HEATING
Name: CLARK, JACK EUGENE JR
Title: CONTACT
Address: 3815 COUNTY RD 2
SILVERTON, CO 81433
SSN: 524-58-XXXX
Phone: (970) 387-0226
Confidence: High

17:

Company Name: SAN JUAN PLUMBING & HEATING
Name: CLARK, JACK EUGENE JR

Address: 3815 COUNTY RD 2
SILVERTON, CO 81433

SSN: 524-58-XXXX
Phone: (970) 387-0226
Confidence: High

18:

Company Name: SAN JUAN PLUMBING & HEATING
Name: CLARK, JACK EUGENE JR
Address: 3815 COUNTY RD 2
SILVERTON, CO 81433
SSN: 524-58-XXXX
Phone: (970) 387-0226
Confidence: High

19:

Company Name: NORTHWEST RAISE CONSULTING
Name: CLARK, JACK
Address: 950 W CAMERON AVE APT 108
KELLOGG, ID 83837-2029
SSN: 524-58-XXXX
Confidence: High

20:

Company Name: NORTHWEST RAISE CONSULTING
Name: CLARK, JACK
SSN: 524-58-XXXX
Confidence: High

Criminal Filings - 3 records found

1: Arizona Court Report

Offender information

Name: CLARK, JACK EUGENE
Address: 209 S BISBEE AVE
WILLCOX, AZ 85643-2406
COCHISE COUNTY
Case Number: J-0404-TR-2002001948
Case Filing Date: 04/18/2002
Case Type: TRAFFIC
DOB: 09/1948
SSN: 524-58-XXXX
Race: WHITE
Sex: Male

Offenses

Case Filing Date: 04/18/2002
Court Description: PAYSON JUSTICE
Court Case Number: J-0404-TR-2002001948
Court Offense: SPEED GREATER THAN REASONABLE AND PRUDENT
Court Disposition: DEFENSIVE DRIVING/DISM NO MVD
Court Disposition Date: 06/21/2002
Court Level/Degree: TRAFFIC

Court Activity

[NONE FOUND]

2: Arizona Court Report

Offender information

Name: CLARK, JACK EUGENE
Address: 209 S BISBEE AVE
WILLCOX, AZ 85643-2406
COCHISE COUNTY
Case Number: J-0404-TR-2001001977
Case Filing Date: 05/24/2001
Case Type: TRAFFIC
DOB: 09/1948
SSN: 524-58-XXXX
Race: WHITE
Sex: Male

Offenses

Case Filing Date: 05/24/2001
Court Description: PAYSON JUSTICE
Court Case Number: J-0404-TR-2001001977
Court Offense: NOT SPECIFIED
Court Level/Degree: TRAFFIC

Court Activity

[NONE FOUND]

3: Arizona Court Report

Offender information

Name: CLARK, JACK EUGENE
Address: 209 S BISBEE AVE
WILLCOX, AZ 85643-2406
COCHISE COUNTY
Case Number: J-0203-TR-953691
Case Filing Date: 06/28/1995
Case Type: TRAFFIC
DOB: 09/1948
SSN: 524-58-XXXX
Race: WHITE
Sex: Male

Offenses

Case Filing Date: 06/28/1995
Court Description: BENSON JUSTICE
Court Case Number: J-0203-TR-953691
Court Offense: EXCEED 85 MPH
Court Disposition: CHARGE AMENDED
Court Disposition Date: 09/14/1995
Court Level/Degree: MISDEMEANOR

Court Activity

[NONE FOUND]

Cellular & Alternate Phones - 7 records found

1:

Personal Information

Name: CLARK, JACK
Address: PO BOX 767
SILVERTON, CO 81433-0767
Phone Number: (602) 300-0501
Phone Type: Mobile

Carrier Information

Carrier: NEW CINGULAR WIRLESS
Carrier City: PHOENIX
Carrier State: AZ

2:

Personal Information

Name: CLARK, JACK
Address: PO BOX 296
SILVERTON, CO 81433-0296
Phone Number: (602) 684-6111
Phone Type: Mobile

Carrier Information

Carrier: NEW CINGULAR WIRLESS
Carrier City: PHOENIX
Carrier State: AZ

3:

Personal Information

Name: CLARK, JACK
Address: 3815 COUNTY ROAD 2
SILVERTON, CO 81433
Phone Number: (970) 387-5063
Phone Type:

Carrier Information

Carrier: QWEST CORPORATION
Carrier City: SILVERTON
Carrier State: CO

4:

Personal Information

Name: CLARK, JACK
Address: PO BOX 767
SILVERTON, CO 81433-0767
Phone Number: (970) 387-5079
Phone Type:

Carrier Information

Carrier: QWEST CORPORATION
Carrier City: SILVERTON
Carrier State: CO

5:

Personal Information

Name: CLARK, JACK
Address: PO BOX 296
SILVERTON, CO 81433-0296
Phone Number: (970) 387-5243
Phone Type:

Carrier Information

Carrier: QWEST CORPORATION
Carrier City: SILVERTON
Carrier State: CO

6:

Personal Information

Name: CLARK, JACK
Address: PO BOX 767
SILVERTON, CO 81433-0767
Phone Number: (970) 387-5243

Phone Type:

Carrier Information

Carrier: QWEST CORPORATION
Carrier City: SILVERTON
Carrier State: CO

7:

Personal Information

Name: CLARK, JACK
Address: 314 S 11TH ST APT 1
GUNNISON, CO 81230-3483
Phone Number: (970) 387-5243
Phone Type:

Carrier Information

Carrier: QWEST CORPORATION
Carrier City: SILVERTON
Carrier State: CO

Sources - 316 records found

All Sources	316 Source Document(s)
Alaskan Permenant Fund	1 Source Document(s)
Corporate Affiliations	2 Source Document(s)
Criminal	3 Source Document(s)
Deed Transfers	7 Source Document(s)
Driver Licenses	3 Source Document(s)
Email addresses	9 Source Document(s)
FAA Aircraft Registrations	1 Source Document(s)
Fictitious Business Names Records	5 Source Document(s)
Historical Person Locator	66 Source Document(s)
Motor Vehicle Registrations	100 Source Document(s)
Person Locator 1	14 Source Document(s)
Person Locator 2	9 Source Document(s)
Person Locator 5	12 Source Document(s)
Person Locator 6	7 Source Document(s)
Phone	5 Source Document(s)
PhonesPlus Records	7 Source Document(s)
Professional Licenses	3 Source Document(s)
Tax Assessor Records	45 Source Document(s)
UCC Lien Filings	2 Source Document(s)
Utility Locator	3 Source Document(s)
Voter Registrations	12 Source Document(s)

Key
High Risk Indicator. These symbols may prompt you to investigate further.
Moderate Risk Indicator. These symbols may prompt you to investigate further.
General Information Indicator. These symbols inform you that additional information is provided.
✓ The most recent telephone listing as reported by the EDA source.

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Your GLBA Permissible Use is: Legal Compliance

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1 OF 1 RECORD(S)

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Date:2/1/2017
Report processed by:
Toeroek Associates Inc||

Full Name	Address	County	Phone
JEPSON, ALAN J	PO BOX 729 SILVERTON, CO 81433-0729 SAN JUAN COUNTY	SAN JUAN	None Listed

ADDITIONAL PERSONAL INFORMATION

SSN	DOB	Gender	LexID(sm)
158-40-XXXX	7/1952 (Age:64)	Male	001242310193

Subject Summary

Name Variations

1: JEPSON, AJ
2: JEPSON, AJOSEPH
3: JEPSON, ALAN
4: JEPSON, ALAN J
5: JEPSON, ALAN JOSEPH
6: JEPSON, J
7: JEPSON, JOE
8: JEPSON, JOSEPH
9: JEPSON, JOSEPH A
10: JOPSON, JOC
11: JOPSON, JOE
12: MEADOWS, JOSEPH

SSNs Summary

No.	SSN	State Iss.	Date Iss.	Warnings
		Most frequent SSN attributed to subject:		
1:	158-40-XXXX	New Jersey	1965-1966	

DOBs

Reported DOBs:
7/1952

Possible E-Mail Addresses

AJEPSON@HOTMAIL.COM
CANYONVIEWMOTEL@EARTHLINK.NET
ALAN.JEPSON@COMCAST.NET

Others Using SSN - 0 records found

Address Summary - 11 records found

No.	Address
1:	PO BOX 729 SILVERTON, CO 81433-0729 SAN JUAN COUNTY

2: 4215 COUNTY ROAD 2 MDWS
SILVERTON, CO 81433
SAN JUAN COUNTY

3: 661 GREENE ST
SILVERTON, CO 81433
SAN JUAN COUNTY

4: 4215 COUNTY RD APT 2
SILVERTON, CO 81433
SAN JUAN COUNTY

5: 4215 COUNTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY

6: 4215 COUNTRY RD
SILVERTON, CO 81433
SAN JUAN COUNTY

7: 4215 CR
SILVERTON, CO 81433
SAN JUAN COUNTY

8: 20 ELIZABETH LN
BUDD LAKE, NJ 07828-2102
MORRIS COUNTY

9: 18 ELIZABETH LN
BUDD LAKE, NJ 07828-2102
MORRIS COUNTY

10: 4215 CTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY

11: 100 RANDOLPH AVE
MINE HILL, NJ 07803-3065
MORRIS COUNTY

Address Details

1: PO BOX 729 SILVERTON, CO 81433-0729

Address	**Dates**	**Phone**
PO BOX 729 SILVERTON, CO 81433-0729 SAN JUAN COUNTY	5/1969 - 1/2017	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

MEADOWS, CHERYL L

Other Associates

None Listed

2: 4215 COUNTY ROAD 2 MDWS SILVERTON, CO 81433

Address	Dates	Phone
4215 COUNTY ROAD 2 MDWS SILVERTON, CO 81433 SAN JUAN COUNTY	4/2002 - 12/2016	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

MEADOWS, CHERYL L

Other Associates

None Listed

3: 661 GREENE ST SILVERTON, CO 81433

Address	Dates	Phone
661 GREENE ST SILVERTON, CO 81433 SAN JUAN COUNTY	2/2004 - 5/2015	(970) 387-5400

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

None Listed

Other Associates

None Listed

4: 4215 COUNTY RD APT 2 SILVERTON, CO 81433

Address	Dates	Phone
4215 COUNTY RD APT 2 SILVERTON, CO 81433 SAN JUAN COUNTY	10/2001 - 3/2011	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

MEADOWS, CHERYL L

Other Associates

None Listed

5: 4215 COUNTY RD 2 SILVERTON, CO 81433

Address	Dates	Phone
4215 COUNTY RD 2 SILVERTON, CO 81433 SAN JUAN COUNTY	3/2003 - 6/2008	(970) 387-5398

Household Members

None Listed

Other Associates

None Listed

6: 4215 COUNTRY RD SILVERTON, CO 81433

Address	Dates	Phone
4215 COUNTRY RD SILVERTON, CO 81433 SAN JUAN COUNTY	12/2002 - 1/2003	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

MEADOWS, CHERYL L

Other Associates

None Listed

7: 4215 CR SILVERTON, CO 81433

Address	Dates	Phone
4215 CR SILVERTON, CO 81433 SAN JUAN COUNTY	7/2001 - 12/2002	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

None Listed

Other Associates

None Listed

8: 20 ELIZABETH LN BUDD LAKE, NJ 07828-2102

Address	Dates	Phone
20 ELIZABETH LN BUDD LAKE, NJ 07828-2102 MORRIS COUNTY	1999 - 9/2000	

Census Data for Geographical Region

Median Head of Household Age: 38
Median Income: $77,237
Median Home Value: $300,596
Median Education: 14 years

Household Members

None Listed

Other Associates

None Listed

9: 18 ELIZABETH LN BUDD LAKE, NJ 07828-2102

Address	Dates	Phone
18 ELIZABETH LN BUDD LAKE, NJ 07828-2102 MORRIS COUNTY	9/1989 - 9/2000	

Census Data for Geographical Region

Median Head of Household Age: 38
Median Income: $77,237

Median Home Value: $300,596
Median Education: 14 years
Household Members
MEADOWS, CHERYL L
Other Associates
None Listed

10: 4215 CTY RD 2 SILVERTON, CO 81433

Address	Dates	Phone
4215 CTY RD 2 SILVERTON, CO 81433 SAN JUAN COUNTY	5/1992 - 7/2000	

Census Data for Geographical Region
Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

11: 100 RANDOLPH AVE MINE HILL, NJ 07803-3065

Address	Dates	Phone
100 RANDOLPH AVE MINE HILL, NJ 07803-3065 MORRIS COUNTY	1/1983 - 1/1983	(973) 891-3212 (973) 989-1999

Census Data for Geographical Region
Median Head of Household Age: 42
Median Income: $106,530
Median Home Value: $371,429
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

Voter Registrations - 10 records found

1: Colorado Voter Registration

Registrant Information

Name: JEPSON, ALAN J
Residential Address: 4215 CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 158-40-XXXX
Date of Birth: 7/1952
Gender: Male

Voter Information

Registration Date: 6/10/1999
Last Vote Date: 11/6/2012

2: Colorado Voter Registration

Registrant Information

Name: JEPSON, ALAN J

Residential Address: 4215 CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 158-40-XXXX
Date of Birth: 7/1952
Gender: Male

Voter Information
Registration Date: 6/10/1999
Last Vote Date: 11/5/2013
Party Affiliation: NONE DECLARED
Active Status: ACTIVE

3: Colorado Voter Registration

Registrant Information
Name: JEPSON, ALAN J
Residential Address: 4215 CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
Home Phone: None Listed
SSN: 158-40-XXXX
Date of Birth: 7/1952

Voter Information
Registration Date: 6/10/1999
Last Vote Date: 11/4/2014
Active Status: ACTIVE

4: Colorado Voter Registration

Registrant Information
Name: JEPSON, ALAN J
Residential Address: 4215CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 158-40-XXXX
Date of Birth: 7/1952
Gender: Male

Voter Information
Registration Date: 6/10/1999
Last Vote Date: 11/4/2014
Party Affiliation: REPUBLICAN
Active Status: ACTIVE

5: Colorado Voter Registration

Registrant Information
Name: JEPSON, ALAN J
Residential Address: 4215 CR 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 158-40-XXXX
Date of Birth: 7/1952
Gender: Male

Voter Information
Registration Date: 6/10/1999
Last Vote Date: 11/8/2016
Party Affiliation: REPUBLICAN

Active Status: ACTIVE

6: Colorado Voter Registration

Registrant Information

Name: JEPSON, ALAN J
Residential Address: 4215 COUNTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 158-40-XXXX
Date of Birth: 7/1952
Gender: Male

Voter Information

Registration Date: 6/10/1999
Last Vote Date: 11/2/2010
Party Affiliation: NONE DECLARED
Active Status: ACTIVE
Status: ABSENTEE

7: Colorado Voter Registration

Registrant Information

Name: JEPSON, ALAN J
Residential Address: 4215 COUNTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 158-40-XXXX
Date of Birth: 7/1952
Gender: Male

Voter Information

Registration Date: 6/10/1999
Last Vote Date: 11/2/2010
Active Status: ACTIVE

8: Colorado Voter Registration

Registrant Information

Name: JEPSON, ALAN J
Residential Address: 4215 COUNTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 158-40-XXXX
Date of Birth: 7/1952
Gender: Male

Voter Information

Registration Date: 6/10/1999
Active Status: ACTIVE

9: Colorado Voter Registration

Registrant Information

Name: JEPSON, ALAN J
Residential Address: 4215 COUNTY ROAD 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 158-40-XXXX
Date of Birth: 7/1952
Gender: Male

Voter Information

Registration Date: 6/10/1999
Active Status: ACTIVE

10: Colorado Voter Registration

Registrant Information

Name: JEPSON, ALAN J
Residential Address: 4215 COUNTY ROAD 2
SILVERTON, CO 81433
SAN JUAN COUNTY
SSN: 158-40-XXXX
Date of Birth: 7/1952
Gender: Male

Voter Information

Registration Date: 6/10/1999
Active Status: ACTIVE

Driver Licenses - 2 records found

1: Colorado Driver License

Driver Information

Name: JEPSON, ALAN J
Address: 3855 CO RD 2/POB 729
SILVERTON, CO 81433-0729
SAN JUAN COUNTY
Data source: Governmental: CO

Personal Information

SSN: 158-40-XXXX
DOB: 1952
Gender: Male
Height: 5'08"
Weight: 190 lbs.

Additional Driver Information

DOB: 1952
Gender: Male
Height: 5'08"
Weight: 190 lbs.

2: New Jersey Driver License

Driver Information

Name: JEPSON, AJ
Address: PO BOX 729
SILVERTON, CO 81433-0729
SAN JUAN COUNTY
Data source: Non-Governmental: NJ

Personal Information

SSN: 158-40-XXXX
DOB: 07/1952

Additional Driver Information

DOB: 07/1952

Professional Licenses - 0 records found
Health Care Providers - 0 records found
Health Care Sanctions - 0 records found

Pilot Licenses - 0 records found
Sport Licenses - 0 records found
Real Property - 2 records found

1: Assessment Record for SAN JUAN County, CO

Owner Information

Name: JEPSON A JOSEPH & MEADOWS CHERYL
Address: PO BOX 729 SILVERTON, CO 81433-0729
County/FIPS: SAN JUAN

Property Information

Address: 661 GREENE ST
Data Source: B

Legal Information

Assessor's Parcel Number: 48291730690006
Recording Date: 05/21/1999
Book/Page: 247/385

Sale Information

Sale Price: $155000

Assessment Information

Assessed Value: $124041
Market Land Value: $295050
Market Improvement Value: $132677
Total Market Value: $427727

2: Assessment Record for SAN JUAN County, CO

Owner Information

Name: JEPSON A JOSEPH & MEADOWS CHERYL
Address: PO BOX 729 SILVERTON, CO 81433-0729
County/FIPS: SAN JUAN

Property Information

Address: 4215 C R 2 ANIMAS M
Data Source: B

Legal Information

Assessor's Parcel Number: 47730310050021
Recording Date: 04/12/1999
Book/Page: 247/273

Sale Information

Sale Price: $192000

Assessment Information

Assessed Value: $26867
Market Land Value: $205200
Market Improvement Value: $132325
Total Market Value: $337525

Motor Vehicle Registrations - 7 records found

1: CO MVR

Registrant Information

Registrant: JEPSON, ALAN JOSEPH
DOB: 7/1952
Address: PO BOX 729
SILVERTON, CO 81433-0729
SAN JUAN COUNTY

Registration Information

Original Registration Date: 6/15/2015
Registration Date: 6/22/2016
Registration Expiration Date: 7/31/2017

Vehicle Information

VIN: 4TAVN13D3RZ205280
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 1994
Make: Toyota
Model: Extra
Series: LONG WB DELUXE
Body Style: Club Cab Pickup

Plate Information

License Plate Type: Private
Previous Plate Number: 01120ZE
Previous Plate State: CO
License Plate Number: 01120ZE
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

2: CO MVR

Vehicle Information

VIN: 4TAVN13D3RZ205280
Class: PASSENGER CAR/LIGHT TRUCK
Model Year: 1994
Make: Toyota
Model: Extra
Series: LONG WB DELUXE
Body Style: Club Cab Pickup

Owner Information

Name: JEPSON, ALAN JOSEPH
DOB: 7/1952
Address: PO BOX 729
SILVERTON, CO 81433-0729
SAN JUAN COUNTY

Title Information

Title Number: 55E012472
Title Transfer Date: 8/30/1999
Title Issue Date: 8/30/1999

Source Information

Data Source: GOVERNMENTAL

3: CO MVR

Registrant Information

Registrant: JEPSON, ALAN JOSEPH
DOB: 7/1952
Address: PO BOX 729
SILVERTON, CO 81433-0729
SAN JUAN COUNTY

Registration Information

Original Registration Date: 6/21/2012
Registration Date: 6/22/2016
Registration Expiration Date: 7/31/2017

Vehicle Information

VIN: LW92023
Class: UNKNOWN
Model Year: 1992
Make: HOMEMADE
Body Style: TILT TANDEM

Plate Information

License Plate Type: Trailer
Previous Plate Number: 395DCY
Previous Plate State: CO
License Plate Number: 395DCY
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

4: CO MVR

Vehicle Information

VIN: LW92023
Class: UNKNOWN
Model Year: 1992
Make: HOMEMADE
Body Style: TILT TANDEM

Owner Information

Name: JEPSON, ALAN JOSEPH
DOB: 7/1952
Address: 4215 CTY RD 2
SILVERTON, CO 81433
SAN JUAN COUNTY

Title Information

Title Number: 55E012747
Title Transfer Date: 7/14/2000
Title Issue Date: 7/14/2000

Source Information

Data Source: GOVERNMENTAL

5: CO MVR

Registrant Information

Registrant: JEPSON, ALAN JOSEPH
DOB: 7/1952
Address: PO BOX 729
SILVERTON, CO 81433-0729
SAN JUAN COUNTY

Registration Information

Original Registration Date: 3/21/2014
Registration Date: 2/17/2016
Registration Expiration Date: 3/31/2017

Vehicle Information

VIN: JS1SK43A4Y2100823
Class: MOTORCYCLE
Model Year: 2000
Make: Suzuki
Model: Dr-Z400S
Series: BASE
Body Style: Enduro

Plate Information

License Plate Type: Motorcycle
Previous Plate Number: 760MQA
Previous Plate State: CO
License Plate Number: 760MQA
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

6: CO MVR

Vehicle Information

VIN: JS1SK43A4Y2100823
Class: MOTORCYCLE
Model Year: 2000
Make: Suzuki
Model: Dr-Z400S
Series: BASE
Body Style: Enduro

Owner Information

Name: JEPSON, ALAN JOSEPH
DOB: 7/1952
Address: PO BOX 729
SILVERTON, CO 81433-0729
SAN JUAN COUNTY

Title Information

Title Number: 55E016352
Title Transfer Date: 11/5/2013
Title Issue Date: 11/5/2013

Source Information

Data Source: GOVERNMENTAL

7: CO MVR

Registrant Information

Registrant: JEPSON, JOE
DOB: 7/1952
Address: PO BOX 729
SILVERTON, CO 81433-0729
SAN JUAN COUNTY

Registration Information

Original Registration Date: 4/26/2004
Registration Date: 7/26/2007
Registration Expiration Date: 7/31/2008

Vehicle Information

VIN: 8989930
Class: UNKNOWN
Model Year: 1979

Plate Information

License Plate Type: Other
Previous Plate Number: 005AVH
Previous Plate State: CO
License Plate Number: 005AVH
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

Boats - 0 records found
Aircraft - 0 records found
Bankruptcy Information - 0 records found
Judgments/Liens - 2 records found

1: NJ Judgments and Liens Filings

Debtor Information

Name: JOPSON, JOC
SSN: 158-40-XXXX
Address: 18 ELIZABETH LN
BUDD LAKE, NJ 07828-2102
MORRIS COUNTY

Creditor Information

Name: TED SONTOS

Filing Information

Jurisdiction: NJ
Amount: $400.00
Filing Date: 9/29/1989
Case Number: JC-00041256-0000-SC
Filing Status: UPDATES MAY BE PRESENT ELSEWHERE IN THIS REPORT; CHECK THE COURT FOR THE CURRENT STATUS

Filing 1

Number: X14SC041256
Type: JUDGMENT
Agency: NEW JERSEY SUPERIOR COURT LAW DIVISION SPECIAL CIVIL PART
Agency State: NJ
Agency County: MORRIS

2: NJ Judgments and Liens Filings

Debtor Information

Name: JOPSON, JOC
SSN: 158-40-XXXX
Address: 18 ELIZABETH LN
BUDD LAKE, NJ 07828-2102
MORRIS COUNTY

Creditor Information

Name: TED SONTOS

Filing Information

Jurisdiction: NJ
Amount: $400.00
Filing Date: 9/6/1989
Case Number: SC-00041256-0000-SC
Filing Status: DISPOSED - HEARING

Filing 1

Number: S14SC041256
Type: CIVIL SUIT
Agency: NEW JERSEY SUPERIOR COURT LAW DIVISION SPECIAL CIVIL PART
Agency State: NJ
Agency County: MORRIS

UCC Liens - 0 records found
Fictitious Businesses - 1 records found

1: Fictitious Businesses

Business Information

Name: CANYON VIEW MOTEL
Office Address: GREENE 66 ST
CO, SI 81433

Mailing Address: 661 GREENE ST
SILVERTON, CO 81433
Jurisdiction: CO
Phone: (970) 387-5400
Type: DBA
Filing Date: 09/05/2003
Business Description: HOTELS & MOTELS
SIC: 701101

Contact Information

Name: JOSEPH JEPSON
Address: GREENE 66 ST
CO, SI 81433
Contact Type: CONTACT

Notice Of Defaults - 0 records found

Potential Relatives - 5 records found

1st Degree: 1, 2nd Degree: 4

No.	Full Name	Address/Phone
1.	MEADOWS, CHERYL L • AKA JEPSON, CHERYL • AKA MEADOWS, CHERYL LYNNE • AKA MEADOWS, CHERYL LYNNE • AKA JEPSON, MEADOWS CHERYL SSN:070-38-XXXX	PO BOX 729 SILVERTON, CO 81433-0729 4215 COUNTY ROAD 2 MDWS SILVERTON, CO 81433 18 ELIZABETH LN BUDD LAKE, NJ 07828-2102 (973) 347-6260 4215 COUNTRY RD SILVERTON, CO 81433 4215 COUNTY RD APT 2 SILVERTON, CO 81433
1.A.	MEADOWS, EDYTHE PEICHER ⚠ Deceased • AKA MEADOWS, EDYTHE • AKA MEADOWS, EDITH SSN:123-12-XXXX DOB:12/1918 (Age: 98)	422 CLAY PITTS RD EAST NORTHPORT, NY 11731-3818 (516) 368-5471 9501 NW 67TH ST TAMARAC, FL 33321-3513 (954) 722-7908
1.B.	MEADOWS, REUBIN ⚠ Deceased • AKA MEADOWS, R • AKA MEADOWS, REUBIN SSN:053-10-XXXX DOB:3/1912 (Age: 104)	9501 NW 67TH ST TAMARAC, FL 33321-3513 (954) 722-7908 422 CLAY PITTS RD EAST NORTHPORT, NY 11731-3818 (954) 722-7908
1.C.	MEADOWS, CHERYL	661 GREENE ST SILVERTON, CO 81433 (970) 387-5400

1.D. MEADOWS, HOWARD SCOTT

• AKA MEADOWS, HOWIE S
• AKA MEADOWS, HARLEY
• AKA EADOWS, HOWARD S
• AKA MEADEOWS, HOWARD
• AKA MEADOWS, H

SSN:112-66-XXXX
DOB:11/1965
(Age: 51)

12 PARK WOODS LN APT 9MAIN
KINGS PARK, NY 11754-4601
(631) 269-4747

10 PARK WOODS LN 12
KINGS PARK, NY 11754-4601

1884 BROADWAY
BROOKLYN, NY 11207-1702
(347) 663-6208
(718) 484-4576
(718) 484-4577

9501 NV 67 ST
FORT LAUDERDALE, FL 33321

422 CLAY PITTS RD
EAST NORTHPORT, NY 11731-3818
(631) 368-5471

Business Associates - 0 records found
Person Associates - 0 records found
Neighbors - 0 records found
Employment Locator - 5 records found

1:

Company Name: CANYON VIEW MOTEL
Name: JEPSON, JOSEPH
Address: 661 GREENE ST
SILVERTON, CO 81433
SSN: 158-40-XXXX
Phone: (970) 387-5400
Confidence: High

2:

Company Name: CANYON VIEW MOTEL
Name: JEPSON, JOSEPH
Title: OWNER
Address: 661 GREENE ST
SILVERTON, CO 81433
SSN: 158-40-XXXX
Phone: (970) 387-5400
Confidence: High

3:

Company Name: CANYON VIEW MOTEL
Name: JEPSON, JOSEPH
Title: OWNER
Address: 661 GREENE ST
SILVERTON, CO 81433
SSN: 158-40-XXXX
Phone: (970) 387-5400
Confidence: High

4:

Company Name: CANYON VIEW MOTEL
Name: JEPSON, JOSEPH
Title: OWNER
Address: PO BOX 729
SILVERTON, CO 81433-0729

SSN: 158-40-XXXX
Phone: (970) 387-5400
Confidence: High

5:

Company Name: CANYON VIEW MOTEL
Name: JEPSON, JOSEPH
Title: OWNER
Address: PO BOX 729
SILVERTON, CO 81433-0729
SSN: 158-40-XXXX
Phone: (970) 387-5400
Confidence: High

Criminal Filings - 0 records found

Cellular & Alternate Phones - 1 records found

1:

Personal Information

Name: JEPSON, JOSEPH
Address: 4215 COUNTY RD
SILVERTON, CO 81433
Phone Number: (970) 387-5414
Phone Type: Residential

Carrier Information

Carrier: QWEST CORPORATION
Carrier City: SILVERTON
Carrier State: CO

Sources - 100 records found

All Sources	100 Source Document(s)
Deed Transfers	2 Source Document(s)
Driver Licenses	2 Source Document(s)
Email addresses	3 Source Document(s)
Fictitious Business Names Records	1 Source Document(s)
Historical Person Locator	10 Source Document(s)
Liens and Judgments	2 Source Document(s)
Motor Vehicle Registrations	14 Source Document(s)
Person Locator 1	4 Source Document(s)
Person Locator 2	3 Source Document(s)
Person Locator 4	1 Source Document(s)
Person Locator 5	19 Source Document(s)
Person Locator 6	19 Source Document(s)
Phone	2 Source Document(s)
PhonesPlus Records	1 Source Document(s)
Tax Assessor Records	6 Source Document(s)
Utility Locator	1 Source Document(s)
Voter Registrations	10 Source Document(s)

Key
High Risk Indicator. These symbols may prompt you to investigate further.
Moderate Risk Indicator. These symbols may prompt you to investigate further.
General Information Indicator. These symbols inform you that additional information is provided.
✓ The most recent telephone listing as reported by the EDA source.

Important: The Public Records and commercially available data sources used on reports have errors. Data is sometimes entered poorly, processed incorrectly and is generally not free from defect. This system should not be relied upon as definitively accurate. Before relying on any data this system supplies, it should be independently verified. For Secretary of State documents, the following data is for information purposes only

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1 OF 1 RECORD(S)

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Date:2/1/2017
Report processed by:
Toeroek Associates Inc||

Full Name	Address	County	Phone
BENTLEY, WALTER W	11475 PEARL ST APT 317 NORTHGLENN, CO 80233-1946 ADAMS COUNTY	ADAMS	(303) 451-0891

ADDITIONAL PERSONAL INFORMATION

SSN	DOB	Gender	LexID(sm)
516-09-XXXX ⚠ Deceased	1/1902 (Would be: 115) (Date of Death: 1/13/1994)		000188519698

Subject Summary

Name Variations
1: BENTLEY, WALTER W

SSNs Summary

No.	SSN	State Iss.	Date Iss.	Warnings
		Most frequent SSN attributed to subject:		
1:	516-09-XXXX	Montana	1936-1951	⚠ Deceased

DOBs
Reported DOBs:
1/1902

Others Using SSN - 0 records found

Address Summary - 2 records found

No.	Address
1:	11475 PEARL ST APT 317 NORTHGLENN, CO 80233-1946 ADAMS COUNTY
2:	381 S PASEO CERRO UNIT C GREEN VALLEY, AZ 85614-0825 PIMA COUNTY

Address Details
1: 11475 PEARL ST APT 317 NORTHGLENN, CO 80233-1946

Address	Dates	Phone
11475 PEARL ST APT 317 NORTHGLENN, CO 80233-1946 ADAMS COUNTY	1/1988 - 12/1992	(303) 451-0891

Census Data for Geographical Region
Median Head of Household Age: 40
Median Income: $36,552
Median Home Value: $151,215
Median Education: 12 years

Household Members
None Listed
Other Associates
None Listed

2: 381 S PASEO CERRO UNIT C GREEN VALLEY, AZ 85614-0825

Address	Dates	Phone
381 S PASEO CERRO UNIT C GREEN VALLEY, AZ 85614-0825 PIMA COUNTY	4/1985 - 12/1991	

Census Data for Geographical Region
Median Head of Household Age: 72
Median Income: $30,217
Median Home Value: $103,947
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

Voter Registrations - 0 records found
Driver Licenses - 0 records found
Professional Licenses - 0 records found
Health Care Providers - 0 records found
Health Care Sanctions - 0 records found
Pilot Licenses - 0 records found
Sport Licenses - 0 records found
Real Property - 0 records found
Motor Vehicle Registrations - 0 records found
Boats - 0 records found
Aircraft - 0 records found
Bankruptcy Information - 0 records found
Judgments/Liens - 0 records found
UCC Liens - 0 records found
Fictitious Businesses - 0 records found
Notice Of Defaults - 0 records found
Potential Relatives - 0 records found
Business Associates - 0 records found
Person Associates - 0 records found
Neighbors - 10 records found

11475 PEARL ST APT 317 NORTHGLENN, CO 80233-1946

Name	Address	Phone
BEITLER, DAVID WILSON, MARIE S	11475 PEARL ST APT 311 NORTHGLENN, CO 80233-1946	
HUNTINGTON, MARY	11475 PEARL ST APT 312 NORTHGLENN, CO 80233-1946	
HARRISON, BEVERLY ANN	11475 PEARL ST APT 313 NORTHGLENN, CO 80233-1946	
ALBRIGHT, ELISE DRENNEN, VIRGINIA L	11475 PEARL ST APT 314 NORTHGLENN, CO 80233-1946	
POTTORFF, JUNE M	11475 PEARL ST APT 315	(303) 280-3167

VEATCH, GERALDINE VEATCH, ROYAL A	NORTHGLENN, CO 80233-1946	
LUJAN, JOSEPH WILLIAM NIELSEN, BERNAD C PAULSEN, FREDELLA M ROTELLO, MADELINE M	11475 PEARL ST APT 318 NORTHGLENN, CO 80233-1946	(303) 452-7545 (303) 320-1618
HELM, NANCY K	11475 PEARL ST APT 319 NORTHGLENN, CO 80233-1946	
MAXON, ELEANOR M	11475 PEARL ST APT 320 NORTHGLENN, CO 80233-1946	
MONTOYA, ROGER H ZIMMER, HELEN	11475 PEARL ST APT 321 NORTHGLENN, CO 80233-1946	
HARR, MARY M	11475 PEARL ST APT 322 NORTHGLENN, CO 80233-1946	

Employment Locator - 0 records found
Criminal Filings - 0 records found
Cellular & Alternate Phones - 0 records found
Sources - 3 records found

All Sources	3 Source Document(s)
Deceased	1 Source Document(s)
Historical Person Locator	2 Source Document(s)

Key
High Risk Indicator. These symbols may prompt you to investigate further.
Moderate Risk Indicator. These symbols may prompt you to investigate further.
General Information Indicator. These symbols inform you that additional information is provided.
✓The most recent telephone listing as reported by the EDA source.

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1 OF 1 RECORD(S)

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Date:2/1/2017
Report processed by:
Toeroek Associates Inc||

Full Name	Address	County	Phone
PADRICK, KEVIN DALE	PO BOX 3510 BEND, OR 97707-0510 DESCHUTES COUNTY	DESCHUTES	None Listed

ADDITIONAL PERSONAL INFORMATION

SSN	DOB	Gender	LexID(sm)
556-06-XXXX SSN linked to multiple people	8/1955 (Age:61)	Male	000224722675

Subject Summary

Name Variations

1: BLY, KEVIN
2: DALE, PADRICK KEVIN
3: PADRICK, K
4: PADRICK, KEVIN
5: PADRICK, KEVIN D
6: PADRICK, KEVIN DALE
7: PADRICK, KEVIN P
8: PADRICK KEVIN, KEVIN D
9: PADRICKETUX, KEVEIN D
10: PARDRICK, KEVIN
11: PATRICK, KEVIN

SSNs Summary

No.	SSN	State Iss.	Date Iss.	Warnings
		Most frequent SSN attributed to subject:		
1:	556-06-XXXX	California	1971	SSN linked to multiple people

DOBs

Reported DOBs:
8/1955

Possible E-Mail Addresses

KEVINPADRICK@AOL.COM

Others Using SSN - 1 records found

#	Full Name	SSN	DOB
1:	PADRICK, KAREN P	556-06-XXXX	3/1953

Address Summary - 27 records found

No.	Address
1:	PO BOX 3510 BEND, OR 97707-0510 DESCHUTES COUNTY

2: 12 RIVER RD
BEND, OR 97707
DESCHUTES COUNTY

3: 56946 RIVER RD
SUNRIVER, OR 97707
DESCHUTES COUNTY

4: 12 NW RIVERSIDE BLVD
BEND, OR 97701-2537
DESCHUTES COUNTY

5: HANGAR D
SUNRIVER, OR 97707
DESCHUTES COUNTY

6: 12 RIVER RD
SUNRIVER, OR 97707
DESCHUTES COUNTY

7: 15 QUELAH
SUNRIVER, OR 97707
DESCHUTES COUNTY

8: 15 QUELAH CONDO
SUNRIVER, OR 97707
DESCHUTES COUNTY

9: PO BOX 116
SILVERTON, CO 81433-0116
SAN JUAN COUNTY

10: 16363 SW WRIGHT ST
BEAVERTON, OR 97007-4027
WASHINGTON COUNTY

11: PO BOX 307
LAKE CITY, CO 81235-0307
HINSDALE COUNTY

12: 8 NANSEN SMT
LAKE OSWEGO, OR 97035-1041
MULTNOMAH COUNTY

13: PO BOX 298
SILVERTON, CO 81433-0298
SAN JUAN COUNTY

14: B 116 PO PO
SILVERTON, CO 81433
SAN JUAN COUNTY

15: 1304 GREENE ST
SILVERTON, CO 81433
SAN JUAN COUNTY

16: 17564 BLUE HERON CT
LAKE OSWEGO, OR 97034-6602
CLACKAMAS COUNTY

17: 8 HANSEN SUM
LAKE OSWEGO, OR 97034
CLACKAMAS COUNTY

18: 14730 SW 144TH AVE
PORTLAND, OR 97224-1443
WASHINGTON COUNTY

19: 2207 NE 18TH AVE
PORTLAND, OR 97212-4612
MULTNOMAH COUNTY

20: 10021 SW QUAIL POST RD
PORTLAND, OR 97219-6368
MULTNOMAH COUNTY

21: 111 SW 5TH AVE APT
PORTLAND, OR 97204-3604
MULTNOMAH COUNTY

22: 751 LAURIE AVE
SANTA CLARA, CA 95054-2238
SANTA CLARA COUNTY

23: 11 SW 5TH AVE
PORTLAND, OR 97204
MULTNOMAH COUNTY

24: PO BOX 19835
PORTLAND, OR 97280-0835
MULTNOMAH COUNTY

25: 759 LAURIE AVE
SANTA CLARA, CA 95054-2238
SANTA CLARA COUNTY

26: 122 E 14TH ST
SILVERTON, CO 81433
SAN JUAN COUNTY

27: PO BOX NANSEN
LAKE OSWEGO, OR 97034
CLACKAMAS COUNTY

Address Details

1: PO BOX 3510 BEND, OR 97707-0510

Address	Dates	Phone
PO BOX 3510 BEND, OR 97707-0510 DESCHUTES COUNTY	9/1997 - 1/2017	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $54,851
Median Home Value: $250,218
Median Education: 13 years

Household Members

PADRICK, DONNA MARIE
PADRICK, KAREN P
PADRICK, KEVIN DALE

Other Associates

OTSUKI, JULIUS AKIRA

2: 12 RIVER RD BEND, OR 97707

Address	Dates	Phone
12 RIVER RD BEND, OR 97707 DESCHUTES COUNTY	4/2001 - 8/2016	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $54,851
Median Home Value: $250,218
Median Education: 13 years

Household Members

PADRICK, KAREN P

Other Associates

OTSUKI, JULIUS AKIRA

3: 56946 RIVER RD SUNRIVER, OR 97707

Address	Dates	Phone
56946 RIVER RD SUNRIVER, OR 97707 DESCHUTES COUNTY	11/1996 - 6/2015	(541) 593-4422

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $54,851
Median Home Value: $250,218
Median Education: 13 years

Household Members

PADRICK, KAREN P

Other Associates

None Listed

4: 12 NW RIVERSIDE BLVD BEND, OR 97701-2537

Address	Dates	Phone
12 NW RIVERSIDE BLVD BEND, OR 97701-2537 DESCHUTES COUNTY	9/2011 - 5/2014	(541) 593-2244

Household Members

None Listed

Other Associates

None Listed

5: HANGAR D SUNRIVER, OR 97707

Address	Dates	Phone
HANGAR D	8/2013 - 12/2013	

SUNRIVER, OR 97707
DESCHUTES COUNTY

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $54,851
Median Home Value: $250,218
Median Education: 13 years

Household Members

None Listed

Other Associates

None Listed

6: 12 RIVER RD SUNRIVER, OR 97707

Address	Dates	Phone
12 RIVER RD SUNRIVER, OR 97707 DESCHUTES COUNTY	11/1997 - 9/2011	(541) 593-2244

Household Members

PADRICK, KAREN P

Other Associates

None Listed

7: 15 QUELAH SUNRIVER, OR 97707

Address	Dates	Phone
15 QUELAH SUNRIVER, OR 97707 DESCHUTES COUNTY	7/2001 - 7/2001	

Household Members

None Listed

Other Associates

None Listed

8: 15 QUELAH CONDO SUNRIVER, OR 97707

Address	Dates	Phone
15 QUELAH CONDO SUNRIVER, OR 97707 DESCHUTES COUNTY	4/2001 - 4/2001	

Household Members

None Listed

Other Associates

None Listed

9: PO BOX 116 SILVERTON, CO 81433-0116

Address	Dates	Phone
PO BOX 116 SILVERTON, CO 81433-0116 SAN JUAN COUNTY	2/1982 - 1/2000	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years

Household Members

None Listed

Other Associates

None Listed

10: 16363 SW WRIGHT ST BEAVERTON, OR 97007-4027

Address	Dates	Phone
16363 SW WRIGHT ST BEAVERTON, OR 97007-4027 WASHINGTON COUNTY	9/1993 - 11/1997	(503) 591-5939

Census Data for Geographical Region

Median Head of Household Age: 43
Median Income: $75,138
Median Home Value: $238,443
Median Education: 14 years

Household Members

MOOREHEAD, KIM MARIE

Other Associates

MOOREHEAD, DAVID MICHAEL

11: PO BOX 307 LAKE CITY, CO 81235-0307

Address	Dates	Phone
PO BOX 307 LAKE CITY, CO 81235-0307 HINSDALE COUNTY	8/1993 - 11/1997	

Census Data for Geographical Region

Median Head of Household Age: 31
Median Income: $65,705
Median Home Value: $358,929
Median Education: 14 years

Household Members

None Listed

Other Associates

None Listed

12: 8 NANSEN SMT LAKE OSWEGO, OR 97035-1041

Address	Dates	Phone
8 NANSEN SMT LAKE OSWEGO, OR 97035-1041 MULTNOMAH COUNTY	11/1987 - 9/1997	

Census Data for Geographical Region

Median Head of Household Age: 46
Median Income: $92,876
Median Home Value: $375,000
Median Education: 16 years

Household Members

PADRICK, BEN DALE

Other Associates

None Listed

13: PO BOX 298 SILVERTON, CO 81433-0298

Address	Dates	Phone
PO BOX 298 SILVERTON, CO 81433-0298 SAN JUAN COUNTY	10/1993 - 2/1997	

Census Data for Geographical Region

Median Head of Household Age: 42

Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years
Household Members
PADRICK, KAREN P
Other Associates
None Listed

14: B 116 PO PO SILVERTON, CO 81433

Address	Dates	Phone
B 116 PO PO SILVERTON, CO 81433 SAN JUAN COUNTY	5/1996 - 5/1996	

Census Data for Geographical Region
Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

15: 1304 GREENE ST SILVERTON, CO 81433

Address	Dates	Phone
1304 GREENE ST SILVERTON, CO 81433 SAN JUAN COUNTY	6/1994 - 6/1994	(970) 387-5713

Census Data for Geographical Region
Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

16: 17564 BLUE HERON CT LAKE OSWEGO, OR 97034-6602

Address	Dates	Phone
17564 BLUE HERON CT LAKE OSWEGO, OR 97034-6602 CLACKAMAS COUNTY	10/1993 - 10/1993	(503) 635-9436 246-2661

Census Data for Geographical Region
Median Head of Household Age: 39
Median Income: $132,005
Median Home Value: $733,782
Median Education: 15 years
Household Members
None Listed
Other Associates
None Listed

17: 8 HANSEN SUM LAKE OSWEGO, OR 97034

Address	Dates	Phone
8 HANSEN SUM LAKE OSWEGO, OR 97034 CLACKAMAS COUNTY	12/1990 - 12/1992	

Household Members

None Listed

Other Associates

None Listed

18: 14730 SW 144TH AVE PORTLAND, OR 97224-1443

Address	Dates	Phone
14730 SW 144TH AVE PORTLAND, OR 97224-1443 WASHINGTON COUNTY	10/1988 - 10/1988	(503) 590-6869 (503) 590-6868

Census Data for Geographical Region

Median Head of Household Age: 38

Median Income: $106,081

Median Home Value: $417,409

Median Education: 14 years

Household Members

None Listed

Other Associates

None Listed

19: 2207 NE 18TH AVE PORTLAND, OR 97212-4612

Address	Dates	Phone
2207 NE 18TH AVE PORTLAND, OR 97212-4612 MULTNOMAH COUNTY	2/1988 - 2/1988	(503) 288-7227 (503) 331-7177

Census Data for Geographical Region

Median Head of Household Age: 37

Median Income: $44,750

Median Home Value: $447,917

Median Education: 16 years

Household Members

None Listed

Other Associates

None Listed

20: 10021 SW QUAIL POST RD PORTLAND, OR 97219-6368

Address	Dates	Phone
10021 SW QUAIL POST RD PORTLAND, OR 97219-6368 MULTNOMAH COUNTY	4/1984 - 4/1986	(503) 246-4036

Census Data for Geographical Region

Median Head of Household Age: 42

Median Income: $111,801

Median Home Value: $389,176

Median Education: 15 years

Household Members

None Listed

Other Associates

None Listed

21: 111 SW 5TH AVE APT PORTLAND, OR 97204-3604

Address	Dates	Phone
111 SW 5TH AVE APT PORTLAND, OR 97204-3604 MULTNOMAH COUNTY	6/1985 - 6/1985	

Census Data for Geographical Region
Median Head of Household Age: 45
Median Income: $13,266
Median Home Value: $494,444
Median Education: 12 years
Household Members
None Listed
Other Associates
None Listed

22: 751 LAURIE AVE SANTA CLARA, CA 95054-2238

Address	Dates	Phone
751 LAURIE AVE SANTA CLARA, CA 95054-2238 SANTA CLARA COUNTY	3/1985 - 3/1985	

Census Data for Geographical Region
Median Head of Household Age: 31
Median Income: $71,307
Median Home Value: $610,632
Median Education: 13 years
Household Members
None Listed
Other Associates
None Listed

23: 11 SW 5TH AVE PORTLAND, OR 97204

Address	Dates	Phone
11 SW 5TH AVE PORTLAND, OR 97204 MULTNOMAH COUNTY	3/1985 - 3/1985	

Household Members
None Listed
Other Associates
None Listed

24: PO BOX 19835 PORTLAND, OR 97280-0835

Address	Dates	Phone
PO BOX 19835 PORTLAND, OR 97280-0835 MULTNOMAH COUNTY	4/1984 - 4/1984	

Census Data for Geographical Region
Median Head of Household Age: 32
Median Income: $45,221
Median Home Value: $477,419
Median Education: 16 years
Household Members
None Listed
Other Associates
None Listed

25: 759 LAURIE AVE SANTA CLARA, CA 95054-2238

Address	Dates	Phone
759 LAURIE AVE SANTA CLARA, CA 95054-2238 SANTA CLARA COUNTY	1/1983 - 1/1983	

Census Data for Geographical Region
Median Head of Household Age: 31
Median Income: $71,307
Median Home Value: $610,632
Median Education: 13 years
Household Members
None Listed
Other Associates
None Listed

26: 122 E 14TH ST SILVERTON, CO 81433

Address	Dates	Phone
122 E 14TH ST SILVERTON, CO 81433 SAN JUAN COUNTY	2/1982 - 2/1982	

Census Data for Geographical Region
Median Head of Household Age: 42
Median Income: $51,299
Median Home Value: $291,250
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

27: PO BOX NANSEN LAKE OSWEGO, OR 97034

Address	Dates	Phone
PO BOX NANSEN LAKE OSWEGO, OR 97034 CLACKAMAS COUNTY	2/1982 - 2/1982	

Household Members
None Listed
Other Associates
None Listed

Voter Registrations - 0 records found

Driver Licenses - 1 records found

1: Colorado Driver License

Driver Information
Name: PADRICK, KEVIN DALE
Address: 122 E 14TH ST PO*
SILVERTON, CO 81433
SAN JUAN COUNTY
Data source: Governmental: CO

Personal Information
SSN: 556-06-XXXX
DOB: 1955
Gender: Male

Height: 5'11"
Weight: 165 lbs.

Additional Driver Information

DOB: 1955
Gender: Male
Height: 5'11"
Weight: 165 lbs.

Professional Licenses - 0 records found
Health Care Providers - 0 records found
Health Care Sanctions - 0 records found
Pilot Licenses - 1 records found

1:

Name: PADRICK, KEVIN DALE
Address: 12 RIVER RD SUNRIVER, OR 97707
Record Type: HISTORICAL
Certification Class: 2
Medical Certification Date: 4/2003
Medical Date Expires: 4/2004

Certification
Type: F
Ratings: F/ASE F/HEL F/INSTI
Date Expires: 5/31/2003

Certification
Type: P
Level: C
Ratings: C/ASEL C/AMEL C/HEL C/INSTI

Certification
Type: I

Certification
Type: F
Ratings: F/ASME F/HEL F/INSTI
Date Expires: 5/31/2004

Certification
Type: F
Ratings: F/ASME F/HEL F/INSTI
Date Expires: 6/30/2005

Certification
Type: F
Ratings: F/ASME F/HEL F/INSTI
Date Expires: 6/30/2007

Certification
Type: F
Ratings: F/ASME F/HEL F/INSTI
Date Expires: 6/30/2009

Certification
Type: F
Ratings: F/ASME F/HEL F/INSTI
Date Expires: 6/30/2011

Certification
Type: P
Level: A
Ratings: A/AMEL C/ASEL C/HEL C/INSTH

Certification
Type: P

Level: A
Ratings: A/AMEL C/ASEL C/HEL C/INSTH C/GL

Certification

Type: F
Ratings: F/ASME F/HEL F/INSTI F/GL
Date Expires: 10/31/2012

Certification

Type: F
Ratings: F/ASME F/HEL F/INSTI F/GL
Date Expires: 10/31/2012

Certification

Type: P
Level: A
Ratings: A/AMEL C/ASEL C/HEL C/INSTH C/GL

Certification

Type: F
Ratings: F/ASME F/HEL F/INSTI F/GL
Date Expires: 10/31/2014

Certification

Type: F
Ratings: F/ASME F/HEL F/INSTI F/GL
Date Expires: 10/31/2016

Certification

Type: F
Ratings: F/ASME F/HEL F/INSTI F/GL
Date Expires: 10/31/2018

Sport Licenses - 0 records found
Real Property - 3 records found

1: Assessment Record for DESCHUTES County, OR

Owner Information

Name: PADRICK, KEVIN D & KAREN
Address: PO BOX 3510 SUNRIVER, OR 97707-0510
County/FIPS: DESCHUTES

Property Information

Address: 56946 RIVER RD SUNRIVER, OR 97707
County/FIPS: DESCHUTES
Data Source: B

Legal Information

Assessor's Parcel Number: 201106 CA 00100
Recording Date: 12/07/2001
Book/Page: 2001/63124

Assessment Information

Assessed Value: $1521330
Market Land Value: $151500
Market Improvement Value: $1562400
Total Market Value: $1713900

2: Assessment Record for DESCHUTES County, OR

Owner Information

Name: PADRICK, KEVIN D & KAREN
Address: PO BOX 3510 SUNRIVER, OR 97707-0510

County/FIPS: DESCHUTES

Property Information

Address: 56946 RIVER RD SUNRIVER, OR 97707
County/FIPS: DESCHUTES
Data Source: B

Legal Information

Assessor's Parcel Number: 201106 C0 00100
Recording Date: 12/07/2001
Book/Page: 2001/63124

Assessment Information

Assessed Value: $1477020
Market Land Value: $174300
Market Improvement Value: $1483920
Total Market Value: $1658220

3: Assessment Record for DESCHUTES County, OR

Owner Information

Name: K2 ENTERPRISES LLC
Name: PADRICK, KEVIN D; PADRICK, KAREN P
Address: PO BOX 3510 SUNRIVER, OR 97707-0510
County/FIPS: DESCHUTES

Property Information

Address: 56946 RIVER RD SUNRIVER, OR 97707
County/FIPS: DESCHUTES
Data Source: B

Legal Information

Assessor's Parcel Number: R 1-095 201106 C0 00100
Recording Date: 11/04/1996
Book/Page: 429/158

Sale Information

Sale Price: $148000

Assessment Information

Assessed Value: $848275
Market Land Value: $316845
Market Improvement Value: $531430
Total Market Value: $848275

Motor Vehicle Registrations - 1 records found

1: CO MVR

Registrant Information

Registrant 1

Registrant: PADRICK, KAREN P
DOB: 3/1953
Address: PO BOX 298
SILVERTON, CO 81433-0298
SAN JUAN COUNTY

Registrant 2

Registrant: PADRICK, KEVIN P
DOB: 8/1955
Address: PO BOX 298
SILVERTON, CO 81433-0298
SAN JUAN COUNTY

Registration Information

Original Registration Date: 2/4/1997
Registration Date: 2/4/1997
Registration Expiration Date: 2/28/1998

Vehicle Information

VIN: 1LESH11S9P1001669
Class: UNKNOWN
Model Year: 1993
Body Style: TILT TANDEM

Plate Information

License Plate Type: Trailer
Previous Plate Number: S08732
Previous Plate State: CO
License Plate Number: S08732
Plate State: CO

Source Information

Data Source: GOVERNMENTAL

Boats - 0 records found

Aircraft - 0 records found

Bankruptcy Information - 0 records found

Judgments/Liens - 0 records found

UCC Liens - 2 records found

1:OR UCC LIEN FILING

Debtor Information

Debtor 1

Name: PADRICK, KEVIN D
SSN: 556-06-XXXX
Address: 8 NANSEN SMT
LAKE OSWEGO, OR 97035-1041

Debtor 2

Name: PADRICK, KAREN P
SSN: 523-64-XXXX
Address: 8 NANSEN SMT
LAKE OSWEGO, OR 97035-1041

Secured Party Information

Secured 1

Name: UNITED STATES NATIONAL BANK OF OREGON
Address: 321 SW 6TH AVE
PORTLAND, OR 97204-1705

Secured 2

Name: UNITED STATES NATIONAL BANK OF OREGON
Address: 321 SW 6TH AVE
PORTLAND, OR 97204-1705

Secured 3

Name: UNITED STATES NATIONAL BANK OF OREGON
Address: 321 SW 6TH AVE
PORTLAND, OR 97204-1705

Assignee Information

Name: UNITED STATES NATIONAL BANK OF OREGON
Address: PO BOX 5308
PORTLAND, OR 97228-5308

Filing Information

Filing Jurisdiction: OREGON
Original Filing Number: P82810
Original Filing Date: 12/4/1991

Filing 1

Type: TERMINATION
Date: 8/20/1996
Number: 0000119846

Filing 2

Type: CONTINUATION
Date: 7/24/1996
Number: 0000119846

Filing 3

Type: INITIAL FILING
Number: P82810
Date: 12/4/1991
Expiration Date: 12/4/1996

Filing Office Information

Filing Agency: SECRETARY OF STATE/UCC DIVISION
Address: 143 STATE CAPITOL
SALEM, OR 97310

Collateral Information

Description: 12/04/1991 P82810 - TRANSPORTATION EQUIPMENT SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;FIXTURES SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT SPECIFIED INCLUDING PROCEEDS AND PRODUCTS

2:OR UCC LIEN FILING

Debtor Information

Debtor 1

Name: PADRICK, KEVIN
SSN: 556-06-XXXX
Address: 8 NANSEN SMT
LAKE OSWEGO, OR 97035-1041

Debtor 2

Name: PADRICK, KEVIN D
SSN: 556-06-XXXX
Address: 8 NANSEN SMT
LAKE OSWEGO, OR 97035-1041

Debtor 3

Name: PADRICK, KAREN
SSN: 523-64-XXXX
Address: 8 NANSEN SMT
LAKE OSWEGO, OR 97035-1041

Debtor 4

Name: PADRICK, KAREN P
SSN: 523-64-XXXX
Address: 8 NANSEN SMT
LAKE OSWEGO, OR 97035-1041

Secured Party Information

Secured 1

Name: UNITED STATES NATIONAL BANK OF OREGON EXECUTIVE BANKING DIVISION
Address: 321 S W SIXTH AVE
PORTLAND, OR 97204

Secured 2

Name: US NAT BK OF OR
Address: 321 SW 6TH AVE
PORTLAND, OR 97204-1705

Secured 3

Name: US NATIONAL BANK OR EXECUTIVE BKG DIV

Address: 321 SW 6TH AVE
PORTLAND, OR 97204-1705

Filing Information

Filing Jurisdiction: OREGON
Original Filing Number: P12685
Original Filing Date: 9/5/1990

Filing 1

Type: TERMINATION
Date: 10/1/1996
Number: 0000073116

Filing 2

Type: CONTINUATION
Number: P12685A
Date: 8/17/1995
Expiration Date: 9/5/2000

Filing 3

Type: INITIAL FILING
Number: P12685
Date: 9/5/1990
Expiration Date: 9/5/1995

Filing Office Information

Filing Agency: SECRETARY OF STATE/UCC DIVISION
Address: 143 STATE CAPITOL
SALEM, OR 97310

Collateral Information

Description: 09/05/1990 P12685 - TRANSPORTATION EQUIPMENT SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;FIXTURES SPECIFIED INCLUDING PROCEEDS AND PRODUCTS

Fictitious Businesses - 3 records found

1: Fictitious Businesses

Business Information

Name: ORECAL PROPERTIES
Office Address: WRIGHT 16 SW ST
OR, BE 97007-4027
Jurisdiction: OR
Type: DBA
Filing Number: 02600781
Filing Date: 03/21/1986

Contact Information

Owner 1

Name: KEVIN D. PADRICK
Address: PO BOX 298
CO, SI 81433-0298
Contact Type: CONTACT

Owner 2

Name: KEVIN D. PADRICK
Address: GREENE 12 ST
CO, SI 81433
Contact Type: CONTACT

Owner 3

Name: DONNA M. PADRICK
Address: BLAUER 20 DR
CA, SA 95070-4305

Contact Type: CONTACT

Owner 4

Name: KAREN P. PADRICK
Address: GREENE 12 ST
CO, SI 81433
Contact Type: CONTACT

Owner 5

Name: THEODORE R. JONES
Address: BERKRIDGE 63 DR
TX, HO 77053-3450
Contact Type: OWNER

2: Fictitious Businesses

Business Information

Name: SIR INVESTMENTS
Office Address: MORNING SK 13 CT
OR, LA 97034-6352
Jurisdiction: OR
Type: DBA
Filing Number: 31702855
Filing Date: 12/05/1984

Contact Information

Owner 1

Name: KEVIN D. PADRICK
Address: QUAIL POST 10 SW RD
OR, PO 97219-6368
Contact Type: CONTACT

Owner 2

Name: DEAN M. LAMPUS
Address: MORNING SK 13 CT
OR, LA 97034-6352
Contact Type: CONTACT

Owner 3

Name: EDWARD L. MALETIS
Address: 170TH 97 NW AV
OR, BE 97006
Contact Type: CONTACT

Owner 4

Name: F. M. NUGENT
Address: 61ST 12 SW CT
OR, PO 97221-1504
Contact Type: CONTACT

Owner 5

Name: JOHN W. BRADLEY
Address: 37TH 31 NE AV
OR, PO 97212-2849
Contact Type: CONTACT

Owner 6

Name: PAUL K. GRAM
Address: FLORENCE 17 SW ST
OR, BE 97078-1854
Contact Type: CONTACT

Owner 7

Name: THOMAS E. MULFLUR
Address: THURMAN 34 NW ST
OR, PO 97210-1283

Contact Type: CONTACT

Owner 8

Name: ROBERT C. FULTON
Address: SHANNON 21 LN
OR, WE 97068-9200
Contact Type: CONTACT

Owner 9

Name: DEAN M. LAMPUS
Address: 48TH 37 SW PL
OR, PO 97221-2103
Contact Type: CONTACT

3: Fictitious Businesses

Business Information

Name: NEHALEM PROPERTIES
Office Address: 144TH 14 SW AV
OR, PO 97224-1443
Jurisdiction: OR
Type: DBA
Filing Number: 29852951
Filing Date: 03/20/1984

Contact Information

Owner 1

Name: KEVIN D. PADRICK
Address: QUAIL POST 10 SW RD
OR, PO 97219-6368
Contact Type: CONTACT

Owner 2

Name: KAREN P. PADRICK
Address: QUAIL POST 10 SW RD
OR, PO 97219-6368
Contact Type: CONTACT

Owner 3

Name: DONNA J. BLY
Address: 144TH 14 SW AV
OR, PO 97224-1443
Contact Type: CONTACT

Owner 4

Name: RECE BLY
Address: 144TH 14 SW AV
OR, PO 97224-1443
Contact Type: CONTACT

Notice Of Defaults - 0 records found

Potential Relatives - 10 records found

1st Degree: 10

No.	Full Name	Address/Phone
1.	PADRICK, KAREN P • AKA PADRICK, KAREN PATRICIA • AKA PADRICK, KAREN D • AKA PATRICIA, PADRICK KAREN JR • AKA PADRICK, KAREN P SSN:556-06-XXXX DOB:3/1953	PO BOX 3510 BEND, OR 97707-0510 12 RIVER RD BEND, OR 97707 56946 RIVER RD SUNRIVER, OR 97707 12 RIVER RD

	(Age: 63)	SUNRIVER, OR 97707 (541) 593-4422 PO BOX 298 SILVERTON, CO 81433-0298
2.	PADRICK, BEN DALE ⚠ Deceased • AKA PADRICK, BENNIE DALE • AKA PADRICK, BENNIE D • AKA PADRICK, BENNIE D • AKA PADRICK, BENNIE D • AKA PADRICKETUX, BENNIE D SSN:535-20-XXXX DOB:9/1927 (Age: 89)	20215 BLAUER DR 202 SARATOGA, CA 95070-4305 PO BOX 1 MOFFETT FIELD, CA 94035-0001 8 NANSEN SMT LAKE OSWEGO, OR 97035-1041
3.	PADRICK, KEVIN DALE SSN:523-64-XXXX	PO BOX 3510 BEND, OR 97707-0510
4.	LEWIS, JANE MARIE • AKA PADRICK, JANE MARIE • AKA PADRICK, J SSN:398-62-XXXX DOB:4/1955 (Age: 61)	12235 SW MEADER WAY BEAVERTON, OR 97008-7318 2 JEFFERSON PKWY APT E14 LAKE OSWEGO, OR 97035-8872 1 JEFFERSON PKWY APT 250 LAKE OSWEGO, OR 97035-8818 5637 SW KRUSE RIDGE DR PORTLAND, OR 97219-7097 (503) 293-1652 PO BOX 990 WILSONVILLE, OR 97070-0990
5.	PADRICK, KERRY LEE • AKA PATRICK, KERRY • AKA PADRICK, KERRY R • AKA WILSON, KERRY SSN:571-37-XXXX DOB:4/1961 (Age: 55)	30845 SW ROGUE CT WILSONVILLE, OR 97070-9786 30534 SW RUTH ST WILSONVILLE, OR 97070-8693 PO BOX 990 WILSONVILLE, OR 97070-0990 1 JEFFERSON PKWY APT 250 LAKE OSWEGO, OR 97035-8818 2 JEFFERSON PKWY APT E14 LAKE OSWEGO, OR 97035-8872
6.	MOOREHEAD, KIM MARIE • AKA PADRICK, KIM M • AKA MOORHEAD, KIM M	16363 SW WRIGHT ST BEAVERTON, OR 97007-4027 (503) 591-5939 18160 COTTONWOOD RD APT 518

	SSN:556-06-XXXX DOB:8/1957 (Age: 59)	BEND, OR 97707-9317 PO BOX 4652 BEND, OR 97707-1652 3 RAGER MOUNTAIN LN SUNRIVER, OR 97707 3105 COCHISE WAY PLEASANTON, CA 94588-4006
7.	PADRICK, DANIEL LEE SSN:541-29-XXXX DOB:1/1987 (Age: 30)	20240 REED LN APT A203 BEND, OR 97702-3504 PO BOX 990 WILSONVILLE, OR 97070-0990 2147 NW MAST PL APT C LINCOLN CITY, OR 97367-4050 250 W BROADWAY APT 210 EUGENE, OR 97401-3022 12235 SW MEADER WAY BEAVERTON, OR 97008-7318
8.	PADRICK, SARAH M SSN:541-39-XXXX DOB:1/1992 (Age: 25)	12235 SW MEADER WAY BEAVERTON, OR 97008-7318 30845 SW ROGUE CT WILSONVILLE, OR 97070-9786 2751 SHADOW VIEW DR APT 237 EUGENE, OR 97408-4661 2802 GREENTREE WAY EUGENE, OR 97405-6230 2751 SHADOW APT 237 EUGENE, OR 97408
9.	PADRICK, DONNA MARIE ⚠ Deceased • AKA PADRICK, DONNAMARIE MARIE • AKA PADRICK, DONNAMARIE P SSN:531-28-XXXX DOB:6/1930 (Age: 86)	20215 BLAUER DR SARATOGA, CA 95070-4305 (408) 867-1796 PO BOX 3510 BEND, OR 97707-0510 20215 DR SARATOGA, CA 95070-4305
10.	PADRICK, CARRIE	30845 SW ROGUE CT WILSONVILLE, OR 97070-9786

Business Associates - 6 records found

1: AAHG, LLC

Name: PADRICK, KEVIN
Address: 12 RIVER RD
SUNRIVER, OR 97707

Status: ACTIVE
State: OR
Corporation Number: 32906190
Descriptive Status: ACTIVE
Title: MANAGER
Record Type: CURRENT
Record Date: 12/2/2016
Filing Date: 5/16/2011

2: CAMP ABBOT HANGAR UNIT OWNERS ASSOCIATION
Name: PADRICK, KEVIN
Address: SUNRIVER AIRPORT
SUNRIVER, OR 97707
Status: ACTIVE
State: OR
Corporation Number: 66994691
Descriptive Status: ACTIVE
Title: REGISTRANT
Record Type: CURRENT
Record Date: 12/2/2016
Filing Date: 3/3/2010

3: OBSIDIAN DVI, LLC
Name: PADRICK, KEVIN
Address: 12 RIVER RD
SUNRIVER, OR 97707
Status: ACTIVE
State: OR
Corporation Number: 32906190
Descriptive Status: ACTIVE
Title: MANAGER
Record Type: CURRENT
Record Date: 12/2/2016
Filing Date: 12/19/2005

4: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN K
Address: 10150 SW NIMBUS AVE STE E5
PORTLAND, OR 97223-4337
State: AL
Corporation Number: 909428
Title: PRESIDENT
Record Type: CURRENT
Record Date: 1/10/2017

5: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN K
Address: 1 CENTERPOINTE DR STE 500
LAKE OSWEGO, OR 97035-8615
Status: EXISTS
State: AL
Corporation Number: 909428
Descriptive Status: EXISTS
Title: PRESIDENT
Record Type: CURRENT
Record Date: 1/10/2017
Filing Date: 10/17/1994

6: SOUTHERN PACIFIC FUNDING CORPORATION

Name: PADRICK, KEVIN K
Address: 1 CENTERPOINTE DR
LAKE OSWEGO, OR 97035-8623
Status: INACTIVE
State: VT
Corporation Number: 278113
Descriptive Status: INACTIVE
Title: PRESIDENT
Record Type: CURRENT
Record Date: 11/21/2016

Person Associates - 2 records found

No.	Full Name	Address	SSN	Phone	DOB
1:	MOOREHEAD, DAVID MICHAEL MOORHEAD, DAVID M	16363 SW WRIGHT ST BEAVERTON, OR 97007-4027 3 RAGER MOUNTAIN LN SUNRIVER, OR 97707 PO BOX 4652 BEND, OR 97707-1652 RAGER MT L3 SUNRIVER, OR 97707 PO BOX 4143 BELLEVUE, WA 98009-4143	567-15-XXXX	(503) 591-5939	6/1957
2:	OTSUKI, JULIUS AKIRA OTSUKI, J A ATSUKI, JULIUS OTSUKI, JULIUS OTSUKI, JULIUS A	PO BOX 3510 BEND, OR 97707-0510 1811 S HARLAN CIR UNIT 216 LAKEWOOD, CO 80232-7097 12 RIVER RD BEND, OR 97707 1811 S HARLAN CIR APT 21 LAKEWOOD, CO 80232-7028	523-18-XXXX	(303) 424-6867	2/1922 2/1922

Neighbors - 2 records found

12 RIVER RD BEND, OR 97707

Name	Address	Phone
CHRISTENSEN, CHRIS CHRISTENSEN, MILLIE E	6 RIVER RD SUNRIVER, OR 97707	
PICKARD, JOSEPH T III	9 RIVER RD SUNRIVER, OR 97707	(541) 593-8580

Employment Locator - 37 records found

1:
Company Name: CAMP ABBOT HANGAR UNIT OWNERS ASSOCIATION
Name: PADRICK, KEVIN
Title: REGISTRANT
SSN: 556-06-XXXX
Confidence: Medium

2:
Company Name: AAHG, LLC
Name: PADRICK, KEVIN

Title: MANAGER
Address: 12 RIVER RD
SUNRIVER, OR 97707
SSN: 556-06-XXXX
Confidence: Medium

3:

Company Name: K2 JET, LLC
Name: PADRICK, KEVIN D
Title: MANAGER
Address: 12 RIVER RD
SUNRIVER, OR 97707
SSN: 556-06-XXXX
Confidence: Medium

4:

Company Name: K2 ACQUISITION, LLC
Name: PADRICK, KEVIN D
Title: MEMBER
Address: 12 RIVER RD
SUNRIVER, OR 97707
SSN: 556-06-XXXX
Confidence: Medium

5:

Company Name: OBSIDIAN FINANCE GROUP, LLC
Name: PADRICK, KEVIN
Title: MEMBER
SSN: 556-06-XXXX
Confidence: Medium

6:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN K
Title: PRESIDENT
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: High

7:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN D
Title: PRESIDENT
SSN: 556-06-XXXX
Confidence: Medium

8:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN K
Title: PRESIDENT
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: High

9:

Company Name: CAMP ABBOT HANGAR UNIT OWNERS ASSOCIATION
Name: PADRICK, KEVIN
Title: REGISTRANT
Address: SUNRIVER AIRPORT
SUNRIVER, OR 97707
SSN: 556-06-XXXX

Confidence: Medium

10:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN D
Title: PRESIDENT
Address: 68OO INDIANA AVE STE 110
RIVERSIDE, CA 92506
SSN: 556-06-XXXX
Confidence: Medium

11:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN K
Title: PRESIDENT
Address: 5 10150 SW NIMBUS AVE SUITE E
PORTLAND, OR 97223
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: Medium

12:

Company Name: K2 ACQUISITION, LLC
Name: PADRICK, KEVIN D
Title: MEMBER
Address: PO BOX 3510
BEND, OR 97707-0510
SSN: 556-06-XXXX
Confidence: Medium

13:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN
Title: DIRECTOR
Address: 1 CENTERPOINTE DR
LAKE OSWEGO, OR 97035-8623
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: High

14:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN K
Title: PRESIDENT
Address: 1 CENTERPOINTE DR
LAKE OSWEGO, OR 97035-8623
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: High

15:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN D
Title: PRESIDENT
Address: 68OO INDIANA AVE STE 110
RIVERSIDE, CA 92506
SSN: 556-06-XXXX
Confidence: Medium

16:

Company Name: K2 ENTERPRISES, LLC

Name: PADRICK, KEVIN D
Title: MEMBER

Address: PO BOX 3510
BEND, OR 97707-0510
SSN: 556-06-XXXX
Confidence: High

17:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN
Address: 1 CENTERPOINTE DR STE 551
LAKE OSWEGO, OR 97035-8605
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: High

18:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN
Title: PRESIDENT
Address: 1 CENTERPOINTE DR STE 551
LAKE OSWEGO, OR 97035-8605
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: High

19:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN
Title: DIRECTOR3
Address: 1 CENTERPOINTE DR
LAKE OSWEGO, OR 97035-8623
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: High

20:

Company Name: PACIFIC CREST TECHNOLOGY, INC.
Name: PADRICK, KEVIN D
Title: DIRECTOR
Address: 19801 SW 72ND AVE STE 350
TUALATIN, OR 97062-8344
SSN: 556-06-XXXX
Phone: (503) 636-3737
Confidence: Medium

21:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN D
Title: PRESIDENT
Address: 1 CENTERPOINTE DR STE 551
LAKE OSWEGO, OR 97035-8605
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: High

22:

Company Name: K2 JET, LLC
Name: PADRICK, KEVIN D
Title: MANAGER

Address: PO BOX 3510
BEND, OR 97707-0510
SSN: 556-06-XXXX
Confidence: Medium

23:
Company Name: EOH PORTLAND HOLDING LLC
Name: PADRICK, KEVIN D
Title: MAILING ADDRESS
Address: 85 BROAD ST
NEW YORK, NY 10004-2434
SSN: 556-06-XXXX
Confidence: Medium

24:
Company Name: OBSIDIAN FINANCE GROUP LLC
Name: PADRICK, KEVIN D
Title: PARTNER
SSN: 556-06-XXXX
Phone: (503) 245-8800
Confidence: High

25:
Company Name: OBSIDIAN FINANCE GROUP LLC
Name: PADRICK, KEVIN D
Title: PARTNER
Address: 10260 SW GREENBURG RD STE 1150
PORTLAND, OR 97223-5516
SSN: 556-06-XXXX
Phone: (503) 245-8800
Confidence: High

26:
Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN D
Title: PRESIDENT
Address: LETTER SENT TO COMPANY
LAKE OSWEGO, OR 97035
SSN: 556-06-XXXX
Confidence: Medium

27:
Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN
Title: PRESIDENT
Address: 8550 UNITED PLAZA BLVD
BATON ROUGE, LA 70809-2256
SSN: 556-06-XXXX
Confidence: Medium

28:
Company Name: SIR INVESTMENTS
Name: PADRICK, KEVIN D
Title: REGISTRANT
Address: 1385 MORNING SKY CT
LAKE OSWEGO, OR 97034-6352
SSN: 556-06-XXXX
Confidence: High

29:
Company Name: SOUTHERN PACIFIC FUNDING CORPORATION

Name: PADRICK, KEVIN D
Title: PRESIDENT
Address: 1 CENTERPOINTE DR STE 551
LAKE OSWEGO, OR 97035-8605
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: High

30:

Company Name: SOUTHERN PACIFIC FUNDING CORPORATION
Name: PADRICK, KEVIN K
Title: PRESIDENT
Address: SW NIMBUS AVE STE E5
PORTLAND, OR 97223
SSN: 556-06-XXXX
Phone: (503) 684-6316
Confidence: Medium

31:

Company Name: ORECAL PROPERTIES
Name: PADRICK, KEVIN D
Address: 16363 SW WRIGHT ST
BEAVERTON, OR 97007-4027
SSN: 556-06-XXXX
Confidence: High

32:

Company Name: ORECAL PROPERTIES
Name: PADRICK, KEVIN D
Address: 16363 SW WRIGHT ST
BEAVERTON, OR 97007-4027
SSN: 556-06-XXXX
Confidence: High

33:

Company Name: ORECAL PROPERTIES
Name: PADRICK, KEVIN D
Address: 16363 SW WRIGHT ST
BEAVERTON, OR 97007-4027
SSN: 556-06-XXXX
Confidence: High

34:

Company Name: SIR INVESTMENTS
Name: PADRICK, KEVIN D
Address: 1385 MORNING SKY CT
LAKE OSWEGO, OR 97034-6352
SSN: 556-06-XXXX
Confidence: High

35:

Company Name: NEHALEM PROPERTIES
Name: PADRICK, KEVIN D
Address: 14730 SW 144TH AVE
PORTLAND, OR 97224-1443
SSN: 556-06-XXXX
Confidence: Medium

36:

Company Name: MILLER NASH
Name: PADRICK, KEVIN DALE

Title: ATTORNEY
SSN: 556-06-XXXX
Confidence: Medium

37:

Company Name: OBSIDIAN FINANCE GROUP LLC
Name: PADRICK, KEVIN
Title: SENIOR PRINCIPALS
Address: 10260 SW GREENBURG RD STE 1150
PORTLAND, OR 97223-5516
SSN: 556-06-XXXX
Phone: (503) 245-8800
Confidence: High

Criminal Filings - 0 records found

Cellular & Alternate Phones - 5 records found

1:

Personal Information
Name: PADRICK, KEVIN
Address: HANGAR D
SUNRIVER, OR 97707
Phone Number: (541) 593-2244
Phone Type:

Carrier Information
Carrier: QWEST CORPORATION
Carrier City: BEND
Carrier State: OR

2:

Personal Information
Name: PADRICK, KEVIN
Address: 12 RIVER RD
SUNRIVER, OR 97707
Phone Number: (541) 593-2244
Phone Type: Residential

Carrier Information
Carrier: QWEST CORPORATION
Carrier City: BEND
Carrier State: OR

3:

Personal Information
Name: PADRICK, KEVIN
Address: 56946 RIVER RD
SUNRIVER, OR 97707
Phone Number: (541) 593-2244
Phone Type:

Carrier Information
Carrier: QWEST CORPORATION
Carrier City: BEND
Carrier State: OR

4:

Personal Information
Name: PADRICK, KEVIN
Address: 12 RIVER RD
SUNRIVER, OR 97707
Phone Number: (541) 593-4422

Phone Type:

Carrier Information

Carrier: QWEST CORPORATION
Carrier City: BEND
Carrier State: OR

5:

Personal Information

Name: PADRICK, KEVIN
Address: 56946 RIVER RD
SUNRIVER, OR 97707
Phone Number: (541) 593-4422
Phone Type: Residential

Carrier Information

Carrier: QWEST CORPORATION
Carrier City: BEND
Carrier State: OR

Sources - 165 records found

All Sources	165 Source Document(s)
Corporate Affiliations	6 Source Document(s)
Deed Transfers	5 Source Document(s)
Driver Licenses	1 Source Document(s)
Email addresses	1 Source Document(s)
FAA Pilot Certifications	16 Source Document(s)
FAA Pilot Licenses	1 Source Document(s)
Fictitious Business Names Records	3 Source Document(s)
Historical Person Locator	30 Source Document(s)
Motor Vehicle Registrations	3 Source Document(s)
Person Locator 1	6 Source Document(s)
Person Locator 2	13 Source Document(s)
Person Locator 5	42 Source Document(s)
Person Locator 6	7 Source Document(s)
Phone	9 Source Document(s)
PhonesPlus Records	5 Source Document(s)
Tax Assessor Records	13 Source Document(s)
UCC Lien Filings	2 Source Document(s)
Utility Locator	2 Source Document(s)

Key
High Risk Indicator. These symbols may prompt you to investigate further.
Moderate Risk Indicator. These symbols may prompt you to investigate further.
General Information Indicator. These symbols inform you that additional information is provided.
✓ The most recent telephone listing as reported by the EDA source.

Important: The Public Records and commercially available data sources used on reports have errors. Data is sometimes entered poorly, processed incorrectly and is generally not free from defect. This system should not be relied upon as definitively accurate. Before relying on any data this system supplies, it should be independently verified. For Secretary of State documents, the following data is for information purposes only and is not an official record. Certified copies may be obtained from that individual state's Department of State.

Your DPPA Permissible Use is: On Government Behalf
Your GLBA Permissible Use is: Legal Compliance

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Comprehensive Business Report

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Search Terms - company(united states minerals corp) radius(15)

Executives - Current (0)	Incorporation/SOS (1)	Operations/Sites (7)	Sales (1)
Licenses (1)	URLs (1)	Real Property - Current (0)	Real Property - Prior (1)
MVRs - Current (0)	MVRs - Prior (1)	Watercraft - Current (0)	Watercraft - Prior (0)
Aircraft - Current (0)	Aircraft - Prior (0)	Bankruptcy Filings (0)	Judgments & Liens Filings (8)
UCC Filings (66)	Executives - Prior (5)	Registered Agents (0)	Name Variations (14)
Possible Employees (3)	Person Associates (2)	Business Associates (28)	TINs (5)
Possible Connected Business (33)	Parent Company (1)	Industry Information (1)	
View All Sources (125)			

Business Summary

Name	Address	Phone
UNITED MINERAL AND CHEMICAL CORPORATION	1100 Valley Brook Ave Lyndhurst, NJ 07071-3620 Bergen County	201-507-3300 (Phone De-Listed in Electronic Directory Assistance)
LexID	Established	TIN
0000-2991-8050	2005 (12 Years in Business)	13-3325508

At a Glance

Real Property	0	UCC Debtor	45
Personal Property	0	Bankruptcy	0
Secured Assets	1	Judgments/Liens	8
Executives	0	Foreclosure/Notice of Default	0

Name Variations - 14 name variations found

NO.	NAME
1.	UNITED MINERAL AND CHEMICAL CORPORATION
2.	ALLOYCHEM INC
3.	CHEMICAL SOURCES ASSOCIATION INC
4.	EASTERN ALLOYS CORPORATION
5.	ICD GROUP INC
6.	ICD GROUP INTERNATIONAL INC
7.	UMC
8.	UMC TAPE AND PACKAGING
9.	UNITED CONSTRUCTION & MANAGEMENT
10.	UNITED MINERAL & CHEM CORP
11.	UNITED MINERAL & CHEMICAL REL
12.	UNITED MINERAL & CHEMICALCORP
13.	UNITED MINERALS AND CHEMICAL CORPORATION
14.	UNITED STATES MINERALS CORP

TINs - 5 TINs found

NO.	TIN	NAME

1.	13-332XXXX	ICD GROUP INTERNATIONAL INC U M C UNITED MINERAL & CHEMICAL CORP UNITED MINERALS & CHEMICAL CORP UNITED STATES MINERALS CORP
2.	13-1924617	ICD GROUP INTERNATIONAL INC UMC TAPE AND PACKAGING UNITED MINERAL AND CHEMICAL
3.	13-388XXXX	UNITED MINERAL & CHEMICAL CORP
4.	13-565XXXX	UNITED MINERAL & CHEMICAL CORP UNITED MINERALS & CHEMICAL CORP
5.	23-7307293	CHEMICAL SOURCES ASSOCIATION INC

Business Profile
Executives: Current - 0 executive(s) found
Incorporation/SOS (1 active, 0 other)

NO.	NAME	FILING TYPE	STATUS	FILING DATE	FILING NO.	STATE
1.	UNITED MINERALS AND CHEMICAL CORPORATION	CORPORATION-BUSINESS	ACTIVE	07/13/1956	97371	NY

Additional Details
Business Type: CORPORATION-BUSINESS
Business Status: ACTIVE
Expiration: PERPETUAL
For Profit: Unknown
Foreign/Domestic: Domestic
Origin: State of NY

Filing History (most recent two years)

Filing Date	Description
07/27/2010	AMENDMENT (DOMESTIC BUSINESS)

OperatingLocations - Showing 7 location(s)

NO.	ADDRESS	METRO AREA	PHONE
1.	5100 District Blvd Vernon, CA 90058-2730 Los Angeles County	Los Angeles-Long Beach, CA	
2.	2853 Janitell Rd Colorado Springs, CO 80906-4104 El Paso County	Colorado Springs, CO	
3.	1100 Valley Brook Ave Lyndhurst, NJ 07071-3620 Bergen County	Bergen-Passaic, NJ	201-507-3300 (Phone De-Listed in Electronic Directory Assistance) 201-438-4086 212-644-1510 (Phone De-Listed in Electronic Directory Assistance) 201-507-1506 (Fax)
4.	500 Plaza Dr Secaucus, NJ 07094-3619 Hudson County	Jersey City, NJ	
5.	3301 State Route 66 Ste 205 Neptune, NJ 07753-2705	Monmouth-Ocean, NJ	

	Monmouth County		
6.	600 Madison Ave New York, NY 10022-1615 New York County	New York, NY	
7.	75 Varick St New York, NY 10013-1917 New York County	New York, NY	212-644-1500 (Most Recent Listing) 09/01/2012 - 01/31/2017 (Business)

Sales - 1 record(s) found

ANNUAL SALES	DATE REPORTED
$2,000,000.00	09/08/2009

Parent Company - 1 record(s) found

NAME	ADDRESS	PHONE
ICD GROUP INTERNATIONAL INC	600 Madison Ave Ste 1800 New York, NY 10022-1678 New York County	212-644-1500 (Business)

Industry Information

SIC		NAIC	
1081	Metal Mining Services	423990	Other Miscellaneous Durable Goods Merchant Wholesalers
2819	Industrial Inorganic Chemicals, Nec	424690	Other Chemical and Allied Products Merchant Wholesalers
5085	Industrial Supplies		
5099	Durable Goods, Nec		
5169	Chemicals And Allied Products, Nec		
5999	Misc. Retail Stores, Nec		
9999	Nonclassifiable Establishments		
Industry Description: CHEMICALS AND ALLIED PRODUCTS, NE			
Business Description: CHEMICALS (WHOLESALE)			

Licenses - 1 licenses found

NO.	LICENSE NO.	DESCRIPTION	ISSUER	ISSUED/EXPIRED
1.		943004		Issued: 06/26/2014

URLs - 1 URLs found

UMCCORP.COM

Bankruptcy (0 active, 0 closed)

Judgments/Liens (8 filings)

NO.	FILING TYPE	AMOUNT	FILE DATE	FILE NUMBER	JURISDICTION
1.	NY CITY TAX WARRANT	$64.93	06/01/1998	5485707	NY

Debtor 1
ALLOYCHEM INC

1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Creditor 1
NYC DEPARTMENT OF FINANCE

Filing Information
Filing Date: 06/01/1998
Original Filing Number: 5485707
Jurisdiction: NY
Amount: $64.93

Filing 1
Filing Type: JUDGMENTS DOCKET
Agency State: NY

2.	JUDGMENT	$64.00	06/01/1998		

Debtor 1
ALLOYCHEM INC
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Creditor 1
NYC DEPARTMENT OF FINANCE

Filing Information
Filing Date: 06/01/1998
Amount: $64.00

Filing 1
Filing Type: JUDGMENT
Agency State: NY

3.	CITY TAX LIEN RELEASE	$64.00	05/19/1998	001097684	NY

Debtor 1
ALLOYCHEM INC
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Creditor 1
CITY OF NEW YORK

Filing Information
Filing Date: 05/19/1998
Original Filing Number: 001097684
Jurisdiction: NY
Amount: $64.00

Filing 1
Filing Number: 001097684
Filing Type: CITY TAX LIEN RELEASE
Agency: NEW YORK COUNTY CLERK
Agency State: NY
Agency County: NEW YORK
Release Date: 10/26/1998

4.	CIVIL SUIT		05/20/1996		PA

Debtor 1
BETRAM LABORATORIES, INC.
72 Readington Rd
North Branch, NJ 08876-3541
Tax Id: 99-8065950

Debtor 2
CRYSTAL SPECIALTIES, INC.
2835 Janitell Rd
Colorado Spgs, CO 80906-4104

Debtor 3
LITTON AIRTRON, AIRTRON
200 E Hanover Ave
Morris Plains, NJ 07950-2442

Debtor 4
LITTON INDUSTRIES
200 E Hanover Ave
Morris Plains, NJ 07950-2442
Tax Id: 95-2277760

Debtor 5
LITTON SYSTEMS
200 E Hanover Ave
Morris Plains, NJ 07950-2442
Tax Id: 95-2277760

Debtor 6
PRECISION RESOURCES TECHNOLOGY CORPORATION
Laguna Niguel Ca 92607
Laguna Niguel, CA 92607

Debtor 7
QUANTUM EPITAXIAL DESIGNS, INC.
119 Technology Dr
Bethlehem, PA 18015-1327
Tax Id: 23-2566613

Debtor 8
SUMITOMO ELECTRIC U.S.A., INC.
65 E 55th St
New York, NY 10022-3219

Debtor 9
UNITED MINERAL AND CHEMICAL CORPORATION
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620
Tax Id: 13-3325508

Debtor 10
VARIAN INTER-AMERICAN CORPORATION
3100 Hansen Way
Palo Alto, CA 94304-1030

Creditor 1

Elia, Bernadette

Creditor 2
Elia, F Richard

Filing Information
Filing Date: 05/20/1996
Jurisdiction: PA
Filing Status: Updates May Be Present Elsewhere In This Report; Check The Court For The Current Status

Filing 1
Filing Type: CIVIL SUIT
Filing Status: UPDATES MAY BE PRESENT ELSEWHERE IN THIS REPORT; CHECK THE COURT FOR THE CURRENT STATUS
Agency: COURT OF COMMON PLEAS
Agency State: PA
Agency County: NORTHAMPTON

5.	STATE TAX LIEN	$32,574.42	07/27/1995	DJ-175296-1995	NJ

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620
Tax Id: 13-3325508

Creditor 1
STATE OF NEW JERSEY

Filing Information
Filing Date: 07/27/1995
Original Filing Number: DJ-175296-1995
Jurisdiction: NJ
Filing Status: Updates May Be Present Elsewhere In This Report; Check The Court For The Current Status
Amount: $32,574.42

Filing 1
Filing Number: DJ-175296-1995
Filing Type: STATE TAX LIEN
Filing Status: UPDATES MAY BE PRESENT ELSEWHERE IN THIS REPORT; CHECK THE COURT FOR THE CURRENT STATUS
Agency: NEW JERSEY SUPERIOR COURT
Agency State: NJ

6.	STATE TAX LIEN	$32,574.42	07/27/1995		NJ

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620
Tax Id: 13-3325508

Creditor 1
STATE OF NEW JERSEY

Filing Information
Filing Date: 07/27/1995
Jurisdiction: NJ

Filing Status: Updates May Be Present Elsewhere In This Report; Check The Court For The Current Status
Amount: $32,574.42

Filing 1
Filing Type: STATE TAX LIEN
Filing Status: UPDATES MAY BE PRESENT ELSEWHERE IN THIS REPORT; CHECK THE COURT FOR THE CURRENT STATUS
Agency: NEW JERSEY SUPERIOR COURT
Agency State: NJ

7.	CIVIL SUIT	$669.00	11/27/1990	S02SC052502	NJ

Debtor 1
UNITED MINERAL AND CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620
Tax Id: 13-3325508

Creditor 1
WILLIAM J TUCKER

Filing Information
Filing Date: 11/27/1990
Original Filing Number: S02SC052502
Jurisdiction: NJ
Filing Status: Dismissed
Amount: $669.00

Filing 1
Filing Number: S02SC052502
Filing Type: CIVIL SUIT
Filing Status: DISMISSED
Agency: NEW JERSEY SUPERIOR COURT LAW DIVISION SPECIAL CIVIL PART
Agency State: NJ
Agency County: BERGEN
Release Date: 12/11/1990

8.	CIVIL SUIT	$687.22	03/16/1989	S0200623234	NJ

Debtor 1
ICD GROUP INC
11000 Valley Brook Ave
Lyndhurst, NJ 07071

Creditor 1
PETROKEM CORP

Filing Information
Filing Date: 03/16/1989
Original Filing Number: S0200623234
Jurisdiction: NJ
Filing Status: Updates May Be Present Elsewhere In This Report; Check The Court For The Current Status
Amount: $687.22

Filing 1
Filing Number: S0200623234
Filing Type: CIVIL SUIT
Filing Status: UPDATES MAY BE PRESENT ELSEWHERE IN THIS REPORT; CHECK THE COURT FOR THE

CURRENT STATUS
Agency: NEW JERSEY SUPERIOR COURT LAW DIVISION SPECIAL CIVIL PART
Agency State: NJ
Agency County: BERGEN
Release Date: 05/11/1989

UCC Filings (65 debtor, 1 creditor)

NO.	ROLE	STATUS	ORIG. FILING DATE	ORIG. FILE NUMBER	JURISDICTION	FILE TYPE
1.	Debtor	Active	04/09/2001	20012027505	CO	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
1560 Broadway
Denver, CO 80202

Filing 1
Filing Number: 20012027505
Filing Date: 04/09/2001
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP
2853 Janitell Rd
Colorado Springs, CO 80906-4104

Secured Party Info 1
FLEET NATL BANK
1185 Avenue Of The Americas
New York, NY 10036-2601

2.	Debtor	Active	04/03/2001	20012025776	CO	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
1560 Broadway
Denver, CO 80202

Filing 1
Filing Number: 20012025776
Filing Date: 04/03/2001
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP
2853 Janitell Rd
Colorado Springs, CO 80906-4104

Secured Party Info 1
ISRAEL DISCOUNT BANK
511 5th Ave
New York, NY 10017-4903

3.	Debtor	Active	04/03/2001	0109560391	CA	

Filing 1
Expiration: 04/03/2006

Debtor 1

UNITED MINERAL & CHEMICAL CORP.
5100 District Blvd
Vernon, CA 90058-2730

Secured Party Info 1
ISRAEL DISCOUNT BANK OF NEW YORK
511 5th Ave
New York, NY 10017-4903

4.	Debtor	Active	03/22/2001	2031796	NJ	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
State Capitol
Trenton, NJ 08608

Filing 1
Filing Number: 2031796
Filing Date: 03/22/2001
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
ISRAEL DISCOUNT BANK OF NEW YORK ATTENTION: LEGAL DEPARTMENT
511 5th Ave
New York, NY 10017-4903

Collateral
GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT ALL INCLUDING PROCEEDS AND PRODUCTS

5.	Debtor	Active	05/25/2000	20002048227	CO	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
1560 Broadway
Denver, CO 80202

Filing 1
Filing Number: 20002048227
Filing Date: 05/25/2000
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK NA
10 Exchange Pl

Jersey City, NJ 07302-3918

Collateral
INVENTORY;ACCOUNTS RECEIVABLE;FIXTURES;GENERAL INTANGIBLE(S);EQUIPMENT;DOCUMENTS;CONTRACT RIGHTS;CHATTEL PAPER

6.	Debtor	Active	09/29/1998	0000440796	OR	Assignment

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
143 State Capitol
Salem, OR 97310

Filing 2
Filing Number: 0000440796
Filing Date: 06/18/2001
Filing Type: ASSIGNMENT
Expiration: 09/28/2003

Debtor 1
UNITED MINERAL AND CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
ISRAEL DISCOUNT BANK OF NEW YORK
511 5th Ave
New York, NY 10017-4903

Assignees 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 0000440796
Filing Date: 09/29/1998
Filing Type: INITIAL FILING
Expiration: 09/28/2003

Debtor 1
UNITED MINERAL AND CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY

Collateral
FIXTURES INCLUDING PROCEEDS AND PRODUCTS;ACCOUNTS RECEIVABLE INCLUDING PROCEEDS AND PRODUCTS;MACHINERY INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT INCLUDINGPROCEEDS AND PRODUCTS;VEHICLES INCLUDING PROCEEDS AND PRODUCTS;NEGOTIABLE INSTRUMENTS INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S)

INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) INCLUDING PROCEEDS AND PRODUCTS;INVENTORY INCLUDING PROCEEDS AND PRODUCTS						
7.	Debtor	Active	05/18/1998	1132412	AR	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
256 State Capitol Building
Little Rock, AR 72201

Filing 1
Filing Number: 1132412
Filing Date: 05/18/1998
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Collateral
FIXTURES INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) INCLUDING PROCEEDS AND PRODUCTS;MACHINERY INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT INCLUDING PROCEEDS AND PRODUCTS;NEGOTIABLE INSTRUMENTS INCLUDING PROCEEDS AND PRODUCTS;INVENTORY INCLUDING PROCEEDS AND PRODUCTS;VEHICLES INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS INCLUDING PROCEEDS AND PRODUCTS;ACCOUNTS RECEIVABLE INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) INCLUDING PROCEEDS AND PRODUCTS

8.	Debtor	Active	07/31/1997	2816538	MO	Assignment

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
600 W Main St Rm 322
Jefferson City, MO 65101

Filing 2
Filing Number: 4178860
Filing Date: 06/22/2001
Filing Type: ASSIGNMENT
Expiration: 07/31/2002

Debtor 1
UNITED MINERAL & CHEMICAL
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Assignees 1
ISRAEL DISCOUNT BANK
511 5th Ave
New York, NY 10017-4903

Filing 1
Filing Number: 2816538
Filing Date: 07/31/1997
Filing Type: INITIAL FILING
Expiration: 07/31/2002

Debtor 1
UNITED MINERAL & CHEMICAL
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Collateral
UNSPECIFIED INCLUDING PROCEEDS AND PRODUCTS

9.	Debtor	Active	03/31/1997	003671215	IL	

Filing 1
Expiration: 03/31/2002

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK NA
1133 Avenue Of The Americas
New York, NY 10036-6710

Collateral
ACCOUNTS RECEIVABLE, INVENTORY, CONTRACT RIGHTS CHATTEL PAPER, GENERAL INTANGIBLE

10.	Debtor	Active	03/12/1997	04497002588	GA	Initial Filing

Filing Office Information
DE KALB SUPERIOR COURT
556 N Mcdonough St
Decatur, GA 30030

Filing 1
Filing Number: 04497002588
Filing Date: 03/12/1997
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
1133 Avenue Of The Americas
New York, NY 10036-6710

Collateral
PROCEEDS;NEGOTIABLE INSTRUMENTS;CHATTEL PAPER;GENERAL INTANGIBLE(S);INVENTORY;FIXTURES;EQUIPMENT;ACCOUNT(S);FARM PRODUCTS/CROPS;MISCELLANEOUS GOODS

11.	Debtor	Active	03/07/1997	663391	RI	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
State Capitol
Providence, RI 02903

Filing 1
Filing Number: 663391
Filing Date: 03/07/1997
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
1133 Avenue Of The Americas
New York, NY 10036-6710

Collateral
CHATTEL PAPER;ACCOUNT(S);INVENTORY;FARM PRODUCTS/CROPS;GENERAL INTANGIBLE(S);EQUIPMENT;FIXTURES;CONTRACT RIGHTS

12.	Debtor	Active	03/07/1997	26-213266	LA	Initial Filing

Filing Office Information
JEFFERSON PARISH CLERKS OFFICE
2nd & Derbigny Streets
Gretna, LA 70054

Filing 1
Filing Number: 26-213266
Filing Date: 03/07/1997
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.

Collateral
EQUIPMENT AND PRODUCTS;FARM PRODUCTS/CROPS AND PRODUCTS;FIXTURES AND PRODUCTS;INVENTORY AND PRODUCTS

13.	Debtor	Active	02/04/1997	06797001374	GA	Initial Filing

Filing Office Information
GWINNETT COUNTY SUPERIOR COURT CLERKS OFFICE
75 Langley Drive
Lawrenceville, GA 30245

Filing 1
Filing Number: 06797001374
Filing Date: 02/04/1997
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

14.	Debtor	Active	10/01/1996	02596005881	GA	Initial Filing

Filing Office Information
CHATHAM COUNTY SUPERIOR COURT
133 Montgomery Street
Savannah, GA 31401

Filing 1
Filing Number: 02596005881
Filing Date: 10/01/1996
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL AND CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

15.	Debtor	Active	07/29/1996	960000156305	FL	Continuation

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
State Capitol
Tallahassee, FL 32314

Filing 4
Filing Number: 200100079742
Filing Date: 04/12/2001
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL AND CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET NATIONAL BANK
1185 Avenue Of The Americas
New York, NY 10036-2601

Filing 3
Filing Number: 200100079741
Filing Date: 04/12/2001
Filing Type: ASSIGNMENT

Debtor 1
UNITED MINERAL AND CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Assignees 1
FLEET NATIONAL BANK
1185 Avenue Of The Americas
New York, NY 10036-2601

Filing 2
Filing Number: 200100079741
Filing Date: 04/12/2001
Filing Type: AMENDMENT
Expiration: 07/29/2006

Debtor 1
UNITED MINERAL AND CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET NATIONAL BANK
1185 Avenue Of The Americas
New York, NY 10036-2601

Filing 1
Filing Number: 960000156305
Filing Date: 07/29/1996
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL AND CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
CHATTEL PAPER INCLUDING PROCEEDS AND

PRODUCTS;INVENTORY INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS INCLUDING PROCEEDS AND PRODUCTS;FIXTURES INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) INCLUDING PROCEEDS AND PRODUCTS;FARM PRODUCTS/CROPS INCLUDING PROCEEDS AND PRODUCTS						
16.	Debtor	Active	07/17/1996	96089413	CO	Initial Filing

Filing Office Information
EL PASO COUNTY CLERK AND RECORDER
200 S Cascade Ave
Colorado Springs, CO 80903

Filing 1
Filing Number: 96089413
Filing Date: 07/17/1996
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP
2853 Janitell Rd
Colorado Springs, CO 80906-4104

Secured Party Info 1
NATWEST BANK
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
ACCOUNT ACCOUNTS RECEIVABLE FIXTURESPROCEEDS EQUIPMENT MACHINERYCONTRACT RIGHTS SEE DOCUMENT

17.	Debtor	Active	07/16/1996	962053982	CO	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
1560 Broadway
Denver, CO 80202

Filing 1
Filing Number: 962053982
Filing Date: 07/16/1996
Filing Type: INITIAL FILING
Expiration: 07/16/2001

Debtor 1
UNITED MINERAL & CHEMICAL CORP
2853 Janitell Rd
Colorado Springs, CO 80906-4104

Secured Party Info 1
NATWEST BANK NA
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
MACHINERY;EQUIPMENT;PROCEEDS;FIXTURES;INVENTORY;GENERAL INTANGIBLE(S);CONTRACT RIGHTS;PRODUCTS

18.	Debtor	Active	07/16/1996	161998146	MD	Initial Filing

Filing Office Information
SECRETARY OF STATE/DEPARTMENT OF ASSESSMENT AND TAXATION/UCC DIVISION
301 W Preston St
Baltimore, MD 21201

Filing 1
Filing Number: 161998146
Filing Date: 07/16/1996
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK N.A.
100 Exchangae Pl
Jersey City, NJ 07302

Collateral
FIXTURES;ACCOUNT(S);CONTRACT RIGHTS;GENERAL INTANGIBLE(S);INVENTORY;FARM PRODUCTS/CROPS;CHATTEL PAPER

19.	Debtor	Active	10/16/1995	152907136	MD	Initial Filing

Filing Office Information
SECRETARY OF STATE/DEPARTMENT OF ASSESSMENT AND TAXATION/UCC DIVISION
301 W Preston St
Baltimore, MD 21201

Filing 1
Filing Number: 152907136
Filing Date: 10/16/1995
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
CONTRACT RIGHTS INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER INCLUDING PROCEEDS AND PRODUCTS;FARM PRODUCTS/CROPS INCLUDING PROCEEDS AND PRODUCTS;FIXTURES INCLUDING PROCEEDS AND PRODUCTS;INVENTORY INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) INCLUDING PROCEEDS AND PRODUCTS

20.	Debtor	Active	09/06/1995	152517319	MD	Initial Filing

Filing Office Information
SECRETARY OF STATE/DEPARTMENT OF ASSESSMENT AND TAXATION/UCC DIVISION
301 W Preston St
Baltimore, MD 21201

Filing 1
Filing Number: 152517319
Filing Date: 09/06/1995
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
ACCOUNT(S) INCLUDING PROCEEDS AND PRODUCTS;FIXTURES INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPERINCLUDING PROCEEDS AND PRODUCTS;INVENTORY INCLUDING PROCEEDS AND PRODUCTS;FARM PRODUCTS/CROPS INCLUDING PROCEEDS AND PRODUCTS

~~21.~~	~~Debtor~~	~~Active~~	~~08/16/1995~~	~~003436147~~	IL	Continuation

Filing 3
Filing Number: 004183959
Filing Date: 03/21/2000
Filing Type: CONTINUATION
Expiration: 08/16/2005

Collateral
ACCOUNTS RECEIVABLE, INVENTORY, CONTRACT RIGHTS CHATTEL PAPER, GENERAL INTANGIBLE,WITH PROCEEDS,WITH PRODUCTS

Filing 2
Filing Number: 004183958
Filing Date: 03/21/2000
Filing Type: ASSIGNMENT TO A SECURED PARTY
Expiration: 08/16/2005

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK NA
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral

ACCOUNTS RECEIVABLE, INVENTORY, CONTRACT RIGHTS CHATTEL PAPER, GENERAL INTANGIBLE,WITH PROCEEDS,WITH PRODUCTS

Filing 1
Filing Number: 004183956
Filing Date: 03/21/2000
Filing Type: ASSIGNMENT TO A SECURED PARTY
Expiration: 08/16/2005

Collateral
ACCOUNTS RECEIVABLE, INVENTORY, CONTRACT RIGHTS CHATTEL PAPER, GENERAL INTANGIBLE,WITH PROCEEDS,WITH PRODUCTS

22.	Debtor	Active	08/14/1995	24581388	PA	Continuation

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
308 North Office Building
Harrisburg, PA 17120

Filing 3
Filing Number: 31301189
Filing Date: 02/22/2000
Filing Type: CONTINUATION
Expiration: 08/14/2000

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Assignees 1
FLEET BANK NA
CT/BP/F19T 10 Exchange Pl
Jersey City, NJ 07302

Filing 2
Filing Number: 31301187
Filing Date: 02/22/2000
Filing Type: ASSIGNMENT
Expiration: 08/14/2000

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Assignees 1
FLEET BANK NA
CT/BP/F19T 10 Exchange Pl
Jersey City, NJ 07302

Filing 1
Filing Number: 24581388
Filing Date: 08/14/1995
Filing Type: INITIAL FILING
Expiration: 08/14/2000

Debtor 1
UNITED MINERAL & CHEMICAL CORP

600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK NA
10 Exchange Pl
Jersey City, NJ 07302-3918

23.	Debtor	Active	07/17/1995	AM01084	OH	Continuation

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
30 E Broad St
Columbus, OH 43215

Filing 3
Filing Number: 20001750004
Filing Date: 06/21/2000
Filing Type: CONTINUATION
Expiration: 07/17/2005

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK NA
10 Exchange Place Ct Eh/415/1Mt
Jersey City, NJ 07302

Filing 2
Filing Number: 20000940836
Filing Date: 03/21/2000
Filing Type: ASSIGNMENT
Expiration: 07/17/2000

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
Natwest, Bank N A
10 Exchange Pl
Jersey City, NJ 07302-3918

Assignees 1
FLEET BANK NA
10 Exchange Place Ct Eh/415/1Mt
Jersey City, NJ 07302

Filing 1
Filing Number: AM01084
Filing Date: 07/17/1995
Filing Type: INITIAL FILING
Expiration: 07/17/2000

Debtor 1
UNITED MINERAL & CHEMICAL CORP

600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
Natwest, Bank N A
10 Exchange Pl
Jersey City, NJ 07302-3918

24.	Debtor	Active	07/17/1995	952052690	CO	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
1560 Broadway
Denver, CO 80202

Filing 1
Filing Number: 952052690
Filing Date: 07/17/1995
Filing Type: INITIAL FILING
Expiration: 07/17/2000

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK NA
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
SEE DOCUMENT FOR DETAILS

25.	Debtor	Active	07/17/1995	58447B	MI	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
430 W Allegan
Lansing, MI 48918

Filing 1
Filing Number: 58447B
Filing Date: 07/17/1995
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS ALL INCLUDING PROCEEDS ANDPRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND

PRODUCTS;FARM PRODUCTS/CROPS ALL INCLUDING PROCEEDSAND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT ALL INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS						
26.	Debtor	Active	07/17/1995	19952052690	CO	Assignment

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
1560 Broadway
Denver, CO 80202

Filing 2
Filing Number: 20002026162
Filing Date: 03/23/2000
Filing Type: ASSIGNMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK NA
10 Exchange Pl
Jersey City, NJ 07302-3918

Assignees 1
FLEET BANK NA
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
SEE DOCUMENT FOR DETAILS

Filing 1
Filing Number: 19952052690
Filing Date: 07/17/1995
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK NA
10 Exchange Pl
Jersey City, NJ 07302-3918

Assignees 1
FLEET BANK NA
10 Exchange Pl
Jersey City, NJ 07302-3918

27.	Debtor	Active	07/17/1995	003423424	IL	Continuation

Filing 2
Filing Number: 004183955

Filing Date: 03/21/2000
Filing Type: CONTINUATION
Expiration: 07/17/2005

Collateral
ACCOUNTS RECEIVABLE, INVENTORY, CONTRACT RIGHTS CHATTEL PAPER, GENERAL INTANGIBLE,WITH PROCEEDS,WITH PRODUCTS

Filing 1
Filing Number: 004183954
Filing Date: 03/21/2000
Filing Type: ASSIGNMENT TO A SECURED PARTY
Expiration: 07/17/2005

Debtor 1
UNITED MINERAL & CHEMICAL CORP
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK NA
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
ACCOUNTS RECEIVABLE, INVENTORY, CONTRACT RIGHTS CHATTEL PAPER, GENERAL INTANGIBLE,WITH PROCEEDS,WITH PRODUCTS

28.	Debtor	Active	05/16/1994	141377179	MD	Amendment

Filing Office Information
SECRETARY OF STATE/DEPARTMENT OF ASSESSMENT AND TAXATION/UCC DIVISION
301 W Preston St
Baltimore, MD 21201

Filing 2
Filing Number: 141377179
Filing Date: 12/27/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 141377179
Filing Date: 05/16/1994
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave

Lyndhurst, NJ 07071-3620

Secured Party Info 1
HOUSETON
230 Park Ave
New York, NY 10169-0005

Collateral
INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENTALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACTRIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS

29.	Debtor	Active	05/09/1994	003255665	IL	Assignment To A Secured Party

Filing 3
Filing Number: 004401314
Filing Date: 06/18/2001
Filing Type: ASSIGNMENT TO A SECURED PARTY
Expiration: 05/09/2004

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
ISRAEL DISCOUNT BANK OF NEW YORK
511 5th Ave
New York, NY 10017-4903

Collateral
ACCOUNTS RECEIVABLE, INVENTORY, CONTRACT RIGHTS CHATTEL PAPER, GENERAL INTANGIBLE,WITH PROCEEDS,WITH PRODUCTS

Filing 2
Filing Number: 003996064
Filing Date: 03/01/1999
Filing Type: CONTINUATION
Expiration: 05/09/2004

Collateral
ACCOUNTS RECEIVABLE, INVENTORY, CONTRACT RIGHTS CHATTEL PAPER, GENERAL INTANGIBLE,WITH PROCEEDS,WITH PRODUCTS

Filing 1
Filing Number: 003629716
Filing Date: 12/20/1996
Filing Type: AMENDMENT TO A SECURED PARTY
Expiration: 05/09/2004

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Collateral
ACCOUNTS RECEIVABLE, INVENTORY, CONTRACT RIGHTS CHATTEL PAPER, GENERAL INTANGIBLE,WITH PROCEEDS,WITH PRODUCTS

30.	Debtor	Active	05/09/1994	0000219272	OR	Assignment

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
143 State Capitol
Salem, OR 97310

Filing 4
Filing Number: 0000219272
Filing Date: 06/18/2001
Filing Type: ASSIGNMENT
Expiration: 05/09/2004

Debtor 1
UNITED MINERAL AND CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
ISRAEL DISCOUNT BANK OF NEW YORK
511 5th Ave
New York, NY 10017-4903

Assignees 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY

Filing 3
Filing Number: 0000219272
Filing Date: 03/04/1999
Filing Type: CONTINUATION
Expiration: 05/09/2004

Debtor 1
UNITED MINERAL AND CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY

Filing 2
Filing Number: 0000219272
Filing Date: 12/19/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK

7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 0000219272
Filing Date: 05/09/1994
Filing Type: INITIAL FILING
Expiration: 05/09/1999

Debtor 1
UNITED MINERAL AND CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
FIXTURES ALL;INVENTORY ALL;GENERAL INTANGIBLE(S) ALL;CHATTEL PAPER ALL;CONTRACT RIGHTS ALL;ACCOUNT(S) ALL

31.	Debtor	Active	05/06/1994	AK97727	OH	Continuation

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
30 E Broad St
Columbus, OH 43215

Filing 3
Filing Number: 19990680071
Filing Date: 02/22/1999
Filing Type: CONTINUATION
Expiration: 05/06/2004

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: 12189608501
Filing Date: 12/18/1996
Filing Type: AMENDMENT
Expiration: 05/06/1999

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr

New York, NY 10048

Filing 1
Filing Number: AK97727
Filing Date: 05/06/1994
Filing Type: INITIAL FILING
Expiration: 05/06/1999

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT ALL INCLUDING PROCEEDS AND PRODUCTS;NEGOTIABLE INSTRUMENTS SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;MACHINERY ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS

32.	Debtor	Active	05/06/1994	942034098	CO	Continuation

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
1560 Broadway
Denver, CO 80202

Filing 3
Filing Number: 962094354
Filing Date: 12/18/1996
Filing Type: CONTINUATION
Expiration: 05/06/2004

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: 962094353
Filing Date: 12/18/1996
Filing Type: AMENDMENT
Expiration: 05/06/2004

Debtor 1

UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Collateral
CONTRACT RIGHTS;GENERAL INTANGIBLE(S);INVENTORY;PRODUCTS;PROCEEDS;AND OTHERS;MACHINERY;EQUIPMENT;FIXTURES

Filing 1
Filing Number: 942034098
Filing Date: 05/06/1994
Filing Type: INITIAL FILING
Expiration: 05/06/1999

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Assignees 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
NEGOTIABLE INSTRUMENTS ALL INCLUDING PROCEEDS AND PRODUCTS;INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT ALL INCLUDING PROCEEDS AND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNTS RECEIVABLE SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;MACHINERY ALL INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS

33.	Debtor	Active	05/06/1994	940506-13263 9A	SC	Continuation

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
Capitol Complex Edgar Brown Bldg Room 525
Columbia, SC 29201

Filing 3
Filing Number: 990222-105412A
Filing Date: 02/22/1999
Filing Type: CONTINUATION
Expiration: 05/06/2004

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave

Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: 961217-115159B
Filing Date: 12/17/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 940506-132639A
Filing Date: 05/06/1994
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

34.	Debtor	Active	05/06/1994	940506 7704	VA	Amendment

Filing Office Information
SECRETARY OF THE COMMONWEALTH/UCC DIVISION
Old Finance Bldg Capitol Square
Richmond, VA 23219

Filing 2
Filing Number: 961213 7114
Filing Date: 12/13/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1

Filing Number: 940506 7704
Filing Date: 05/06/1994
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
CONTRACT RIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;MACHINERY ALL INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT ALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS

35.	Debtor	Active	05/06/1994	940000090348	FL	Continuation

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
State Capitol
Tallahassee, FL 32314

Filing 3
Filing Number: 990000040028
Filing Date: 02/22/1999
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY

Filing 2
Filing Number: 960000263634
Filing Date: 12/17/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr

New York, NY 10048

Filing 1
Filing Number: 940000090348
Filing Date: 05/06/1994
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS;NEGOTIABLE INSTRUMENTS SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT ALL INCLUDING PROCEEDS AND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;MACHINERY ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS

36.	Debtor	Active	05/06/1994	797989	MS	Initial Filing

Filing Office Information
UCC DIVISION
202 N Congress St
Jackson, MS 39201

Filing 1
Filing Number: 797989
Filing Date: 05/06/1994
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

37.	Debtor	Active	05/06/1994	1569497	NJ	Assignment

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
State Capitol
Trenton, NJ 08608

Filing 3
Filing Number: 1569497
Filing Date: 05/23/2001

Filing Type: ASSIGNMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Assignees 1
ISRAEL DISCOUNT BANK OF NEW YORK ATTENTION: LEGAL DEPARTMENT
511 5th Ave
New York, NY 10017-4903

Filing 2
Filing Number: 1569497
Filing Date: 12/16/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 1569497
Filing Date: 05/06/1994
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
EQUIPMENT ALL INCLUDING PROCEEDS AND PRODUCTS;NEGOTIABLE INSTRUMENTS ALL INCLUDING PROCEEDS AND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS

38.	Debtor	Active	05/06/1994	1105097	NC	Continuation

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
300 N Salisbury St, Legis Off Bldg
Raleigh, NC 27603

Filing 3
Filing Number: 199916925
Filing Date: 02/22/1999
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: 1408178
Filing Date: 12/16/1996
Filing Type: AMENDMENT
Expiration: 05/06/1999

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 1105097
Filing Date: 05/06/1994
Filing Type: INITIAL FILING
Expiration: 05/06/1999

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT ALL INCLUDING PROCEEDS AND PRODUCTS

39.	Debtor	Active	05/06/1994	06094810601	GA	Continuation

Filing Office Information
FULTON COUNTY SUPERIOR COURT CLERKS OFFICE
136 Pryor St Sw 1st Floor
Atlanta, GA 30303

Filing 2
Filing Number: 06099004399
Filing Date: 03/08/1999
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 06096025016
Filing Date: 12/17/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

40.	Debtor	Active	07/12/1991	1407932	NJ	Assignment

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
State Capitol
Trenton, NJ 08608

Filing 3
Filing Number: 1407932
Filing Date: 06/19/2001
Filing Type: ASSIGNMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORPORATION
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Assignees 1
ISRAEL DISCOUNT BANK OF NEW YORK ATTENTION: LEGAL DEPARTMENT
511 5th Ave
New York, NY 10017-4903

Filing 2
Filing Number: 1407932
Filing Date: 06/27/1996
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORPORATION
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Filing 1
Filing Number: 1407932
Filing Date: 07/12/1991
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
FIXTURES SPECIFIED AND PROCEEDS;MACHINERY SPECIFIED AND PROCEEDS;INVENTORY SPECIFIED AND PROCEEDS;EQUIPMENT SPECIFIED AND PROCEEDS;COMPUTER EQUIPMENT SPECIFIED AND PROCEEDS;GENERAL INTANGIBLE(S) SPECIFIED AND PROCEEDS;CHATTEL PAPER SPECIFIED AND PROCEEDS;ACCOUNT(S) SPECIFIED AND PROCEEDS;CONTRACT RIGHTS SPECIFIED AND PROCEEDS

41.	Debtor	Active		96386779	MA	Continuation

Filing 2
Filing Number: 00766339
Filing Date: 12/28/2000
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr

New York, NY 10048

Filing 1
Filing Number: 96386779

Debtor 1
UNITED MINERAL & CHEMICAL
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

42.	Debtor	Active		96375726	MA	Continuation

Filing 2
Filing Number: 00751542
Filing Date: 10/23/2000
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL, CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET NATIONAL BANK
10 Exchange Pl
Jersey City, NJ 07302-3918

Filing 1
Filing Number: 96375726

Debtor 1
UNITED MINERAL & CHEMICAL, CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
Natwest Bank, N A
10 Exchange Pl
Jersey City, NJ 07302-3918

43.	Debtor	Active		95332163	MA	Continuation

Filing 3
Filing Number: 00703173
Filing Date: 03/22/2000
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL, CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N. A.
10 Exchange Pl

Jersey City, NJ 07302-3918

Filing 2
Filing Number: 00703160
Filing Date: 03/22/2000
Filing Type: ASSIGNMENT

Debtor 1
UNITED MINERAL & CHEMICAL, CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
Natwest Bank, N A
10 Exchange Pl
Jersey City, NJ 07302-3918

Assignees 1
FLEET BANK, N. A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Filing 1
Filing Number: 95332163

Debtor 1
UNITED MINERAL & CHEMICAL, CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
Natwest Bank, N A
10 Exchange Pl
Jersey City, NJ 07302-3918

44.	Debtor	Active		95326089	MA	Continuation

Filing 3
Filing Number: 00700693
Filing Date: 03/10/2000
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL, CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N. A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Filing 2
Filing Number: 00700613
Filing Date: 03/10/2000
Filing Type: ASSIGNMENT

Debtor 1
UNITED MINERAL & CHEMICAL, CORP.
600 Madison Ave

New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK
10 Exchange Pl
Jersey City, NJ 07302-3918

Assignees 1
FLEET BANK
10 Exchange Pl
Jersey City, NJ 07302-3918

Filing 1
Filing Number: 95326089

Debtor 1
UNITED MINERAL & CHEMICAL, CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
Natwest, Bank N A
10 Exchange Pl
Jersey City, NJ 07302-3918

45.	Debtor	Active		9400086712	TX	Continuation

Filing 3
Filing Number: 9900625798
Filing Date: 02/25/1999
Filing Type: CONTINUATION
Expiration: 05/06/2004

Filing 2
Filing Number: 9600749426
Filing Date: 12/18/1996
Filing Type: AMENDMENT, MASTER AMENDMENT
Expiration: 05/06/2004

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Filing 1
Filing Number: 9400086712
Filing Date: 05/06/1994
Filing Type: UCC STANDARD
Expiration: 05/06/2004

46.	Debtor	Closed	10/16/2002	02234992	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave

Albany, NY 12210

Filing 4
Filing Number: 201509186046961
Filing Date: 09/18/2015
Filing Type: TERMINATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
HSBC BANK USA, NATIONAL ASSOCIATION
452 5th Ave
New York, NY 10018-2706

Filing 3
Filing Number: 201206135680063
Filing Date: 06/13/2012
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.

Secured Party Info 1
HSBC BANK USA, NATIONAL ASSOCIATION SUCCESSOR BY MERGER TO H

Filing 2
Filing Number: 200706265619159
Filing Date: 06/26/2007
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.

Secured Party Info 1
HSBC BANK USA, NATIONAL ASSOCIATION SUCCESSOR BY MERGER TO H

Filing 1
Filing Number: 02234992
Filing Date: 10/16/2002
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
HSBC BANK USA
452 5th Ave
New York, NY 10018-2706

Collateral
UNSPECIFIED

47.	Debtor	Closed	06/21/2002	02145613	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave
Albany, NY 12210

Filing 3
Filing Number: 200907105634318
Filing Date: 07/10/2009
Filing Type: TERMINATION

Debtor 1
UNITED MINERALS AND CHEMICALS CORPORATION

Secured Party Info 1
ISRAEL DISCOUNT BANK OF NEW YORK

Filing 2
Filing Number: 200705075462611
Filing Date: 05/07/2007
Filing Type: CONTINUATION

Debtor 1
Melville, Andrew

Secured Party Info 1
ISRAEL DISCOUNT BANK OF NEW YORK

Filing 1
Filing Number: 02145613
Filing Date: 06/21/2002
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATION
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
ISRAEL DISCOUNT BANK OF NEW YORK
511 5th Ave
New York, NY 10017-4903

Collateral
EQUIPMENT;ACCOUNT(S);INVENTORY;GENERAL INTANGIBLE(S);CHATTEL PAPER;FIXTURES

48.	Debtor	Closed	02/27/2002	02047525	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave
Albany, NY 12210

Filing 3
Filing Number: 02233474
Filing Date: 10/15/2002
Filing Type: TERMINATION

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATION

Secured Party Info 1
FLEET BANK, NA

Filing 2
Filing Number: 02064162
Filing Date: 03/19/2002
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL AND CHEMICAL CORPORATION

Secured Party Info 1
FIRST BANK, N.A.

Filing 1
Filing Number: 02047525
Filing Date: 02/27/2002
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
1185 Avenue Of The Americas
New York, NY 10036-2601

Collateral
UNSPECIFIED

49.	Debtor	Closed	02/27/2002	02047520	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave
Albany, NY 12210

Filing 3
Filing Number: 02233477
Filing Date: 10/15/2002
Filing Type: TERMINATION

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATION

Secured Party Info 1
FLEET BANK, NA

Filing 2
Filing Number: 02064168
Filing Date: 03/19/2002
Filing Type: AMENDMENT

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATION

600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.

Filing 1
Filing Number: 02047520
Filing Date: 02/27/2002
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
1185 Avenue Of The Americas
New York, NY 10036-2601

Collateral
UNSPECIFIED

50.	Debtor	Closed	02/27/2002	02047517	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave
Albany, NY 12210

Filing 3
Filing Number: 02233479
Filing Date: 10/15/2002
Filing Type: TERMINATION

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATION

Secured Party Info 1
FLEET BANK, NA

Filing 2
Filing Number: 02064170
Filing Date: 03/19/2002
Filing Type: AMENDMENT

Debtor 1
UNITED MINERALS AND CHEMICALS CORPORATION

Secured Party Info 1
FLEET BANK, N.A.

Filing 1
Filing Number: 02047517
Filing Date: 02/27/2002
Filing Type: INITIAL FILING

Debtor 1

UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
1185 Avenue Of The Americas
New York, NY 10036-2601

Collateral
UNSPECIFIED

51.	Debtor	Closed	02/27/2002	02047506	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave
Albany, NY 12210

Filing 3
Filing Number: 02233480
Filing Date: 10/15/2002
Filing Type: TERMINATION

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATION

Secured Party Info 1
FLEET BANK, NA

Filing 2
Filing Number: 02064175
Filing Date: 03/19/2002
Filing Type: AMENDMENT

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATION

Secured Party Info 1
FLEET BANK, N.A.

Filing 1
Filing Number: 02047506
Filing Date: 02/27/2002
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
1185 Avenue Of The Americas
New York, NY 10036-2601

Collateral
UNSPECIFIED

52.	Debtor	Closed	02/27/2002	02047503	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave
Albany, NY 12210

Filing 3
Filing Number: 02233470
Filing Date: 10/15/2002
Filing Type: TERMINATION

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATION

Secured Party Info 1
FLEET BANK, NA

Filing 2
Filing Number: 02064180
Filing Date: 03/19/2002
Filing Type: AMENDMENT

Debtor 1
UNITED MINERALS & CHEMICAL CORPORATION

Secured Party Info 1
FLEET BANK, N.A.

Filing 1
Filing Number: 02047503
Filing Date: 02/27/2002
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
1185 Avenue Of The Americas
New York, NY 10036-2601

Collateral
UNSPECIFIED

53.	Debtor	Closed	02/27/2002	02047500	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave
Albany, NY 12210

Filing 3
Filing Number: 02233468
Filing Date: 10/15/2002
Filing Type: TERMINATION

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATION

Secured Party Info 1
FLEET BANK, NA

Filing 2
Filing Number: 02064184
Filing Date: 03/19/2002
Filing Type: AMENDMENT

Debtor 1
UNITED MINERALS AND CHEMICAL CORPORATIONS

Secured Party Info 1
FLEET BANK, N.A.

Filing 1
Filing Number: 02047500
Filing Date: 02/27/2002
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
1185 Avenue Of The Americas
New York, NY 10036-2601

Collateral
UNSPECIFIED

54.	Debtor	Closed	03/15/1996	1687055	NJ	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
315 W State St
Trenton, NJ 08618

Filing 4
Filing Number: 1687055
Filing Date: 10/23/2002
Filing Type: TERMINATION

Debtor 1
FLEET BANK, NA

Secured Party Info 1
UNITED MINERAL & CHEMICAL CORP.

Filing 3
Filing Number: 1687055
Filing Date: 12/07/2000
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave

New York, NY 10022-1615

Secured Party Info 1
FLEET NATIONAL BANK
10 Exchange Pl
Jersey City, NJ 07302-3918

Filing 2
Filing Number: 1687055
Filing Date: 12/06/2000
Filing Type: ASSIGNMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Assignees 1
FLEET NATIONAL BANK
10 Exchange Pl
Jersey City, NJ 07302-3918

Filing 1
Filing Number: 1687055
Filing Date: 03/15/1996
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
CHATTEL PAPER;EQUIPMENT;INVENTORY;FIXTURES;GENERAL INTANGIBLE(S);CONTRACT RIGHTS;ACCOUNT(S);FARM PRODUCTS/CROPS

55.	Debtor	Closed	08/14/1995	1651836	NJ	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
315 W State St
Trenton, NJ 08618

Filing 4
Filing Number: 1651836
Filing Date: 10/23/2002
Filing Type: TERMINATION

Debtor 1

FLEET BANK, NA

Secured Party Info 1
UNITED MINERAL & CHEMICAL CORP.

Filing 3
Filing Number: 1651836
Filing Date: 04/07/2000
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Filing 2
Filing Number: 1651836
Filing Date: 04/07/2000
Filing Type: ASSIGNMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Assignees 1
FLEET BANK, NA
10 Exchange Place Ct Eh/415/1Mt
Jersey City, NJ 07302

Filing 1
Filing Number: 1651836
Filing Date: 08/14/1995
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Collateral
EQUIPMENT INCLUDING PROCEEDS AND PRODUCTS;FIXTURES INCLUDING PROCEEDS AND PRODUCTS;INVENTORY INCLUDING PROCEEDS AND PRODUCTS;FARM PRODUCTS/CROPS INCLUDING

PROCEEDS AND PRODUCTS;CHATTEL PAPER INCLUDINGPROCEEDS AND PRODUCTS;ACCOUNT(S) INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS INCLUDING PROCEEDSAND PRODUCTS;GENERAL INTANGIBLE(S) INCLUDING PROCEEDS AND PRODUCTS						
56.	Debtor	Closed	07/17/1995	9520160498	CA	Ucc3 Continuation

Filing 2
Filing Number: 00075C0361
Filing Date: 03/10/2000
Filing Type: UCC3 CONTINUATION
Expiration: 07/18/2005

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, NA
10 Exchange Pl
Jersey City, NJ 07302-3918

Filing 1
Filing Number: 00075C0357
Filing Date: 03/10/2000
Filing Type: UCC3 ASSIGNMENT
Expiration: 07/18/2005

57.	Debtor	Closed	07/17/1995	95143597	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave
Albany, NY 12210

Filing 3
Filing Number: 02233469
Filing Date: 10/15/2002
Filing Type: TERMINATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.

Secured Party Info 1
FLEET BANK NA

Filing 2
Filing Number: 00032049
Filing Date: 02/16/2000
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
FLEET BANK, N.A.

10 Exchange Pl
Jersey City, NJ 07302-3918

Filing 1
Filing Number: 00032048
Filing Date: 02/16/2000
Filing Type: ASSIGNMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
600 Madison Ave
New York, NY 10022-1615

Secured Party Info 1
NATWEST BANK N.A.
10 Exchange Pl
Jersey City, NJ 07302-3918

Assignees 1
FLEET BANK, NA
10 Exchange Place Ct Bp/F19t
Jersey City, NJ 07302

58.	Debtor	Closed	05/16/1994	36-83538	LA	Termination

Filing Office Information
ORLEANS PARISH CLERK
421 Loyola Ave
New Orleans, LA 70112

Filing 4
Filing Number: 36-159034
Filing Date: 06/11/2001
Filing Type: TERMINATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Bro0k Ave
Lyndhurst, NJ 07071

Secured Party Info 1
STANDARD CHARTERED BANK

Filing 3
Filing Number: 36-136529
Filing Date: 03/02/1999
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK

Filing 2
Filing Number: 36-113180
Filing Date: 12/16/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK

Filing 1
Filing Number: 36-83538
Filing Date: 05/16/1994
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;VEHICLES ALL INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENTALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;MACHINERY ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS

59.	Debtor	Closed	05/06/1994	94091030	NY	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
162 Washington Ave
Albany, NY 12210

Filing 3
Filing Number: 01112462
Filing Date: 06/11/2001
Filing Type: TERMINATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: 99033947
Filing Date: 02/19/1999

Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 96245801
Filing Date: 12/12/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

60.	Debtor	Closed	05/06/1994	42501B	MI	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
430 W Allegan
Lansing, MI 48918

Filing 4
Filing Number: 0458829T
Filing Date: 06/11/2001
Filing Type: TERMINATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 3
Filing Number: D483739
Filing Date: 02/26/1999
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1

STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: D173879
Filing Date: 12/17/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 42501B
Filing Date: 05/06/1994
Filing Type: INITIAL FILING

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
VEHICLES SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDS AND PRODUCTS;NEGOTIABLE INSTRUMENTS SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS ANDPRODUCTS;EQUIPMENT ALL INCLUDING PROCEEDS AND PRODUCTS;MACHINERY ALL INCLUDING PROCEEDS AND PRODUCTS;INVENTORY ALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS

61.	Debtor	Closed	05/06/1994	11194000334	GA	Termination

Filing Office Information
PEACH COUNTY SUPERIOR COURT
205 W. Church St.
Fort Valley, GA 31030

Filing 3
Filing Number: 11101000341
Filing Date: 06/12/2001
Filing Type: TERMINATION

Debtor 1

UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: 11199000153
Filing Date: 03/08/1999
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 11196001026
Filing Date: 12/17/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

62.	Debtor	Closed	05/06/1994	0797989	MS	Termination

Filing Office Information
UCC DIVISION
202 N Congress St
Jackson, MS 39201

Filing 4
Filing Number: 1531974
Filing Date: 06/11/2001
Filing Type: TERMINATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr

New York, NY 10048

Filing 3
Filing Number: 1299171
Filing Date: 03/02/1999
Filing Type: CONTINUATION
Expiration: 05/06/2004

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: 1061181
Filing Date: 12/20/1996
Filing Type: AMENDMENT
Expiration: 05/06/1999

Debtor 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 0797989
Filing Date: 05/06/1994
Filing Type: INITIAL FILING
Expiration: 05/06/1999

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

Collateral
NEGOTIABLE INSTRUMENTS SPECIFIED INCLUDING PROCEEDS AND PRODUCTS;CHATTEL PAPER ALL INCLUDING PROCEEDS AND PRODUCTS;CONTRACT RIGHTS ALL INCLUDING PROCEEDS AND PRODUCTS;ACCOUNT(S) ALL INCLUDING PROCEEDSAND PRODUCTS;FIXTURES ALL INCLUDING PROCEEDS AND PRODUCTS;MACHINERY ALL INCLUDING PROCEEDS AND PRODUCTS;GENERAL INTANGIBLE(S) ALL INCLUDING PROCEEDS AND PRODUCTS;EQUIPMENT ALL INCLUDING PROCEEDS ANDPRODUCTS;INVENTORY ALL INCLUDING PROCEEDS AND

PRODUCTS						
63.	Debtor	Closed	05/06/1994	04094000548	GA	Termination

Filing Office Information
CRISP COUNTY SUPERIOR COURT CLERKS OFFICE
210 7th St South
Cordele, GA 31015

Filing 3
Filing Number: 04001001086
Filing Date: 06/12/2001
Filing Type: TERMINATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: 04099000406
Filing Date: 03/08/1999
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 04096001607
Filing Date: 12/17/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

64.	Debtor	Closed	05/06/1994	03394003908	GA	Termination

Filing Office Information
COBB COUNTY SUPERIOR COURT
32 Waddell St
Marietta, GA 30090

Filing 3
Filing Number: 03301007298
Filing Date: 06/13/2001
Filing Type: TERMINATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 2
Filing Number: 03399003887
Filing Date: 03/08/1999
Filing Type: CONTINUATION

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
7 World Trade Ctr
New York, NY 10048

Filing 1
Filing Number: 03396017400
Filing Date: 12/17/1996
Filing Type: AMENDMENT

Debtor 1
UNITED MINERAL & CHEMICAL CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Secured Party Info 1
STANDARD CHARTERED BANK
160 Water St
New York, NY 10038-4922

65.	Debtor	Closed	08/20/1993	1527738	NJ	Termination

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
State Capitol
Trenton, NJ 08608

Filing 1
Filing Number: 1527738
Filing Date: 12/09/1993
Filing Type: TERMINATION

Debtor 1
ICD GROUP INC
1100 Valley Brook Ave

Lyndhurst, NJ 07071-3620

Secured Party Info 1
SWISS BANK CORPORATION
222 Broadway
New York, NY 10038-2510

66.	Creditor	Active	08/12/1999	19992045662	CO	Initial Filing

Filing Office Information
SECRETARY OF STATE/UCC DIVISION
1560 Broadway
Denver, CO 80202

Filing 1
Filing Number: 19992045662
Filing Date: 08/12/1999
Filing Type: INITIAL FILING

Debtor 1
CRYSTAL SPECIALTIES INC
2853 Janitell Rd
Colorado Springs, CO 80906-4104

Secured Party Info 1
UNITED MINERAL & CHEMICAL CORP
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620

Collateral
EQUIPMENT

Real Property (0 current, 1 prior)

NO.	ADDRESS	STATUS	PURCHASE PRICE	SALE PRICE	STATE
1.	1354 Milledge Ave NJ Bergen County Source: B	Prior			NJ

Owner 1 Information
UNITED MINERAL AND CHEMICAL COMPANY
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620
Bergen County

Legal Information
Parcel Number: P00006026564
Assessment Year: 2012
Document Type: ASSESSOR
Assessed Value: $214,690.00
Total Market Value: $536,734.00
Type of Address: BUSINESS PERSONAL PROPERTY (GE

Personal Property (0 current, 1 prior)

NO.	TYPE	STATUS	YEAR/MAKE	MODEL	VIN
1.	MVR	Prior	2000 Lincoln	TOWN CAR EXECUTIVE,	1L1FM81W5YY820360

				Limousine	

Vehicle Information
VIN: 1L1FM81W5YY820360
Year: 2000
Make: Lincoln
Model: TOWN CAR EXECUTIVE
Style: Limousine
Base Price: $38,630.00

Source Information
Data Source: GOVERNMENTAL

Registrant 1
UNITED MINERAL & CHEM. CORP.
1100 Valley Brook Ave
Lyndhurst, NJ 07071-3620
Bergen County
Jurisdiction: NY
License Plate: ABP4091
License Plate Type: Other
Registration Date: 01/04/2000
Registration Expiration Date: 02/02/2000

Associates

Executives: Prior - 5 prior executive(s) found

NO.	NAME	TITLE
1.	Becidyan, Nurhan Associated with Other Companies	CHAIRMAN
2.	Bogen, Ellen	VICE PRESIDENT (01/1977 - 06/10/2013)
3.	Leviant, Jacques	CHAIRMAN (09/1987 - 06/18/2014)
4.	Leviant, Jacques Associated with Other Companies	CHIEF EXECUTIVE OFFICER (01/1977 - 06/10/2013)
5.	Von Brauschitch, Gerhard	MANAGING DIRECTOR

Registered Agents - 0 registered agent(s) found

Possible Employees - 1 current, 2 prior employees found

NO.	NAME	ADDRESS	STATUS	DATE(S)
1.	Becidyan, Norman N/A	1100 Valley Brook Ave Lyndhurst, NJ 07071-3620	Current	07/01/2002 - 04/19/2016
2.	Becidyan, A	1100 Valley Brook Ave Lyndhurst, NJ 07071-3620	Prior	
3.	Befumo, Phil N/A	1100 Valley Brook Ave Lyndhurst, NJ 07071-3620	Prior	11/26/2013 - 02/27/2014

Person Associates - 2 other person associates found

NO.	NAME	ADDRESS	ROLE

1.	Alpert, Stephen H	230 Park Ave New York, NY 10169-0005 New York County	UCC
2.	Simon, Salas Moderate Risk	25 Elm Pl Brooklyn, NY 11201-5826 Kings County	Judgment/Lien

Possible Connected Business - 33 businesses found

NO.	NAME	ADDRESS
1.	ALLOYCHEM INC.	600 Madison Ave New York, NY 10022-1615 New York County
2.	ANDREW M CLOHERTY CARPENTRY	10 Chester Pl West Roxbury, MA 02132-1818 Suffolk County
3.	CHEMICAL SOURCES ASSOCIATION I	PO Box 3189 Secaucus, NJ 07096-3189 Hudson County
4.	HACKENSACK MEDICAL	5 Summit Ave Hackensack, NJ 07601-8503 Bergen County
5.	ICD GROUP INTERNATIONAL INC	600 Madison Ave Ste 1800 New York, NY 10203-0001 New York County
6.	LIVINGSTON UNITED METHODIST CH	290 W Hobart Gap Rd Livingston, NJ 07039-5145 Essex County
7.	QUINTON UNITED METHODIST CHURC	PO Box 116 Quinton, NJ 08072-0116 Salem County
8.	U MC	PO Box 5593 Parsippany, NJ 07054-6593 Morris County
9.	UMC CORP.	733 Yonkers Ave Yonkers, NY 10704-2635 Westchester County
10.	UMC CORPORATION	378 Washington St Newark, NJ 07102-1217 Essex County
11.	UMC INC	24 Burnett Ter West Orange, NJ 07052-3810 Essex County
12.	UNITED CONSTRUCTION & MANAGEME	37 Vreeland Ave Totowa, NJ 07512-1160 Passaic County
13.	UNITED CONSTRUCTION AND MANAGE	15 Ramsey Rd Middletown, NJ 07748-3038
14.	UNITED CONSTRUCTION AND MANAGE	335 Clifton Ave Clifton, NJ 07011-2618 Passaic County
15.	UNITED CONSTRUCTION MANAGEMENT	Newark, NJ
16.	UNITED CONSTRUCTION MANAGEMENT	3288 Delsea Dr Franklinville, NJ 08322-3165 Gloucester County
17.	UNITED CONSTRUCTION MANAGEMENT	9-25 Alling St Ste 8 Newark, NJ 07102-5376

		Essex County
18.	UNITED MINERAL & CHEMICAL	475 Division St Elizabeth, NJ 07201-2044 Union County
19.	UNITED MINERAL & CHEMICAL CORP	1100 Valley Rd Lyndhurst, NJ 07071 Bergen County
20.	UNITED MINERAL & CHEMICAL CORP	1100 Valley Bro0k Ave Lyndhurst, NJ 07071 Bergen County
21.	UNITED MINERAL & CHEMICAL CORP	129 Hudson St New York, NY 10013-2333 New York County
22.	UNITED MINERAL & CHEMICAL CORP	155 Myrtle Ave Irvington, NJ 07111-3358
23.	UNITED MINERAL & CHEMICAL CORP	18 Van Veghten Dr Bridgewater, NJ 08807-3259 Somerset County
24.	UNITED MINERAL & CHEMICAL CORP	521 Clouet St New Orleans, LA 70117-6714 Orleans County
25.	UNITED MINERAL & CHEMICAL CORP	711 3rd Ave New York, NY 10017-4014 New York County
26.	UNITED MINERAL AND CHEMICAL CO	110 Valley Brook Ave Lyndhurst, NJ 07071-1855 Bergen County
27.	UNITED MINERAL AND CHEMICAL CO	129 E Holsman St Paterson, NJ 07522-1822
28.	UNITED MINERAL AND CHEMICAL CO	2201 Mount Ephraim Ave Camden, NJ 08104-3232 Camden County
29.	UNITED MINERAL AND CHEMICAL CO	72 Ave Paterson, NJ 07644
30.	UNITED MINERAL AND CHEMICAL CO	926 Rxr Plz Uniondale, NY 11556-0926
31.	UNITED MINERAL CHEMICAL	43 Quincy St Passaic, NJ 07055-6608
32.	UNIVERSAL INTL GROUP TRV	2110 Madison Ave Apt 6A New York, NY 10037-2811 New York County
33.	US MINERALS INC	250 Kings Point Rd Great Neck, NY 11024-1022 Nassau County

Business Associates - 28 business associates found

NO.	NAME	ADDRESS	ROLE
1.	BETRAM LABORATORIES, INC.	72 Readington Rd Branchburg, NJ 08876-3541 Somerset County	Judgment/Lien
2.	CITY OF NEW YORK		Judgment/Lien
3.	CRYSTAL SPECIALTIES INC	2853 Janitell Rd Colorado Springs, CO 80906-4104 El Paso County	UCC

4.	CRYSTAL SPECIALTIES, INC.	2835 Janitell Rd Colorado Springs, CO 80906-4104 El Paso County	Judgment/Lien
5.	FLEET BANK	10 Exchange Pl Jersey City, NJ 07302-3918 Hudson County	UCC
6.	FLEET BANK NA	1133 Avenue Of The Americas New York, NY 10036-6710 New York County	UCC
7.	FLEET BANK NA	CT/BP/F19T 10 Exchange Pl Jersey City, NJ 07302 Hudson County	UCC
8.	FLEET BANK, N.A.	1185 Avenue Of The Americas New York, NY 10036-2601 New York County	UCC
9.	FLEET BANK, NA	10 Exchange Place Ct Eh/415/1Mt Jersey City, NJ 07302 Hudson County	UCC
10.	FLEET BANK, NA	10 Exchange Place Ct Bp/F19t Jersey City, NJ 07302 Hudson County	UCC
11.	HOUSETON	230 Park Ave New York, NY 10169-0005 New York County	UCC
12.	HSBC BANK USA	452 5th Ave New York, NY 10018-2706 New York County	UCC
13.	HSBC BANK USA, NATIONAL ASSOCIATION	452 5th Ave New York, NY 10018-2706 New York County	UCC
14.	ISRAEL DISCOUNT BANK OF NEW YORK	511 5th Ave New York, NY 10017-4903 New York County	UCC
15.	LITTON AIRTRON, AIRTRON	200 E Hanover Ave Morris Plains, NJ 07950-2442 Morris County	Judgment/Lien
16.	NATWEST BANK	10 Exchange Pl Jersey City, NJ 07302-3918 Hudson County	UCC
17.	NATWEST BANK N.A.	100 Exchangae Pl Jersey City, NJ 07302 Hudson County	UCC
18.	NYC DEPARTMENT OF FINANCE	25 Elm Pl Brooklyn, NY 11201-5826 Kings County	Judgment/Lien
19.	OTTERBOURG	230 Park Ave New York, NY 10169-0005 New York County	UCC
20.	PRECISION RESOURCES TECHNOLOGY CORPORATION	Laguna Niguel Ca 92607 Laguna Niguel, CA 92607 Orange County	Judgment/Lien
21.	QUANTUM EPITAXIAL DESIGNS, INC.	119 Technology Dr Bethlehem, PA 18015-1327 Northampton County	Judgment/Lien
22.	ROSEN PC	230 Park Ave New York, NY 10169-0005 New York County	UCC

23.	STANDARD CHARTERED BANK	7 World Trade Ctr New York, NY 10048	UCC
24.	STEINDLER	230 Park Ave New York, NY 10169-0005 New York County	UCC
25.	SUMITOMO ELECTRIC U.S.A., INC.	65 E 55th St New York, NY 10022-3219 New York County	Judgment/Lien
26.	SWISS BANK CORPORATION	222 Broadway New York, NY 10038-2510 New York County	UCC
27.	UNITED MINERAL AND CHEMICAL COMPANY	1354 Milledge Ave	Real Property
28.	VARIAN INTER-AMERICAN CORPORATION	3100 Hansen Way Palo Alto, CA 94304-1030 Santa Clara County	Judgment/Lien

Sources

All Sources	125 Source Documents
Experian Business Data	5 Source Documents
Real Property	8 Source Documents
Personal Property	1 Source Documents
Corporate Filings	1 Source Documents
Judgment & Liens	8 Source Documents
UCC	66 Source Documents
Government Agency	10 Source Documents
Other Directories	12 Source Documents
Telco	7 Source Documents
Experian FEIN	3 Source Documents
Experian	4 Source Documents

Key:

High Risk Indicator. These symbols may prompt you to investigate further.
Moderate Risk Indicator. These symbols may prompt you to investigate further.
General Information Indicator. These symbols inform you that additional information is provided.
The most recent telephone listing as reported by Electronic Directory Assistance.
Wireless Phone Indicator. These symbols indicate a cell phone number.
Residential Phone Indicator. These symbols indicate a residential phone number.
Business Phone Indicator. These symbols indicate a business phone number.
Shared Phone Indicator. These symbols indicate the phone number may be shared between wireless and landline service.
FAX Indicator. These symbols indicate a FAX number.
Government Phone Indicator. These symbols indicate a government phone number.

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1 OF 1 RECORD(S)

FEIN Records

This data is for informational purposes only.

TIN: 13-3325508
Company Name: UNITED MINERAL & CHEMICAL CORP
SIC Code: 1081
SIC Description: METAL MINING SERVICES
Address(s): 600 MADISON AVE
NEW YORK, NY 10022
Contact Name: GERHARD VON BRAUSCHITCH
Title: MANAGING DIRECTOR

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Date:3/7/2017
Report processed by:
Toeroek Associates Inc||

Full Name	Address	County	Phone
JONES, MITCHEL CRAIG	PO BOX 992978 REDDING, CA 96099-2978 SHASTA COUNTY	SHASTA	None Listed

ADDITIONAL PERSONAL INFORMATION

SSN	DOB	Gender	LexID(sm)
563-51-XXXX	9/1963 (Age:53)		001281267673

Subject Summary

Name Variations

1: JONES, MITCH
2: JONES, MITCHEL
3: JONES, MITCHEL C
4: JONES, MITCHEL CRAIG
5: JONES, MITCHELL
6: JONES, MITCHELL C
7: JONES, NITCHEL C
8: MITCHELL, JONES

SSNs Summary

No.	SSN	State Iss.	Date Iss.	Warnings
		Most frequent SSN attributed to subject:		
1:	563-51-XXXX	California	1978	

DOBs

Reported DOBs:
9/1963

Possible E-Mail Addresses

MJONES647@COX.NET
MJONES647@HOME.COM
MJONES647@ATTBI.COM
MITCHELJONES@EXCITE.COM
MITCH@EMCCORPORATION.NET

Others Using SSN - 0 records found

Address Summary - 25 records found

No.	Address
1:	PO BOX 992978 REDDING, CA 96099-2978 SHASTA COUNTY
2:	15801 HORSELESS CARRIAGE DR REDDING, CA 96001-9527 SHASTA COUNTY

3: 20007 GILMAN RD
LAKEHEAD, CA 96051-9632
SHASTA COUNTY

4: 251 HILLTOP DR APT 31
REDDING, CA 96003-3221
SHASTA COUNTY

5: 1041 LIBERTY ST
REDDING, CA 96001-0712
SHASTA COUNTY

6: 3782 SISKIYOU ST
REDDING, CA 96001-2900
SHASTA COUNTY

7: 500 HILLTOP DR APT 239
REDDING, CA 96003-2849
SHASTA COUNTY

8: 560 N SAN PEDRO RD
SAN RAFAEL, CA 94903-3029
MARIN COUNTY

9: 500 HILLPRK DR # 239
REDDING, CA 96003
SHASTA COUNTY

10: 2898 ASPEN GLOW LN
REDDING, CA 96001-5715
SHASTA COUNTY

11: 2177 ANGIE PL
REDDING, CA 96001-2441
SHASTA COUNTY

12: 1443 FRESWICK DR
FOLSOM, CA 95630-5302
SACRAMENTO COUNTY

13: 4422 CLAY ST
REDDING, CA 96003-2417
SHASTA COUNTY

14: 2400 NATOMA STATION DR APT 14
FOLSOM, CA 95630-8151
SACRAMENTO COUNTY

15: 2400 NATOMA STATION DR APT 141
FOLSOM, CA 95630-8156
SACRAMENTO COUNTY

16: 4420 CLAY ST APT 1
REDDING, CA 96003-2450
SHASTA COUNTY

17: 1625 HWY 299W
REDDING, CA 96002
SHASTA COUNTY

18: 16625 STATE HIGHWAY 299 W
REDDING, CA 96001-9621
SHASTA COUNTY

19: 16625 HY 299 W
REDDING, CA 96001
SHASTA COUNTY

20: 7101 CANA HWY
CHICO, CA 95973-9469
BUTTE COUNTY

21: 4820 AIRPORT
REDDING, CA 96002
SHASTA COUNTY

22: 1859 HELLER LN
REDDING, CA 96001-4425
SHASTA COUNTY

23: 1791 SHERIDAN ST APT
REDDING, CA 96001-2550
SHASTA COUNTY

24: 299 W
REDDING, CA 96001
SHASTA COUNTY

25: 3154 RIESLING PATH
REDDING, CA 96001-1365
SHASTA COUNTY

Address Details

1: PO BOX 992978 REDDING, CA 96099-2978

Address	Dates	Phone
PO BOX 992978 REDDING, CA 96099-2978 SHASTA COUNTY	11/2004 - 2/2017	

Census Data for Geographical Region

Median Head of Household Age: 42
Median Income: $47,407
Median Home Value: $229,717
Median Education: 13 years

Household Members

JONES, TRACI LYNN

Other Associates

None Listed

2: 15801 HORSELESS CARRIAGE DR REDDING, CA 96001-9527

Address	Dates	Phone
15801 HORSELESS CARRIAGE DR REDDING, CA 96001-9527 SHASTA COUNTY	1/2008 - 4/2016	

Census Data for Geographical Region

Median Head of Household Age: 43
Median Income: $88,404
Median Home Value: $439,024
Median Education: 14 years

Household Members
JONES, GREGORY M
Other Associates
RYAN, BRENDA JEAN

3: 20007 GILMAN RD LAKEHEAD, CA 96051-9632

Address	Dates	Phone
20007 GILMAN RD LAKEHEAD, CA 96051-9632 SHASTA COUNTY	2013 - 3/2016	

Census Data for Geographical Region
Median Head of Household Age: 51
Median Income: $43,500
Median Home Value: $217,500
Median Education: 13 years
Household Members
JONES, GREGORY M
JONES, ROBERTA S
Other Associates
None Listed

4: 251 HILLTOP DR APT 31 REDDING, CA 96003-3221

Address	Dates	Phone
251 HILLTOP DR APT 31 REDDING, CA 96003-3221 SHASTA COUNTY	1/2012 - 11/2013	

Census Data for Geographical Region
Median Head of Household Age: 46
Median Income: $42,201
Median Home Value: $292,073
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

5: 1041 LIBERTY ST REDDING, CA 96001-0712

Address	Dates	Phone
1041 LIBERTY ST REDDING, CA 96001-0712 SHASTA COUNTY	3/2005 - 8/2006	

Census Data for Geographical Region
Median Head of Household Age: 47
Median Income: $22,836
Median Home Value: $256,250
Median Education: 13 years
Household Members
None Listed
Other Associates
None Listed

6: 3782 SISKIYOU ST REDDING, CA 96001-2900

Address	Dates	Phone
3782 SISKIYOU ST REDDING, CA 96001-2900 SHASTA COUNTY	1992 - 11/2005	(530) 242-0782

Census Data for Geographical Region
Median Head of Household Age: 44

Median Income: $92,130
Median Home Value: $353,103
Median Education: 14 years
Household Members
JONES, TRACI LYNN
Other Associates
None Listed

7: 500 HILLTOP DR APT 239 REDDING, CA 96003-2849

Address	Dates	Phone
500 HILLTOP DR APT 239 REDDING, CA 96003-2849 SHASTA COUNTY	5/2004 - 10/2004	

Census Data for Geographical Region
Median Head of Household Age: 46
Median Income: $42,201
Median Home Value: $292,073
Median Education: 14 years
Household Members
None Listed
Other Associates
None Listed

8: 560 N SAN PEDRO RD SAN RAFAEL, CA 94903-3029

Address	Dates	Phone
560 N SAN PEDRO RD SAN RAFAEL, CA 94903-3029 MARIN COUNTY	9/1996 - 10/2004	(415) 472-4131

Census Data for Geographical Region
Median Head of Household Age: 52
Median Income: $82,880
Median Home Value: $685,606
Median Education: 14 years
Household Members
JONES, TRACI LYNN
Other Associates
None Listed

9: 500 HILLPRK DR # 239 REDDING, CA 96003

Address	Dates	Phone
500 HILLPRK DR # 239 REDDING, CA 96003 SHASTA COUNTY	3/2004 - 3/2004	

Household Members
None Listed
Other Associates
None Listed

10: 2898 ASPEN GLOW LN REDDING, CA 96001-5715

Address	Dates	Phone
2898 ASPEN GLOW LN REDDING, CA 96001-5715 SHASTA COUNTY	1998 - 9/2003	(530) 242-0782

Census Data for Geographical Region
Median Head of Household Age: 41
Median Income: $91,912
Median Home Value: $353,395
Median Education: 14 years

Household Members
None Listed
Other Associates
None Listed

11: 2177 ANGIE PL REDDING, CA 96001-2441

Address	Dates	Phone
2177 ANGIE PL REDDING, CA 96001-2441 SHASTA COUNTY	1996 - 4/2003	(530) 244-3025

Census Data for Geographical Region
Median Head of Household Age: 33
Median Income: $31,881
Median Home Value: $240,714
Median Education: 12 years
Household Members
None Listed
Other Associates
None Listed

12: 1443 FRESWICK DR FOLSOM, CA 95630-5302

Address	Dates	Phone
1443 FRESWICK DR FOLSOM, CA 95630-5302 SACRAMENTO COUNTY	11/2001 - 2/2003	

Census Data for Geographical Region
Median Head of Household Age: 34
Median Income: $136,706
Median Home Value: $554,805
Median Education: 15 years
Household Members
None Listed
Other Associates
None Listed

13: 4422 CLAY ST REDDING, CA 96003-2417

Address	Dates	Phone
4422 CLAY ST REDDING, CA 96003-2417 SHASTA COUNTY	2/1984 - 8/2002	(530) 244-3025

Census Data for Geographical Region
Median Head of Household Age: 41
Median Income: $42,707
Median Home Value: $251,724
Median Education: 13 years
Household Members
None Listed
Other Associates
None Listed

14: 2400 NATOMA STATION DR APT 14 FOLSOM, CA 95630-8151

Address	Dates	Phone
2400 NATOMA STATION DR APT 14 FOLSOM, CA 95630-8151 SACRAMENTO COUNTY	8/2001 - 9/2001	

Census Data for Geographical Region
Median Head of Household Age: 36
Median Income: $138,047

Median Home Value: $470,963
Median Education: 16 years
Household Members
None Listed
Other Associates
None Listed

15: 2400 NATOMA STATION DR APT 141 FOLSOM, CA 95630-8156

Address	Dates	Phone
2400 NATOMA STATION DR APT 141 FOLSOM, CA 95630-8156 SACRAMENTO COUNTY	8/2001 - 8/2001	

Census Data for Geographical Region
Median Head of Household Age: 36
Median Income: $138,047
Median Home Value: $470,963
Median Education: 16 years
Household Members
None Listed
Other Associates
None Listed

16: 4420 CLAY ST APT 1 REDDING, CA 96003-2450

Address	Dates	Phone
4420 CLAY ST APT 1 REDDING, CA 96003-2450 SHASTA COUNTY	4/1996 - 2000	

Census Data for Geographical Region
Median Head of Household Age: 41
Median Income: $42,707
Median Home Value: $251,724
Median Education: 13 years
Household Members
None Listed
Other Associates
None Listed

17: 1625 HWY 299W REDDING, CA 96002

Address	Dates	Phone
1625 HWY 299W REDDING, CA 96002 SHASTA COUNTY	6/1995 - 6/1995	(530) 244-3025

Household Members
None Listed
Other Associates
None Listed

18: 16625 STATE HIGHWAY 299 W REDDING, CA 96001-9621

Address	Dates	Phone
16625 STATE HIGHWAY 299 W REDDING, CA 96001-9621 SHASTA COUNTY	2/1984 - 12/1992	(530) 244-3025

Census Data for Geographical Region
Median Head of Household Age: 47
Median Income: $75,455
Median Home Value: $407,813
Median Education: 13 years
Household Members

None Listed
Other Associates
None Listed

19: 16625 HY 299 W REDDING, CA 96001

Address	Dates	Phone
16625 HY 299 W REDDING, CA 96001 SHASTA COUNTY	12/1991 - 12/1991	

Household Members
None Listed
Other Associates
None Listed

20: 7101 CANA HWY CHICO, CA 95973-9469

Address	Dates	Phone
7101 CANA HWY CHICO, CA 95973-9469 BUTTE COUNTY	2/1991 - 2/1991	

Census Data for Geographical Region
Median Head of Household Age: 45
Median Income: $70,170
Median Home Value: $252,083
Median Education: 12 years
Household Members
None Listed
Other Associates
None Listed

21: 4820 AIRPORT REDDING, CA 96002

Address	Dates	Phone
4820 AIRPORT REDDING, CA 96002 SHASTA COUNTY	6/1989 - 12/1990	

Household Members
None Listed
Other Associates
None Listed

22: 1859 HELLER LN REDDING, CA 96001-4425

Address	Dates	Phone
1859 HELLER LN REDDING, CA 96001-4425 SHASTA COUNTY	5/1988 - 5/1988	(530) 247-3878

Census Data for Geographical Region
Median Head of Household Age: 40
Median Income: $49,100
Median Home Value: $277,679
Median Education: 13 years
Household Members
None Listed
Other Associates
None Listed

23: 1791 SHERIDAN ST APT REDDING, CA 96001-2550

Address	Dates	Phone

1791 SHERIDAN ST APT REDDING, CA 96001-2550 SHASTA COUNTY	4/1985 - 4/1986

Census Data for Geographical Region
Median Head of Household Age: 33
Median Income: $31,881
Median Home Value: $240,714
Median Education: 12 years
Household Members
None Listed
Other Associates
None Listed

24: 299 W REDDING, CA 96001

Address	Dates	Phone
299 W REDDING, CA 96001 SHASTA COUNTY	2/1984 - 2/1984	

Household Members
None Listed
Other Associates
None Listed

25: 3154 RIESLING PATH REDDING, CA 96001-1365

Address	Dates	Phone
3154 RIESLING PATH REDDING, CA 96001-1365 SHASTA COUNTY	10/2005 -	(530) 605-0975

Census Data for Geographical Region
Median Head of Household Age: 41
Median Income: $92,014
Median Home Value: $352,250
Median Education: 15 years
Household Members
None Listed
Other Associates
None Listed

Voter Registrations - 0 records found
Driver Licenses - 1 records found

1: California Driver License

Driver Information
Name: JONES, MITCHEL C
Address: 2177 ANGIE PL
REDDING, CA 96001-2441
SHASTA COUNTY
Data source: Non-Governmental: CA
Personal Information
SSN: 563-51-XXXX

Additional Driver Information

Professional Licenses - 0 records found
Health Care Providers - 0 records found
Health Care Sanctions - 0 records found
Pilot Licenses - 0 records found
Sport Licenses - 0 records found
Real Property - 15 records found

1: Assessment Record for SHASTA County, CA

Owner Information

Name: JONES MITCHEL C
Address: PO BOX 992978 REDDING, CA 96099-2978
County/FIPS: SHASTA

Property Information

Address: 20007 GILMAN RD LAKEHEAD, CA 96051-9632
County/FIPS: SHASTA
Data Source: B

Legal Information

Assessor's Parcel Number: 084-270-001-000

Assessment Information

Assessed Value: $147509

2: Assessment Record for SHASTA County, CA

Owner Information

Name: JONES MITCHEL C
Address: PO BOX 992978 REDDING, CA 96099-2978
County/FIPS: SHASTA

Property Information

Address: 20007 GILMAN RD LAKEHEAD, CA 96051-9632
County/FIPS: SHASTA
Data Source: B

Legal Information

Assessor's Parcel Number: 084-270-01

Assessment Information

Assessed Value: $145294

3: Deed Record for SHASTA County

Buyer Information

Name: JONES, MITCHEL C
Address: 15801 HORSELESS CARRIAGE DR REDDING, CA 96001-9527
County/FIPS: SHASTA

Seller Information

Name: JONES, GREGORY M

Property Information

Address: 20007 GILMAN RD LAKEHEAD, CA 96051-9632
County/FIPS: SHASTA
Data Source: B

Lender Information

Name: AMERICAN PACIFIC MORTGAGE CORP

Legal Information

Assessor's Parcel Number: 684-270-01
Contract Date: 01/23/2014
Recording Date: 01/31/2014
Document Number: 2014-0002806
Document Type: GRANT DEED

Sale Information

Sale Price: $80000

Mortgage Information

Loan Amount: $86500
Loan Type: NEW CONVENTIONAL
Title Company: PLACER TITLE COMPANY

4: Deed Record for SHASTA County

Buyer Information
Name: JONES, MITCHEL C
Name: JONES, GREGORY M
Address: 15801 HORSELESS CARRIAGE DR REDDING, CA 96001-9527
County/FIPS: SHASTA

Seller Information
Name: PLOTTS III, THOMAS P
Name: JONES/SEANOR TRUST,

Property Information
Address: 20007 GILMAN RD LAKEHEAD, CA 96051-9632
County/FIPS: SHASTA
Data Source: B

Legal Information
Assessor's Parcel Number: 084-270-01
Contract Date: 07/30/2012
Recording Date: 08/29/2012
Document Number: 2012-0028850
Document Type: QUIT CLAIM DEED

Mortgage Information
Loan Type: THIS CODE IS USED ONLY FOR BKFS LEGACY
Title Company: NONE AVAILABLE

5: Assessment Record for SHASTA County, CA

Owner Information
Name: JONES MITCHEL C & TRACI LYNN
Address: 3782 SISKIYOU ST REDDING, CA 96001-2900
County/FIPS: SHASTA

Property Information
Address: 3782 SISKIYOU ST REDDING, CA 96001-2900
County/FIPS: SHASTA
Data Source: B

Legal Information
Assessor's Parcel Number: 104-890-07
Recording Date: 1992
Book/Page: 2945/659

Assessment Information
Assessed Value: $318750

6: Assessment Record for SHASTA County, CA

Owner Information
Name: JONES MITCHEL & TRACI
Address: 3782 SISKIYOU ST REDDING, CA 96001-2900
County/FIPS: SHASTA

Property Information
Data Source: B

Legal Information

Assessor's Parcel Number: 046-030-05
Recording Date: 1998
Book/Page: 3740/581

Assessment Information

Assessed Value: $3306

7: Assessment Record for SHASTA County, CA

Owner Information

Name: JONES MITCHEL & TRACI
Address: 3782 SISKIYOU ST REDDING, CA 96001-2900
County/FIPS: SHASTA

Property Information

Data Source: B

Legal Information

Assessor's Parcel Number: 046-030-06
Recording Date: 1998
Book/Page: 3740/581

Assessment Information

Assessed Value: $1000

8: Assessment Record for SHASTA County, CA

Owner Information

Name: JONES MITCHEL & TRACI
Address: 3782 SISKIYOU ST REDDING, CA 96001-2900
County/FIPS: SHASTA

Property Information

Data Source: B

Legal Information

Assessor's Parcel Number: 046-030-08
Recording Date: 1998
Book/Page: 3740/581

Assessment Information

Assessed Value: $9370

9: Assessment Record for SHASTA County, CA

Owner Information

Name: JONES MITCHEL & TRACI
Address: 3782 SISKIYOU ST REDDING, CA 96001-2900
County/FIPS: SHASTA

Property Information

Data Source: B

Legal Information

Assessor's Parcel Number: 046-030-09
Recording Date: 1998
Book/Page: 3740/581

Assessment Information

Assessed Value: $2000

10: Assessment Record for SHASTA County, CA

Owner Information

Name: JONES MITCHEL & TRACI
Address: 3782 SISKIYOU ST REDDING, CA 96001-2900

County/FIPS: SHASTA

Property Information

Data Source: B

Legal Information

Assessor's Parcel Number: 046-030-11

Recording Date: 1998

Book/Page: 3740/581

Assessment Information

Assessed Value: $8269

11: Assessment Record for SHASTA County, CA

Owner Information

Name: JONES MITCHEL & TRACI

Address: 3782 SISKIYOU ST REDDING, CA 96001-2900

County/FIPS: SHASTA

Property Information

Data Source: B

Legal Information

Assessor's Parcel Number: 065-620-05

Recording Date: 1998

Book/Page: 3740/581

Assessment Information

Assessed Value: $8819

12: Deed Record for SHASTA County

Buyer Information

Name: JONES, MITCHEL C

Name: JONES, TRACI LYNN

Address: 3782 SISKIYOU ST REDDING, CA 96001-2900

County/FIPS: SHASTA

Seller Information

Name: COON, THOMAS M

Name: COON, CAROLYN E

Property Information

Address: 3782 SISKIYOU ST REDDING, CA 96001-2900

County/FIPS: SHASTA

Data Source: B

Lender Information

Name: OPTION ONE MORTGAGE CORP

Legal Information

Assessor's Parcel Number: 104-890-07

Contract Date: 07/23/2003

Recording Date: 08/04/2003

Document Number: 2003-0050809

Document Type: GRANT DEED

Sale Information

Sale Price: $312500

Mortgage Information

Loan Amount: $296875

Loan Type: UNKNOWN

Title Company: ALLIANCE TITLE COMPANY

13: Assessment Record for SHASTA County, CA

Owner Information

Name: JONES MITCHEL C & TRACI L
Address: 2177 ANGIE PL REDDING, CA 96001-2441
County/FIPS: SHASTA

Property Information

Address: 2177 ANGIE PL REDDING, CA 96001-2441
County/FIPS: SHASTA
Data Source: B

Legal Information

Assessor's Parcel Number: 105-560-05
Recording Date: 1996
Book/Page: 3466/642

Assessment Information

Assessed Value: $140508

14: Assessment Record for MARIN County, CA

Owner Information

Name: JONES TRACI L & JONES MITCHELL C
Address: 560 N SAN PEDRO RD SAN RAFAEL, CA 94903-3029
County/FIPS: MARIN

Property Information

Address: 560 N SAN PEDRO RD SAN RAFAEL, CA 94903-3029
County/FIPS: MARIN
Data Source: B

Legal Information

Assessor's Parcel Number: 180-221-38
Recording Date: 03/03/2000

Sale Information

Sale Price: $510000

Assessment Information

Assessed Value: $516038

15: Deed Record for MARIN County

Buyer Information

Name: JONES, MITCHELL C
Name: JONES, TRACI L
Address: 560 N SAN PEDRO RD SAN RAFAEL, CA 94903-3029
County/FIPS: MARIN

Seller Information

Name: 411 NEW YORK OWNERS CORP
Address: 550 N SAN PEDRO RD SAN RAFAEL, CA 94903-3029
County/FIPS: MARIN

Property Information

Address: 560 N SAN PEDRO RD SAN RAFAEL, CA 94903-3029
County/FIPS: MARIN
Data Source: B

Lender Information

Name: UNITED PANAM MTG

Legal Information

Assessor's Parcel Number: 180-221-38
Contract Date: 03/16/1999
Recording Date: 04/01/1999
Document Number: 1999-0025487
Document Type: GRANT DEED

Sale Information

Sale Price: $496000

Mortgage Information

Loan Amount: $396800
Title Company: CALIFORNIA LAND TITLE CO

Motor Vehicle Registrations - 0 records found

Boats - 0 records found

Aircraft - 0 records found

Bankruptcy Information - 1 records found

1: CALIFORNIA EASTERN - SACRAMENTO

Petitioner Information

Petitioner 1

Name: JONES, MITCHEL
Address: 2177 ANGIE PL REDDING, CA 96001-2441
SSN: 563-51-XXXX
Type: INDIVIDUAL - JOINT

Petitioner 2

Name: JONES, TRACI
Address: 2177 ANGIE PL REDDING, CA 96001-2441
SSN: 541-94-XXXX
Type: INDIVIDUAL - JOINT

Bankruptcy Information

Case Number: 0027165
Court: CALIFORNIA EASTERN - SACRAMENTO
Filing Date: 06/21/2000
Filing Type: CHAPTER 7
Meeting Date:
Meeting Time: 0900

Status Information

Status: DISCHARGED
Status Date: 09/28/2000

Trustee Information

Name: DACQUISTO, MICHAEL P
Address: PO BOX 992631 REDDING, CA 96099-2631

Attorney Information

Attorney 1

Name:
MARK W BRIDEN ATT AT LAW
Address: 691 MARAGLIA ST STE D REDDING, CA 96002-1029

Attorney 2

Name: BRIDEN, MARK W
Address: 691 MARAGLIA ST STE D REDDING, CA 96002-1029

Judgments/Liens - 2 records found

1: CA Judgments and Liens Filings

Debtor Information

Name: JONES, MITCHEL C
SSN: 563-51-XXXX
Address: 15801 HORSELESS CARRIAGE DR
REDDING, CA 96001-9527
SHASTA COUNTY

Creditor Information

Name: COUNTY OF SHASTA

Filing Information

Jurisdiction: CA
Amount: $58
Filing Date: 11/14/2016

Filing 1

Number: 20160035239
Type: COUNTY TAX LIEN
Agency: SHASTA COUNTY COURT (RD)
Agency State: CA
Agency County: SHASTA

2: CA Judgments and Liens Filings

Debtor Information

Name: JONES, MITCHEL C
SSN: 563-51-XXXX
Address: 15801 HORSELESS CARRIAGE DR
REDDING, CA 96001-9527
SHASTA COUNTY

Creditor Information

Name: COUNTY OF SHASTA

Filing Information

Jurisdiction: CA
Amount: $58
Original Filing Number: 20150034110
Filing Date: 11/19/2015
Release Date: 2/24/2016

Filing 1

Number: 20160004910
Type: COUNTY TAX LIEN RELEASE
Agency: SHASTA COUNTY COURT (RD)
Agency State: CA
Agency County: SHASTA

Filing 2

Number: 20150034110
Type: COUNTY TAX LIEN
Agency: SHASTA COUNTY COURT (RD)
Agency State: CA
Agency County: SHASTA

UCC Liens - 0 records found
Fictitious Businesses - 0 records found
Notice Of Defaults - 0 records found
Potential Relatives - 10 records found

1st Degree: 10

No.	Full Name	Address/Phone
1.	JONES, TRACI LYNN • AKA HOLT, TRACI L • AKA HOLTJONES, TRACI L • AKA JONES, TRACI HOLT • AKA ABERSOLD, TRACI L • AKA HOLT, JONES TRACI • AKA HOLT JONES, TRACI • AKA JONES, TRAC HOLT • AKA JONES, TRAC L • AKA ABERSOLD, TRACI • AKA ABERSOLD, TRACI	3956 WHITNEY CT REDDING, CA 96001-5829 (530) 242-0784 4365 HEATHER RIDGE LN REDDING, CA 96001-6139 (530) 215-1350 PO BOX 992978 REDDING, CA 96099-2978 3782 SISKIYOU ST REDDING, CA 96001-2900

• AKA JONESHOLT, TRACI LYNN
• AKA HOLY-JONES, TRACI L
• AKA ABERSOLD, TRACI L
• AKA JONES HOLT, TRACI LYNN

SSN:541-94-XXXX
DOB:8/1966
(Age: 50)

(530) 242-0784

560 N SAN PEDRO RD
SAN RAFAEL, CA 94903-3029
(415) 472-4131

2. JONES, TERRA A

SSN:625-92-XXXX
DOB:12/1992
(Age: 24)

4101 SAINT PATRICKS AVE APT 4
REDDING, CA 96003-2260

3956 WHITNEY CT
REDDING, CA 96001-5829
(530) 242-0784

107 ALMOND ST
MEDFORD, OR 97504-7328

189 NORTHRIDGE TER
MEDFORD, OR 97501-8962

3872 JEWELL ST APT H203
SAN DIEGO, CA 92109-6423
(858) 412-6307

3. JONES, MITCHELL GRANT

• AKA JONES, MITCHELL D
• AKA AONES, MITCHELL G
• AKA JONES, MITCH G
• AKA JONES, M G
• AKA JONES, MITCH G
• AKA JONES, MITHCHELL

SSN:509-90-XXXX
DOB:11/1977
(Age: 39)

16511 149TH TER
BONNER SPRINGS, KS 66012-9378
(913) 441-1935

10808 W 95TH TER
OVERLAND PARK, KS 66214-2204
(913) 744-2930

8793 W 106TH TER
OVERLAND PARK, KS 66212-5500

8920 W 80TH ST
OVERLAND PARK, KS 66204-3308
(913) 825-1454

7705 CONSER ST
OVERLAND PARK, KS 66204-2826

4. JONES, MICHAEL L

• AKA JONES, MICHAEL L
• AKA JONES, MICHAEL LEONARD
• AKA JONES, MIKE
• AKA JONES, MIKE
• AKA JONES, MIKE L

SSN:560-50-XXXX
DOB:10/1940
(Age: 76)

3075 NORTHWOODS WAY
REDDING, CA 96002-2149

1141 RUTHIE LN
REDDING, CA 96002-2905
(530) 605-1336
(530) 222-6009

5375 RANCHO VISTA WAY
REDDING, CA 96002-9455
(530) 605-0994
(530) 605-3553

PO BOX 493066
REDDING, CA 96049-3066

11241 RUTHIE AVE
REDDING, CA 96002

5.	JONES, GREGORY M	20007 GILMAN RD LAKEHEAD, CA 96051-9632
6.	JONES, ROBERTA S Deceased • AKA JONES, ROBERTA A SSN:573-58-XXXX DOB:12/1942 (Age: 74)	20007 GILMAN RD LAKEHEAD, CA 96051-9632 PO BOX 66 LAKEHEAD, CA 96051-0066 1012 B RT LAKEHEAD, CA 96051
7.	JONES, STACY D • AKA REED, STACY D • AKA JONES, STACY D • AKA JONES, STACEY SSN:564-08-XXXX	4555 RIDDLE RD APT 144 SHASTA LAKE, CA 96019-2281 9216 FRENCH CREEK RD ETNA, CA 96027-9720 (530) 467-3488 (530) 467-3024 251 HILLTOP DR APT 130 REDDING, CA 96003-3247 32 NAOMI DR ETNA, CA 96027-9564 (530) 467-3410 3532 BRIDGER DR REDDING, CA 96002-2368 (530) 722-9982
8.	JOHNSON, NANCY KAY Deceased • AKA JONES, NANCY K • AKA JOHNSON, NANC • AKA NANCY, K JOHNSON SSN:509-46-XXXX DOB:3/1947 (Age: 70)	16510 149TH TER BONNER SPRINGS, KS 66012-9378 (913) 441-1935 170 CORNELL AVE BONNER SPRINGS, KS 66012-1108 (913) 441-6006 (913) 441-1935 16511 149TH TER BONNER SPRINGS, KS 66012-9378 (913) 441-1935
9.	JONES, MATTHEW RYAN • AKA JONES, MATHEW • AKA JONES, RYAN • AKA JONES, MATT R SSN:514-88-XXXX DOB:1/1971 (Age: 46)	2811 W 48TH ST WESTWOOD, KS 66205-1646 115 E 29TH ST KANSAS CITY, MO 64108-3806 8920 W 80TH ST OVERLAND PARK, KS 66204-3308 5100 W 66TH ST PRAIRIE VILLAGE, KS 66208-1453 (913) 283-8099 8 PENN CTR W APT PITTSBURGH, PA 15276-0137
10.	JONES, GREGORY M	15801 HORSELESS CARRIAGE DR REDDING, CA 96001-9527

Business Associates - 1 records found

1: ENGINEERING, MINING & CONSTRUCTION CORPORATION

Name: JONES, MITCHEL CRAIG
Address: PO BOX 993841
REDDING, CA 96099-3841
Status: SUSPENDED
State: CA
Corporation Number: C2490785
Descriptive Status: SUSPENDED
Record Type: CURRENT
Record Date: 2/7/2017
Filing Date: 1/10/2003

Person Associates - 3 records found

No.	Full Name	Address	SSN	Phone	DOB
1:	HAWKINS, ROBIN L KRAMER, ROBIN L NAWKINS, ROBIN AAWKINS, ROBIN HAWKINS, ROBIN LYNNE KRAKER, ROBIN L ROBINS, HAWKINS HAWKINS, R	188 RAINBOW DR APT 8816 LIVINGSTON, TX 77399-1088 16287 VALPARAISO WAY REDDING, CA 96001-8742 188 RAINBOWS END EVEN DR LIVINGSTON, TX 77399-0001 9807 GRANDVIEW AVE ARVADA, CO 80002-2136 188 RAINBOW DR APT 8816 CONROE, TX	545-29-XXXX	(303) 422-1274 (530) 242-1179 (530) 242-1179	11/1961 1962
2:	WESTRIP, MARIANNE A WESTRIP, MARY WESTRIP, MARYANNE ROSSER, MARIANNE OCONNER SCHOLZ, MARIANNE SCHOLZ, MARY OCONNER ROSSER, MARIANNE ROSSER, MARIANNE W ROSSER O CONNER, MARIANNE CONNER, MARY O O CONNER, MARY O CONNER, MARIANNE ROSSER WESTRIP, MARIANNE CONNER ROSSER, MARY W OCONNER, MARY ROSSER-OCONNER, MARIANNE CONNER, MARIANNE O OCONNER, MARIANNE ROSSER OCONNER, MARI ANNE ROSSEROCONNER, MARIANNE ROSSEROCONNER, MARY WESTSTRIP, MARY	469 WIMBLETON DR SAN JACINTO, CA 92583-2677 3001 FREEMAN ST ANDERSON, CA 96007-3466 11556 CALIFORNIA ST REDDING, CA 96001-9613 3075 NORTHWOODS WAY REDDING, CA 96002-2149 5375 RANCHO VISTA WAY REDDING, CA 96002-9455	572-92-XXXX	(530) 246-2256 (530) 605-0994 (530) 605-3553	9/1953
3:	RYAN, BRENDA JEAN SCHNEIDER, BRENDA JEAN SCHNIDER, BRENDA SCHNEIDER, B	555 PAULARINO AVE APT D202 COSTA MESA, CA 92626-3262 PO BOX 191406 SACRAMENTO, CA 95819-1406	551-49-XXXX	(530) 244-7534 (916) 476-3664	3/1964

RYAN-JONES, BRENDA JEAN	2828 HARLAN DR REDDING, CA 96003-3332
	3149 C ST SACRAMENTO, CA 95816-3328
	15801 HORSELESS CARRIAGE DR REDDING, CA 96001-9527

Neighbors - 6 records found

15801 HORSELESS CARRIAGE DR REDDING, CA 96001-9527

Name	Address	Phone
WRIGHT, HARVEY WILLIAM	15737 HORSELESS CARRIAGE DR APT D REDDING, CA 96001-9527	(530) 241-3696
DILBECK, CHARLENE O DILBECK, WILLIAM JACK DILBECK, WILLIAM	15738 HORSELESS CARRIAGE DR REDDING, CA 96001-9527	(530) 246-4644
WAINWRIGHT, DUANE LIONEL WAINWRIGHT, MARY LOUISE	15738 HORSELESS CARRIAGE DR APT D REDDING, CA 96001-9527	
OLIVER, JORDI	15754 HORSELESS CARRIAGE DR REDDING, CA 96001-9527	(530) 246-3149
OLIVER, MARK THAYER OLIVER, STACY H	15754 HORSELESS CARRIAGE DR APT D REDDING, CA 96001-9527	(530) 246-3149
FACEY, AYDIN FACEY, MISSY FACEY, SHELLEY P FACEY, TROY C FARMER, SHEENA FACEY ROBERTS, JENAE	15784 HORSELESS CARRIAGE DR REDDING, CA 96001-9527	

Employment Locator - 14 records found

1:
Company Name: ENGINEERING, MINING & CONSTRUCTION CORPORATION
Name: JONES, MITCHEL CRAIG
Title: PRESIDENT
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: Medium

2:
Company Name: ENGINEERING, MINING & CONSTRUCTION CORPORATION
Name: JONES, MITCHEL CRAIG
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: Medium

3:
Company Name: ENGINEERING, MINING & CONSTRUC CORPORA
Name: JONES, MITCHEL CRAIG
SSN: 563-51-XXXX
Confidence: Medium

4:
Company Name: ENGINEERING, MINING & CONSTRUCTION CORPORATION
Name: JONES, MITCHEL CRAIG
Title: PRESIDENT

Address: PO BOX 993841
REDDING, CA 96099-3841
SSN: 563-51-XXXX
Confidence: Medium

5:
Company Name: EMC CORPORATION
Name: JONES, MITCH
Title: PRESIDENT
Address: PO BOX 992978
REDDING, CA 96099-2978
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

6:
Company Name: ENGINEERING, MINING & CONSTRUCTION CORPORATION
Name: JONES, MITCHEL C
Title: PRESIDENT
Address: PO BOX 992978
REDDING, CA 96099-2978
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

7:
Company Name: EMC CORPORATION
Name: JONES, MITCH
Address: PO BOX 992978
REDDING, CA 96099-2978
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

8:
Company Name: ENGINEERING, MINING & CONSTRUCTION CORPORATION
Name: JONES, MITCHELL
Title: PRESIDENT
Address: PO BOX 992978
REDDING, CA 96099-2978
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

9:
Company Name: ENGINEERING MINING & CONSTR
Name: JONES, MITCHEL
Title: OWNER
Address: PO BOX 992978
REDDING, CA 96099-2978
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

10:
Company Name: ENGINEERING MINING & CONSTR
Name: JONES, MITCHEL
Title: OWNER
Address: 3154 RIESLING PATH
REDDING, CA 96001-1365
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

11:

Company Name: ENGINEERING MINING & CONSTR
Name: JONES, MITCHEL
Title: OWNER
Address: 1320 PINE ST
REDDING, CA 96001-0604
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

12:

Company Name: ENGINEERING MINING & CONSTR
Name: JONES, MITCHEL
Title: OWNER
Address: PO BOX 992978
REDDING, CA 96099-2978
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

13:

Company Name: ENGINEERING MINING & CONSTR
Name: JONES, MITCHEL
Title: OWNER
Address: 1320 PINE ST
REDDING, CA 96001-0604
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

14:

Company Name: ENGINEERING, MINING & CONSTRUCTION CORPORATION
Name: JONES, MITCHEL C
Title: PRESIDENT
Address: 2898 ASPEN GLOW LN
REDDING, CA 96001-5715
SSN: 563-51-XXXX
Phone: (530) 242-0782
Confidence: High

Criminal Filings - 10 records found

1: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR140004821001
Case Filing Date: 03/10/2014
Case Type: TRAFFIC INFRACTION
County: SHASTA
DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 03/10/2014
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR140004821001
Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

2: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR130015825001
Case Filing Date: 07/30/2013
Case Type: TRAFFIC INFRACTION
County: SHASTA
DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 07/30/2013
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR130015825001
Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

3: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR130004676001
Case Filing Date: 02/21/2013
Case Type: TRAFFIC INFRACTION
County: SHASTA
DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 02/21/2013
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR130004676001
Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL 20130415
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

4: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR130003682001
Case Filing Date: 02/13/2013
Case Type: TRAFFIC INFRACTION
County: SHASTA
DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 02/13/2013
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR130003682001

Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL 20130415
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

5: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR120003088001
Case Filing Date: 02/17/2012
Case Type: TRAFFIC INFRACTION
County: SHASTA
DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 02/17/2012
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR120003088001
Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

6: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR110022902001
Case Filing Date: 12/01/2011
Case Type: TRAFFIC INFRACTION
County: SHASTA
DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 12/01/2011
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR110022902001
Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL 20120418
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

7: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR080029887001
Case Filing Date: 10/24/2008
Case Type: TRAFFIC INFRACTION
County: SHASTA

DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 10/24/2008
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR080029887001
Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

8: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR080011836001
Case Filing Date: 05/02/2008
Case Type: TRAFFIC INFRACTION
County: SHASTA
DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 05/02/2008
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR080011836001
Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

9: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR080006155001
Case Filing Date: 03/13/2008
Case Type: TRAFFIC INFRACTION
County: SHASTA
DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 03/13/2008
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR080006155001
Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

10: California Court Report

Offender information

Name: JONES, MITCHEL CRAIG
Address: CA
Case Number: MCRDINTR060024526001
Case Filing Date: 10/02/2006
Case Type: TRAFFIC INFRACTION
County: SHASTA
DOB: 1963
SSN: 563-51-XXXX

Offenses

Case Filing Date: 10/02/2006
Court Description: SHASTA COUNTY SUPERIOR COURT REDDING
Court Case Number: MCRDINTR060024526001
Court Offense: NOT SPECIFIED
Court Disposition: Status:FINAL
Court Level/Degree: TRAFFIC INFRACTION

Court Activity

[NONE FOUND]

Cellular & Alternate Phones - 0 records found

Sources - 185 records found

All Sources	185 Source Document(s)
Bankruptcy Records	1 Source Document(s)
Corporate Affiliations	1 Source Document(s)
Criminal	10 Source Document(s)
Deed Transfers	12 Source Document(s)
Driver Licenses	1 Source Document(s)
Email addresses	7 Source Document(s)
Historical Person Locator	31 Source Document(s)
Liens and Judgments	3 Source Document(s)
Person Locator 1	13 Source Document(s)
Person Locator 2	9 Source Document(s)
Person Locator 5	39 Source Document(s)
Person Locator 6	16 Source Document(s)
Phone	3 Source Document(s)
Tax Assessor Records	37 Source Document(s)
Utility Locator	2 Source Document(s)

Key
High Risk Indicator. These symbols may prompt you to investigate further.
Moderate Risk Indicator. These symbols may prompt you to investigate further.
General Information Indicator. These symbols inform you that additional information is provided.
✓ The most recent telephone listing as reported by the EDA source.

Important: The Public Records and commercially available data sources used on reports have errors. Data is sometimes entered poorly, processed incorrectly and is generally not free from defect. This system should not be relied upon as definitively accurate. Before relying on any data this system supplies, it should be independently verified. For Secretary of State documents, the following data is for information purposes only and is not an official record. Certified copies may be obtained from that individual state's Department of State.

Your DPPA Permissible Use is: On Government Behalf
Your GLBA Permissible Use is: Legal Compliance

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San Juan County Assessor Parcel 47730310050022

Name: CLARK JACK E & BARBARA J
Location Address: 3815 CR 2 - ANIMAS MNG DIST , , CO
Mailing Address: PO BOX 767, SILVERTON, CO 81433 0767
Assessor Nbhd: 5 (EUREKA MINING DISTRICT) **Tax District:** 101

Legal Description: JOHN H FRENCH PLACER - 45

		Abstract Class	ActualValue	Assessed
Land Information:	76.88 Acres	SPEC PURPOSE LAND	325595	94423
Improvements:		SPECIAL PURPOSE	193532	38165*
		RESIDENTIAL PORTION	212672	5417*
Totals:			406204	43582*
		Total Value, Land and Imps:	**731799**	**138005***

* Assessed value has been reduced due to land discounting, partial interest, or special adjustment(s) *

Non-Residential Structure #1
No Construction Type Available
*COMMERCIAL SPECIAL PURPOSE
Good Quality

No Sketch Available!

Year Built:	1994	**Year remodeled:**	N/A
~~**Use:**~~			
Building Area:	10975	**Perimeter:**	370
Number Stories:	2	**Basement Area:**	0
Finished Basement:	0	**Mezzanine Area:**	0
Wall Height:	22	**Floor?:**	yes
Electrical?:	yes	**Plumbing?:**	yes
Elevator?:	no	**Sprinkler?:**	no
HVAC:	100% Electric		

Non-Residential Structure #1
No Construction Type Available
*COMMERCIAL SPECIAL PURPOSE
Good Quality

No Sketch Available!

Year Built:	1994	**Year remodeled:**	N/A
~~**Use:**~~			
Building Area:	10975	**Perimeter:**	370
Number Stories:	2	**Basement Area:**	0
Finished Basement:	0	**Mezzanine Area:**	0
Wall Height:	22	**Floor?:**	yes
Electrical?:	yes	**Plumbing?:**	yes
Elevator?:	no	**Sprinkler?:**	no
HVAC:	100% Electric		

Current Tax Information for tax year 2016

Mill Levy: 34.277 **Property Type:** MC **Total Tax Amount: $** $4,730.40

...(Continued on next page)...

San Juan County Assessor Parcel 477O310050022

Current Transfer Information

Sale Date	Sale Amount	Grantor	Grantee	Other Details
03/16/04 143294	N/A	C W M AND ASSOCIATES,	CLARK JACK E & BARBA	Rcpt# 143294 Bk/Pg 0/0 RELATED PARTIE
06/27/03 WARRANTY DEED	525000	K2 ENTERPRISES LLC	C W M INC	Rcpt# 142702 Bk/Pg 0/0 COMMERCIAL/IND
06/27/03 WARRANTY DEED	6500	PADRICK KEVIN D & KA	K2 ENTERPRISES LLC	Rcpt# 142701 Bk/Pg 0/0 RELATED PARTIE
12/17/93 WARRANTY DEED	51100	UNITED STATES MINERAL	KEVIN D & KAREN P PAD	Rcpt# 0 Bk/Pg 242/70 MULTIPLE PARCE

City/Town: _____ Parcel Number: 47730310050021 Tax Status: Active/Senior Exemption Applied Tax District: 101 02/01/17

Name: JEPSON A JOSEPH &, MEADOWS CHERYL,
Address: 4215 C R 2 - ANIMAS M D , CO **Mailing Address:** PO BOX 729 SILVERTON, CO 81433

Grantee	Grantor	Sale Date	Sale Amount	Type	Reception	Sale Comments (Code)
A JOSEPH JEJPSON & CHERYL MEAD	GREAT DIVIDE MINING & MILLING	04/12/99	192000	WD	139852	IMPROVED RES W/LAND

No Photo available!

Legal Description:
A PORTION OF THE JOHN H FRENCH PLACER SN 45 39.00 AC.

**********Residential Inventory Card number 1 of 1.**********

***Above Average Quality RANCH**
Construction: Log Rooms: 4 Baths: 1.75 Beds: 1

Characteristic	Type	9	10	11	12	13	14	Tot SqFt
First Floor Area	Log					X		1130
Above First Floor								
Half Story Area								
Unfinished Bsmnt								
Finished Basement								
						X		352

Age and Condition Adjustments
Year Blt: 2000 Year Remodel: 0 %Remodel: 0%
Adjusted year built: 2000....Adjusted Age: 0
Economic adjustment: 0% Functional adjustment: 0%
Age Adjustment: 0% Design Adjustment: 0%
Exterior Adjustment: 0% Interior Adjustment: 0%
Fireplace Adj: 0% Yard Adjustment: 0%

Building Permit Information

Permit Date	Permit#	Permit Type	%done
02/29/00	1	SINGLE FAM	0

Improvement Construction type and Wall and Appliance Inventory

Description	#	10	11	12	13	14	14	13	12	11	10	#	Description
								X					Forced Air
								X					Hip Roof
								X					Pro-Panel

Distribution of tax dollars by taxing entity

Tax Entity Name	Levy	Tax Amount	% of Tot
SAN JUAN COUNTY	19.888	534.29	82%
SOUTHWEST WATER CONS	.395	10.61	2%
SCHOOL DISTRICT #1	13.994	375.95	58%

Land Area	Land Class	Land Value
Situs	SING FAM RES LAND	TBD

Imp Classification	Imp Value
SINGLE FAMILY RES	TBD

Historical values of land and improvement

Year	Actual Value	Assessed Value
2017	TBD	TBD
2016	337500	26865
2015	337500	26865
2014	337525	26867
2013	337525	26867
2012	324528	25832
2011	324528	25832

Treasurer Tax Information

Year	Type	Paid Date	Amount	Balance
2016	MC DUE			**648.02**

Additional Treasurer Fees

Special Improvements:	no
Property in Tax Sale:	no
Delinquent Payments:	no
Tax Sale Certificates Outstanding:	no
Advertising Charges due:	no

FOR the fees due on any of the above items, please call the Treasurer at 9703875488

San Juan County Assessor Parcel 4773031005002 1

Name: JEPSON A JOSEPH &
Location Address: 4215 C R 2 - ANIMAS M D, , CO
Mailing Address: PO BOX 729, SILVERTON, CO 81433 0729
Assessor Nbhd: 5 (EUREKA MINING DISTRICT) **Tax District:** 101

Legal Description: A PORTION OF THE JOHN H FRENCH PLACER SN 45 39.00 AC.

		Abstract Class	ActualValue	Assessed
Land Information:	SITUS	SING FAM RES LAND	174420	1388
Improvements:		SINGLE FAMILY RES	163080	1298
		Total Value, Land and Imps:	**337500**	**2686**

Residential Structure #1
Log Construction
No Garage or Carport
Above Average Quality
Effective Year Built: 2000

Year Built:	2000	**Year remodeled:**	0
Rooms:	4	**Bedrooms:**	1
Bathrooms:	1.75		
First Floor:	1130	**Above First Floor:**	0
Half Story Area:	0	**Total Basement Area:**	1130
Finished Basement:	0		
Total Garage Area:	0	**Total Carport Area:**	0
Total Porch:	352	**Roof Type:**	Hip Roof
Composition:	PRO PANEL		
HVAC:	Forced Air		
Fireplace:	NO	**Landscaping:**	NO
Misc:			

Current Tax Information for tax year 2016

Mill Levy: 34.277 **Property Type:** MC **Total Tax Amount: $** $648.0

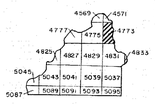
Current Transfer Information

Sale Date	Sale Amount	Grantor	Grantee	Other Details
04/12/99	192000	GREAT DIVIDE MINING &	A JOSEPH JEJPSON & CH	Rcpt# 139852
WARRANTY DEED				Bk/Pg 247/273
				IMPROVED RES

4773-31
T42N R6W SEC. 31

SAN JUAN COUNTY

CLINT SHERRILL & ASSOC.		
DRAWN BY Doss Vandeburg DATE 2/23/79		
CHECKED BY _____ DATE _____		
REVISED		
Date	By	Remarks



COUNTY INDEX

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
	32	33	34	35	36

TOWNSHIP INDEX

N

200' 0 200' 400'
SCALE 1" = 200'

Adjoining
4773-30

Adjoining
4775

Adjoining
4773-32

Adjoining
4831

4775-254-00-007
Leviathan S.N.18396
004
90063
Bradford M.S.
S.N.18396 B
004
99063
003
Aetna M.S.
84907
S.N.18397 B
NF
011
S.N. 45
John H. French Placer
002
S.N.18843
Forest Queen No. 6
038
156419
S.N.18843
Forest Queen No. 7
039
156419
S.N.18843
Forest Queen No. 8
040
156419
S.N.18843
Forest Queen No. 9
041
156419
S.N.18843
Forest (exempt) Queen No. 10
001
156419
S.N. 1382
Bullion City
005
156419
S.N. 1175
013
Carbonate King
8745
9127
S.N. 17366
S.N.18640
44931
S.N.17366
Galena No. 3
Galena No. 5
011
158600
S.N.18640 Whale No. 1
158600
S.N. 18640
012
Whale
158600
009
44931
Galena M.S.
S.N.17366B
Galena No. 2
S.N.17366
44931
Galena
010
44931
006
44931
S.N. 18397
Blue Bird
84907
84907
Aetna
007
S.N.17746 Hamlet Ext.
44579
2490
U.S.M.M.
"Animas River"
011
(EXEMPT)
Polonius
008
44579
S.N. 4994
S.N. 18397
S.N 17746
43966
16465
Lonergan
S.N. 4512
S.N.17512 Sarsfield
14821
S.N. 18224
Elsinore
Gertrude S.N.17746
44579
Hamlet
Ophelia
17238
S.N. 4994
008
17238
010
(EXEMPT)
ANIMAS-LA PLATA REC. PROJ.
4831-062-00-003
4831-062-00-002
4831-062-00-001
SAN JUAN NATIONAL FOREST
4773-323-00-004

Warning: The dimensions shown on this drawing are in decimal feet. Do not attempt to scale distances to obtain dimensions. This drawing is not to be used for any purpose not intended by the surveyor. Any unauthorized alterations or additions to this drawing will void the surveyor's liability for any consequent incorrect interpretations. This drawing is subject to copyright protection and its unauthorized reproduction or use is forbidden. Any other use or reuse without the written authorization of the surveyor is at the sole risk of the party using or reusing the drawing. The surveyor will defend, indemnify and hold harmless the surveyor against all claims, injuries, losses, expenses, damages, judgments, costs, including but not limited to fees and charges of attorneys and expert witnesses, which may be incurred by the surveyor in connection with the unauthorized use or reuse of the drawing by the user or by others after the user has obtained possession of the drawing, whether the surveyor is partially or solely at fault.

4773-31
T42N R6W SEC. 31

Last metes and bounds parcel number used is 011

Reception No. 136608 Dorothy A. Zavani Recorder.
Recorded at 10:34 o'clock A. M. BK 242 pg 70

WARRANTY DEED
(Statutory Form)

RECORDER'S STAMP

STATE SUBSIDIARY TO
DATE 12-30-93
$ 5.00

UNITED STATES MINERALS CORPORATION,

whose street address is 505 Park Avenue
New York, NY 10022

County of New York and State of New York, grantor,

for the consideration of
fifty-one thousand one hundred and 00/100-($51,100) DOLLARS,
in hand paid, hereby sells and conveys to

KEVIN D. PADRICK and KAREN P. PADRICK, in joint tenancy,

whose address is PO Box 298
Silverton, Colorado 81433

of the County of San Juan and State of Colorado, grantees,
the following real property in the County of San Juan and State of Colorado, to wit:

Parcel One
That portion of the John H. French et al Placer Mining Claim, USMS No. 45, according to the United States Patent No. 2490 as recorded in the records of San Juan County, Book A1, page 17, ordered, adjudged and decreed to The Minnie Gulch Mining and Tunnel Company, John F. Heney, and the Kittimac Mines Co. pursuant to that certain Decree recorded in Book 137, Page No. 286 as recorded in the records of San Juan County and entered in the District Court for the County of San Juan, State of Colorado, Case No. 1259, in which The Tom Moore Mining & Milling Company was the plaintiff and The Minnie Gulch Mining & Tunnel Company et al were the defendants. Situated in the Animas Mining District, County of San Juan, State of Colorado. Containing 78.344 acres, more or less.

Parcel Two
Forest Queen No. 6 claim USMS 18843, Eureka Mining District, according to the United States Patent No. 156419. Containing 10.056 acres, more or less.

Parcel Three
Forest Queen No. 7 claim USMS 18843, Eureka Mining District, according to the United States Patent No. 156419. Containing 10.331 acres, more or less.

Parcel Four
Forest Queen No. 8 claim USMS 18843, Eureka Mining District, according to the United States Patent No. 156419. Containing 10.331 acres, more or less.

Parcel Five
Forest Queen No. 9 claim USMS 18843, Eureka Mining District, according to the United States Patent No. 156419. Containing 10.331 acres, more or less.

Parcel Six
Forest Queen No. 10 claim USMS 18843, Eureka Mining District, according to the United States Patent No. 156419. Containing 8.453 acres, more or less.

with all their appurtenances and warrants the title to the same.

Signed this 17th day of December, 1993.

Attested: P.L. MacDougall
Asst/ Secretary
United States Minerals Corporation

UNITED STATES MINERALS CORPORATION
By: [signature]
Title: President

STATE OF New York)
County of New York) ss.

The foregoing instrument was acknowledged before me this 17th day of December, 1993, by John A. Bradley as President and P.L. MacDougall as Secretary of United States Minerals Corporation.

My commission expires January 31, 1995. Witness my hand and official seal.

PHAEDRA SAVAS
Notary Public, State of New York
No. 41-4812664
Qualified in Queens County
Commission Expires Jan. 31, 1995

PHAEDRA SAVAS
Notary Public, State of New York
No. [illegible]
Qualified [illegible]

Phaedra Savas
Notary Public

Recorded at 1:52 o'clock P.M. this 7th day of July 2003, at Reception No. 414702, Recorder.

GENERAL WARRANTY DEED

THIS DEED, is made the date first set forth below, between the undersigned and hereinafter named Grantor and the hereinafter named Grantee:

DATE: July 1, 2003

Grantor:
K-2 ENTERPRISES, L.L.C.
P.O. BOX 3510
SUNRIVER, OR 97707

STATE DOCUMENTARY FEE
DATE 7/7/03
$ 52.50

Grantee:
C.W.M. INC
100 HILL TOP DRIVE, SUITE 19
REDDING, CA 96003

CONSIDERATION: FIVE HUNDRED TWENTY FIVE THOUSAND DOLLARS

IN WITNESS WHEREOF, GRANTOR, in consideration of the herein above stated CONSIDERATION, the receipt of which is hereby acknowledged, does hereby grant, sell and convey unto GRANTEE, their heirs, personal representatives, executors, administrators, successors, and assigns forever, ALL that certain plot, piece or parcel of land, situate, lying and being in San Juan County, Colorado, to wit:

SEE ATTACHED HERETO AND MADE A PART OF THIS INSTRUMENT EXHIBIT - A.

TOGETHER with all and singular the hereditaments and appurtenances thereto belonging, or in any wise appertaining, and the reversion and reversions, remainder and remainders, rents, issues and profits thereof, and all the estate, right, title, interest, claim and demand whatsoever of the Grantors, either in law or equity, of, in and to the above bargained premises, with the hereditaments and appurtenances.

TO HAVE AND TO HOLD the premises herein granted unto Grantee, their heirs and assigns forever. Grantor, WARRANTS that said premises are free and clear from all former and other grants, bargains, sales, liens, taxes, assessments, encumbrances and restrictions of whatever kind or nature soever, except: TAXES AND ASSESSMENTS FOR THE YEAR IN WHICH THIS DEED IS EXECUTED, EASEMENTS, RESTRICTIONS, RESERVATIONS, COVENANTS AND RIGHTS-OF-WAY OF RECORD.

IN WITNESS WHEREOF, Grantor has duly executed this deed on the date first above written.

K-2 Enterprises, L.L.C.

Kevin D. Padrick, Manager of K-2 Enterprises, L.L.C.

STATE OF Oregon)
) ss:
COUNTY OF Deschutes)

ACKNOWLEDGED before me this 27 day of June, 2003, by Kevin D. Padrick, Manager of K-2 Enterprises, L.L.C.

Witness my hand and official seal.
My commission expires: Jan 31, 2006

Notary Public

OFFICIAL SEAL
JAMIE MARLO QUAL
NOTARY PUBLIC- OREGON
COMMISSION NO. 354277
MY COMMISSION EXPIRES JAN 31, 2006

14217B2

EXHIBIT A

All in the County of San Juan, State of Colorado.

That portion of the John H. French et al Placer Mining Claim, USMS No. 45, according to the United States Patent No. 2490 as recorded in the records of San Juan County, Book A1, Page 17, ordered, adjudged and decreed to The Minnie Gulch Mining and Tunnel Company, John F. Heney, and the Kittimac Mines Co. pursuant to that certain Decree recorded in Book 137, Page No. 266 as recorded in the records of San Juan County and entered in the District Court for the County of San Juan, State of Colorado, Case No. 1259, in which the Tom Moore Mining & Milling Company was the plaintiff and The Minnie Gulch Mining & Tunnel Company et al were the defendants. Situated in the Animas Mining District, County of San Juan, State of Colorado.

And

That portion of the Placer claim of John French, et al, Survey No. 45, described as follows, to wit:

Beginning at Corner No. 1, Survey No. 45, John H. French, et al Placer claim. Thence - Variance 15° East - North 36° East eight hundred and eight and five tenths (808.5) feet to a point in line 1 - 2 of Survey No. 45 John H. French, et al Placer claim. Thence North 54° West three hundred feet (300) to a point. Thence South 27° 22' West eight hundred and seventeen and eight tenths (817.8) feet to a point in line 16 - 1 of Survey No. 45 John H. French, et al placer claim. Thence South 54° East one hundred and seventy-seven and two tenths (177.2) feet to Corner No. 1, Survey No. 45 John H. French, et al Placer claim. The place of beginning. Situated in the Animas Mining District, County of San Juan, State of Colorado, as described in decree recorded 03-08-57 in Book 178 at Page 560.

LESS AND EXCEPT: All the Tracts Described in Monumented Land Survey, Portion of The John H. French Placer M.S. No. 45, Recorded 4-9-99 in Book 247 at Page 251.

Recorded at 2:00 o'clock P M. on March 16 04 Fee 11.00
Reception No. 143294 Ladonna L. Gramillo Recorder
Deputy

Quit Claim Deed

THIS DEED is a conveyance from the individual(s), corporation(s) or other entity(ies) named below as GRANTOR to the individual(s) or entity(ies) named below as GRANTEE of whatever interest the GRANTOR may have in the real property described below.

The GRANTOR hereby sells and quit claims to the GRANTEE the real property described below with all its appurtenances.

The specific terms of this deed are:

Grantor: (Give name(s) and place(s) of residence. If the spouse of the above grantor is joining in this Deed to release homestead rights identify grantors as husband and wife.)

C.W.M. AND ASSOCIATES, INC.

STATE DOCUMENTARY FEE
DATE 3-16-04 OR
Exempt

Grantee: (Give name(s) and address(es). Statement of address, including available road or street number, is required.)

JACK E. CLARK JR. & BARBARA J. CLARK

Form of Co-Ownership: (If there are two or more grantees named, they will be considered to take as tenants in common unless the words "in joint tenancy" or words of the same meaning are added in the space below.)

JOINT TENANTS

Property Description: (Include county and state.)

SEE EXHIBIT "A"

Property Address: 5815 COUNTY ROAD 2 SILVERTON, COLORADO 81433

Reservations-Restrictions: (If the GRANTOR intends to reserve any interest in the property or to convey less than he owns, or if the GRANTOR is reserving the GRANTEE'S rights to the property, make appropriate indication.)

"NONE"

Executed by the Grantor on JAN. 2 2004

Signature Clause for Corporation, Partnership or Association:

C.W.M. AND ASSOCIATES, INC.
Name of Grantor: Corporation, Partnership or Association

By _____ Grantor

By JACK E. CLARK JR. PRESIDENT

Attest: _____

Signature Clause for Individual(s):

Jack E. Clark Jr.
Grantor

Jack E. Clark Jr.
Grantor

STATE OF COLORADO)
COUNTY OF San Juan) ss

The foregoing instrument was acknowledged before me this 16th day of March
by: Jack E. Clark, Jr.

WITNESS my hand and official seal
My commission expires: 6/17/07

Melody A. Skinner
Notary Public

STATE OF)
COUNTY OF San Juan) ss

The foregoing instrument was acknowledged before me this 16th day of March
by: Jack E. Clark, Jr.

(* name individual Grantor(s) in if Grantor is Corporation, Partnership or Association, then literally signed as president, vice president, and secretary or assistant secretary of corporation, or as partner(s) of partnership, or as authorized member(s) of association.)

WITNESS my hand and official seal
My commission expires: 6/17/07

Melody A. Skinner
Notary Public

After recording, return to:

©1981 UPDATE LEGAL FORMS
P.O. Box 1815 - Greeley, Colorado 80632
(303) 356-6380

NO. 203

(2) 143294

EXHIBIT A 142703

All in the County of San Juan, State of Colorado.

That portion of the John H. French et al Placer Mining Claim, USMS No. 45, according to the United States Patent No. 2490 as recorded in the records of San Juan County, Book A1, Page 17, ordered, adjudged and decreed to The Minnie Gulch Mining and Tunnel Company, John F. Haney, and the Kittimac Mines Co. pursuant to that certain Decree recorded in Book 167, Page No. 288 as recorded in the records of San Juan County and entered in the District Court for the County of San Juan, State of Colorado, Case No. 1258, in which the Tom Moore Mining & Milling Company was the plaintiff and The Minnie Gulch Mining & Tunnel Company et al were the defendants. Situated in the Animas Mining District, County of San Juan, State of Colorado.

And

That portion of the Placer claim of John French, et al, Survey No. 45 described as follows, to wit:

Beginning at Corner No. 1, Survey No. 45, John H. French, et al Placer claim. Thence - Variance 16° East - North 36° East eight hundred and eight and five tenths (808.5) feet to a point in line 1 - 2 of Survey No. 45 John H. French, et al Placer claim. Thence North 54° West three hundred feet (300) to a point. Thence South 27° 22' West eight hundred and seventeen and eight tenths (817.8) feet to a point in line 16 - 1 of Survey No. 45 John H. French, et al placer claim. Thence South 54° East one hundred and seventy-seven and two tenths (177.2) feet to Corner No. 1, Survey No. 45 John H. French, et al Placer claim. The place of beginning. Situated in the Animas Mining District, County of San Juan, State of Colorado, as described in decree recorded 09-06-67 in Book 178 at Page 560

LESS AND EXCEPT: All the Tracts Described in Monumented Land Survey, Portion of The John H. French Placer M.S. No. 45, Recorded 4-9-99 in Book 247 at Page 251.

1977

THE LIFE AND DEATH OF THE KITTIMAC

Howard Campbell

Late in the afternoon on a summer day in 1956 my wife and I, with our teen-aged son, arrived among the tumble-down cabins at the abandoned mining camp of Middleton, in the San Juan Mountains of southwestern Colorado. Middleton was in Animas Canyon on the east side of the Animas River, at the mouth of Maggie Gulch. The site is about six miles northeast of Silverton as the crow is supposed to fly, and of course somewhat farther by the winding road between Silverton and Eureka which travellers must follow to reach Middleton from the south. Eureka, now also only a ghost but once a considerable town, lies a couple of miles beyond Middleton.

We set up camp amid the spooky cabins and ate our supper. Then, while my wife remained in camp to take advantage of the remaining daylight for some sketching, the boy and I walked northward over the rotting ties of the long-defunct Silverton Northern Railroad, which here parallels the road. In the rapidly failing light the contrast between the gloom of the canyon and the last of the sunlight touching the awesome peaks was overwhelming in that historic place. The near presence of the ghosts of dead miners and railroaders seemed almost palpable as we made our way along the railroad grade. A few hundred yards north of Middleton, just beyond a mountain spur, an enormous structure unexpectedly loomed before us in the dusk. We decided to investigate it in the morning and returned to our camp.

When we awoke shivering with cold next morning the sun was shining on the tops of the highest peaks but it was far from light in Middleton and there was ice on our bedrolls. Hot drinks and a crackling wood fire, however, did wonders for us and as soon as things were put to rights in camp we all hiked

up the road to see what had been found the evening before. It proved to be a huge ore mill, partially fallen to ruin. We learned later that this was the Kittimac Mill where ore from the Kittimac Mine, once one of the major producers of the distrct, had been processed for shipment to the smelters. The mill is located near the mouth of Minnie Gulch and the mine is in the North Fork of Minnie Gulch on the slopes of Calibre Mountain, about two miles northeast of the mill. The mill and mine were connected by an aerial tramway. Disintegration of all these structures was already well advanced at the time of this, our first visit to the Silverton area. The tramhouse adjacent to the mill was, however, still standing on its tall stilts. (It fell down a few years later.)

The early morning light proved to be too poor for effective photography, but before we left I tried a photograph of the mill which turned out to be the first in a series of photographs spanning many years. Then and there I determined to learn more about the Kittimac. On subsequent visits to the San Juan country, beginning the next year and continuing at intervals over the following twenty-two years I have taken periodic photographs of the mill, many of them from the same point, in order to follow the process of decay of the structure. Some of these photographs are reproduced here, and provide a graphic record of the progressive disintegration of the mill under the severe snowy climate of the San Juans. Probably this can be considered typical of what has happened, and is happening, to scores of similar mining structures in that part of Colorado.

Periodic photography was one thing but learning much about the history of the Kittimac was quite another. My results along that line fall far short of completeness, but they are given here for the record and for whatever they

may be worth to others interested in the mining history of Colorado. Robert L. Brown (Jeep Trails to Colorado Ghost Towns), Perry Eberhart (A Guide to the Colorado Ghost Towns and Mining Camps), and Muriel Sibell Wolle (Stampede to Timberline) all mention the Kittimac and say that it was one of the few big producers of the Middleton area, but these are all only brief passing references. Neither the Colorado Historical Society nor the Western Historical Collections of the University of Colorado were able to supply much information, although from the latter I obtained a copy of a U. S. Bureau of Land Management antiquities site inventory by Richard Bouts which indicated that as of August 5, 1976, the roof of the power house at the mine was collapsed and the tram house at the mine was partially collapsed.[1] He gave no data on the mill except that it was in poor condition (decidedly an understatement!). He indicated that the mine is on U. S. Forest Service land and the mill is on private land. Local sources in Silverton were unable to supply definite information. [redacted]

Most of what I was able to learn concerning the history of the Kittimac is from a mining prospectus, a copy of which was kindly provided by the Western History Department of the Denver Public Library.[2] This curious document appears to be the only thing on the Kittimac which the library has. The prospectus describes a reorganization of the Kittimac Mines under the name of the Lone Wolf Mining Company. This was a Colorado corporation, dating from the mid-1930's, organized by a group of five Denver men (C. F. DuRoy, Chas. B. Ferguson, Frank L. Ross, J. W. Norris, and F. R. Davis). The purpose was to take title (the mine had reverted to the public domain and the mill was in receivership), re-open and explore, and then operate the Kittimac Mine which was thought to have large quantities of merchantable ores of several metals

still available for mining. Initial capitalization was $30,000 for the preliminary work of taking title and re-opening and exploring the mine. Shares were offered at the very nominal par value of one cent per share. As far as I have been able to learn, nothing much ever came of this optimistic plan insofar as reviving the Kittimac as a producing mine was concerned, but at least it had the effect of collecting for the benefit of future history buffs what little data are still available on the history of the Kittimac.

In the San Juan country generally, the initial prospecting and mining from shallow workings dates back to the 1870's, but evidently at first the Middleton area received comparatively little attention. Not until the 1880's and 1890's were any sizeable mines opened in the vicinity of Maggie and Minnie gulches. Information as to just when the first long tunnels were driven at the Kittimac Mine seems to be lacking, but this was certainly prior to 1900, most likely in the late 1880's or early 1890's. Initially, mining at the Kittimac was for gold and silver. The ore was evidently shipped to a custom mill, probably in Silverton, for processing before going on to a smelter. The Kittimac Mill was not built until somewhat later, probably around 1902, when ore containing copper, lead, and zinc began to be mined along with the gold and silver. This mill was not as large as some others in the district, for example the great Sunnyside Mill in Eureka or the Green Mountain Mill in Cunningham Gulch, but it was by no means the smallest either.

The metalliferous ores of this mining district occur in two series of veins which intersect each other. The veins occupy two sets of fracture zones of different geological age. The younger of the two series of fracture zones runs in a more or less north-south direction and contains quartz veins which carry values in gold and silver, almost to the exclusion of other metals. The older of the two series runs in a generally east-west direction and contains

sulfide veins which carry values in copper, lead, and zinc, with only very small amounts of gold and silver.

The first mining at what was later to be known as the Kittimac apparently was done by a variety of individual operators whose names are probably lost in the mists of antiquity. This was followed by a period of consolidation of holdings, and soon after 1900 an organization known as the Minnie Gulch Mining Company gained control and considerably extended one of the mine tunnels. There are two main tunnels at the Kittimac, known as Upper and Lower, located one atop the other and parelleling each other at a vertical distance of about 160 feet. The upper tunnel is about 900 feet long and the lower one more than 3000 feet. Both of them cut several prominent mineralized veins, and stope mining was done from at least one of the tunnels. The entrances are on the side of Calibre Mountain (could this odd name for a mountain be an Anglo-Saxon corruption of Spanish culebra, snake?) and they run into the mountain at a slightly upward angle so that water drains out. By the middle 1930's, when the Lone Wolf Mining Company was trying to revive the mine, both tunnels were caved at various points.

How much mining was done by the Minnie Gulch Company is not known, but very early in the 1900's a new organization, the Kittimac Mines Company, took over and it was at this time that the Kittimac Mill and the aerial tramway connecting the mill to the mine were built. The mill and tramway were financed by Scottish investors, but one doubts that those supposedly canny Scots ever realized any handsome dividends on their investment. Anyhow, from the time that the Kittimac company took control until metal mining in Colorado fell upon hard times during or immediately after World War I the mine and mill operated at least intermittently as the price of this or that metal allowed. So far as I have been able to determine,

final closing of the mine and mill occurred in the summer of 1918, sixty years ago and more.

The Kittimac Mill was of an old-fashioned water-gravitation type. It was capable of concentrating only somewhat less than 60 percent of the metal contents of the ore it processed, and for that reason it was never as profitable, ton for ton of ore, as more modern plants such as the Sunnyside Mill which concentrated similar ores with an efficiency of more than 90 percent, using an oil flotation process. Periodic plans for extensive improvements at the Kittimac Mill never materialized because of the great expense which such improvements would have entailed. Ironically, some improvements were finally made near the end of the Kittimac's life, and the indebtedness thus incurred may have actually hastened the end rather than postponing it.

Probably no complete record of the Kittimac's production now exists, although exhaustive research might possibly turn up a considerable amount of information from smelter records which may have been preserved in scattered localities. As already mentioned, the early mining at what was eventually to be known as the Kittimac was primarily for gold and silver, utilizing the quartz veins. Later on, the older sulfide veins were mined for their copper and lead. Zinc was also present in the ore but because of deficiencies in the milling process it could not be properly separated from the copper and lead, and in effect it was a contaminant which incurred penalties at the smelter. This at least was the situation until the last years of the Kittimac's activity. Small values in gold and silver also occurred in the sulfide ore but not enough to be of much significance.

The Lone Wolf prospectus provides some sample smelter records. These are from the Durango smelter of the American Smelting and Refining Company and are for shipments made in 1917 and 1918, the last years in which the Kittimac seems to have operated. These records show that in those years a total of 612.2 tons of concentrates were shipped from the mill, and that this brought the Kittimac Mines Company $25,941.67, or an average of $42.37 per ton of concentrate. (The prospectus says $54.07 per ton but according

to the data given this figure is erroneous.) The average metal content per ton of these concentrates was as follows, according to the smelter records: gold, 0.03 ounces; silver, 9.35 ounces; lead, 17.2 pounds; copper, 6.9 pounds; zinc, 7.8 pounds. If this is a complete record of production for those two years, and considering the large expense even then of mining and milling, the approximately $26,000 income hardly seems sufficient to keep the (lone) wolf from the door. But possibly concentrates were also shipped to other smelters during those years?

Evidently the sulfide veins were being mined in both 1917 and 1918, but the smelter records above quoted may indicate that in the latter year material from the quartz veins was also included in the concentrates from the mill because for that year the average gold and silver content per ton of concentrate was significantly higher than in 1917. Or possibly this difference was due to the eleventh-hour improvements to the mill as the lead content per ton of concentrate was also significantly higher in 1918 than in 1917. For 1918 the average figures for gold, silver, and lead were 0.05 ounces,, 18.24 ounces, and 42.2 pounds, respectively, while the corresponding figures for 1917 were only 0.02 ounces, 6.39 ounces, and 8.9 pounds.

The quartz veins seem to have carried reasonably good values in gold and silver, and without knowing the exact circumstances it is difficult for me to understand why the Kittimac Mines Company did not focus their efforts on them rather than on the sulfide veins. Of course, mining prospectuses are not often famous for understatement, so perhaps the Lone Wolf assertion of gold content of the quartz veins running as high as 25 ounces per ton of ore and silver as high as 100 to 150 ounces should be viewed with some skepticism. Smelter records for the year 1909 for similar quartz ore from the nearby

Esmeralda Mine, also quoted in the prospectus, probably offer a more realistic picture. These records show an average of 1.11 ounces of gold and 60.07 ounces of silver per ton of ore, leaving out of the calculation one especially rich shipment which apparently contained 17.77 ounces of gold and 1,391.24 ounces of silver per ton.

Concentrates from the Kittimac Mill doubtlessly went to the smelters in Silverton and Durango by rail. The mill was served by a spur of the Silverton Northern Railroad, the main line of which passed nearby. The location of the mill spur could be traced by means of old ties still in place at least until a few years ago, and perhaps careful search would still reveal some of them. The Silverton Northern was one of the three Otto Mears narrow-gauge railroads which fanned out from Silverton. The main line of the S.N. served numerous mines and mills northward from Silverton to Animas Forks, via Eureka, and there was a branch from Howardsville up Cunningham Gulch. Material for the smelter in Durango travelled from Silverton over the narrow-gauge iron of the Denver and Rio Grande, to which the Mears lines were important as feeders and as extensions fingering into the mountain fastnesses beyond Silverton.[3]

At least two efforts to revive the Kittimac were made prior to the Lone Wolf's attempt in the middle 1930's, but like that attempt they both came to grief on the hard rocks of economic reality. In the prosperity year 1925, J. J. Clark of Denver, who had held a controlling interest in the Kittimac for many years, tried to generate support for re-opening the mine and mill, but without success. The Lone Wolf prospectus includes a partial copy of a 1925 letter to Clark from J. T. Joyce, a former manager of the Kittimac and

in 1925 a mining commissioner for the State of Colorado.[4] The letter was in response to a letter from Clark requesting information. Joyce was very sanguine concerning the outlook for getting the operation going again, and in the course of his letter he stated that in 1923, when he had last visited the property, he found the equipment at the mine and mill intact and in fairly good condition. This 1925 effort was to be a major reorganization with a two-million dollar capitalization. It was supported by surveys and favorable reports of at least two mining engineers, R. J. Walter and J. H. Anderson. On paper the prospects for success looked bright but in the end apparently nothing came of it.

As the Great Depression deepened in 1931, Clark made another effort to reorganize the "proposition" under the new name of Kittimac Gold Mining Company. As the name indicated, the idea now was to concentrate on the gold-bearing veins to the exclusion of the base metals. Gold mining, in Clark's view, was the answer to the Depression. Again, favorable reports by a battery of mining engineers -- there were four of them this time, B. E. McKechnie, J.G. McNulty, R. B. Stanton, and D. Davidson -- were quoted in support of the plan.[5] And again, stubborn economic realities intervened, and by that time, too, progressive deterioration of the mine and mill were making prospects for success more and more remote in any case. Finally, Clark died and then came the Lone Wolf Mining Company's last-ditch effort to bring the Kittimac back to life. After that, deterioration worsened into utter ruin, and that is where matters stand today.

But all is not quite lost. Romance and interest still surround the Kittimac to intrigue those of us who are sensitive to such unprofitable things. And there are small mysteries, too, such as the origin of the very name Kittimac. Who <u>was</u> Kittimac, that she should have had a mine and mill named

for her? Or was it perhaps Kitti and Mac? And what has Time done to her -- or them? Does any living soul know the anwers?

CAPTIONS FOR PHOTOGRAPHS:

Figure 1. Grade of the abandoned Silverton Northern main line in Animas Canyon near the Kittimac Mill.

Figure 2. Kittimac Mill in 1972. Person in lower corner of photograph indicates scale.

Figure 3. Kittimac Mill in 1957. (Rec'd by WNC)

Figure 4. Kittimac Mill in 1960.

Figure 5. Kittimac Mill in 1967.

Figure 6. Kittimac Mill in 1974.

Figure 7. Kittimac Mill in 1978. (Rec'd by WHC)

FOOTNOTES:

1. Richard Bouts, Antiquities Site Inventory, Kitti Mack (sic), 5 August 1976. United States Department of the Interior, Bureau of Land Management.
2. A Prospectus Describing the Lone Wolf Mining Company, Denver, Colorado. No date, but internal evidence indicates mid-1930s. Western History Department, Denver Public Library, Denver, Colorado.
3. Josie Moore Crum, Rails Among the Peaks. Three Little Lines: Silverton Railroad; Silverton, Gladstone, and Northerly Railroad; Silverton Northern Railroad. Bert Baker, 309 Northwestern Building, Minneapolis, Minnesota. Third edition, 1956. (Originally published as Bulletin No. 74 of the Railway and Locomotive Historical Society.)
4. J. T. Joyce to J. J. Clark, 29 July 1925; partial copy in Lone Wolf prospectus.
5. J. J. Clark to C. Guy Wakefield, no date but interal evidence indicates 1931; copy in Lone Wolf prospectus.

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MINERAL RESOURCES

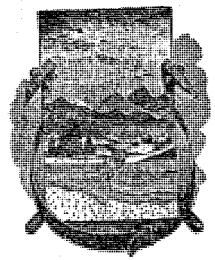
OF THE

UNITED STATES

CALENDAR YEAR

1908

PART I—METALLIC PRODUCTS



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1909

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ity of zinc also fell off 5,077,384 pounds. No copper production was reported, although the smelters show a small extraction of copper from the ores of the county. The production of gold in the county was insignificant. The tonnage sold or treated in 1908 was 33,408 short tons, a decrease of 50,428 tons.

Pitkin County in 1908 took third place in the production of silver, with San Juan County a close fourth, though for many years Aspen has been a close rival of Leadville in silver production. In the production of lead Leadville was first, with twice the output of San Juan. Pitkin was third.

The quantity of silver reported from dry ore, most of which carried less than 4.5 per cent of lead and had a siliceous or limestone gangue, was 530,928 fine ounces. The source of silver ore of next importance was lead-zinc ores, from which were extracted 438,064 fine ounces. The rest came from lead ores proper. The average assay in silver and lead of all the ore treated or sold was, theoretically, silver, 7.81 ounces; lead, 2.83 per cent.

Roaring Fork (or Aspen) district.—The larger mines of Aspen were not actively worked from the beginning of 1908 until April, when the Smuggler mill was started. Neither the Smuggler nor the Durant (which is owned by the same interests) made an output approaching that of 1907. The production from the Aspen mine was about the same as in 1907.

The Argentum-Juniata Mining Company shipped considerable siliceous silver ore.

Production was reported from the Aspen Fraction and American Fraction mines. The operators of the Spar Consolidated, Bushwhacker, Morley Zona, and Millince mines shipped silver-bearing lead ores. The Millionaire mine, with a tunnel 6,500 feet, the Della K., with a tunnel 6,000 feet, the Franklin, opened by a tunnel 4,500 feet long, all produced lead-silver ores. The Mineral Farm Consolidated mine was worked under lease, as was the Leadville mine. The Mineral Farm has an incline shaft. Some ore was shipped from the Hood Thunder and Celeste claims at Tourtelotte Park. The Percy-La Salle mines were shut down during 1908.

Lincoln district.—During the last two months of the year the Ruby Mines and Development Company's property, located in the southeast corner of the county, was worked, and ore was sent to smelter. There is a 50-ton concentration mill on this property. The workings consist of a 1,000-foot tunnel and drifts.

Columbia (or Ashcroft) district.—The Tam O'Shanter-Montezuma Mining Company developed its mine. An aerial tramway from mine to mill, about 1 mile long, is being constructed. A 50-ton concentrating mill was nearly completed in 1908.

RIO GRANDE AND SAGUACHE COUNTIES.

Four mines in Saguache and 1 in Rio Grande counties produced ore valued at less than $3,000. A small shipment of gold ore was made from Summitville, Rio Grande County.

The production in Saguache County in 1908 was about one-third of that of 1907. The decrease was nearly all in silver, the production of the other metals remaining as in 1907. A car of ore was shipped from the Independence mine, at Crestone, in the Baca land grant.

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In the Embargo district, in southern Saguache County, just across the line from Rio Grande County, small shipments were made from the Golden Income mine and the Last Relief mine.

In the Bonanza district a few cars of lead-silver ore were shipped from the Antoro mine.

ROUTT COUNTY.

There was very little difference in the values of the metal production in Routt County in 1907 and 1908, the increase for 1908 being only $573. The total value of the output was $5,865, of which $5,207 was in gold and $658 was in silver.

Hahn's Peak district.—A little high-grade ore was shipped from the Royal Flush group by the Hahn's Peak Gold Mining and Milling Company. The property is opened by a shaft 600 feet deep and tunnels aggregating 2,972 feet.

Placer operations in 1908 were mainly confined to hydraulic work on the Blackburn placer and dredging on the Centennial placers by the Iowa-Hahn's Peak Gold Mining Company. There were a number of small producers.

Small placer operations were carried on in the Four Mile and Lay districts. In the latter the Housel-Melvin Mining Company began hydraulic work.

SAN JUAN COUNTY.

Mine production of gold, silver, and associated metals in San Juan County, Colo., in 1907 and 1908.

Metal.	1907.		1908.		Increase (+) or decrease (−).	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold.....fine ounces..	46,814.03	$967,732	48,269.74	$997,824	+ 1,455.71	+$30,092
Silver.....do....	1,175,176	775,616	1,004,287	532,272	− 170,889	−243,344
Copper.....pounds..	2,450,280	490,056	2,282,738	301,321	− 167,542	−188,735
Lead.....do....	12,483,507	661,626	8,402,569	352,908	−4,080,938	−308,718
Zinc.....do....	237,677	14,023	10,131	476	− 227,546	− 13,547
	.....	2,909,053	.....	2,184,801	.....	−724,252

The value of the metallic production in San Juan County in 1908 showed a decrease of $724,252 as compared with that of 1907, but an increase over that of 1906. With the exception of gold, there was a decrease in yield of all the metals. The output of lead showed the greatest decline, from 12,483,507 pounds to 8,402,569 pounds, a difference of 4,080,938 pounds.

San Juan County continues to be second to Lake County in the production of copper and lead, the yield in each case being less than one-half of the output of Lake County.

The tonnage of siliceous ore mined was 180,487 short tons, as compared with 187,242 in 1907, a decrease of 6,755 tons. The copper ores decreased from 10,063 short tons to 2,149 tons, the lead ores from 35,201 tons to 19,513 tons, and the copper-lead ores decreased from 3,133 tons to 494 tons.

The average value per ton of siliceous ore in gold and silver was $6.89, of which $5.19 was gold; of copper ores, $24.24, of which

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3.36 was gold; of lead ores, $11.75, of which $2.70 was gold; and copper-lead ores, $10.70, of which $1.91 was gold.

During 1908 there were treated at gold and silver mills 120,862 ns, and the bullion amounted to $387,459 in gold, an average of 3.21 per ton, and $2,351 in silver, an average of 2 cents per ton, a tal value in gold and silver of $389,810, and an average value of 3.23 per ton. From the ore treated at gold and silver mills, and om 77,370 tons sent to mills for concentration only, a total of)8,232 tons (97.8 per cent of all the tonnage mined) were produced ',346 tons of concentrates, valued at $584,759 in gold, an average $15.66 per ton, and $330,532 in silver, an average of $8.85 per n, a total in gold and silver of $915,291 and an average of $24.51 r ton.

There were produced from the ore to both classes of mills, from)th bullion and concentrates, $972,218 in gold, an average of $4.90 r ton, and $332,883 in silver, an average of $1.68 per ton, a total gold and silver of $1,305,101, and an average of $6.58 per ton for l ore milled.

Crude ore shipped to smelters amounted to 4,411 tons, containing 5,606 in gold, and averaging $5.81 per ton; $199,389 in silver, eraging $45.20 per ton—a total in gold and silver of $224,995, and a average of $51.01 per ton.

The average value in 1908 in gold, silver, copper, and lead of the ntire tonnage of 202,643 tons was $10.78, of which $4.92 was for)ld, $2.63 was for silver, $1.49 was for copper, and $1.74 was for ad.

Mining operations on the part of the regular shipping companies San Juan County were not as active in 1908 as in 1907. The rning of the Gold King surface buildings in June, 1908, and the recking of the Iowa mill by a snowslide in March lessened the oduction considerably. The Silver Lake mines were worked with reduced force during the latter part of the year. The harsh winter 1908–1909, with the closing of railroad transportation for some onths, prevented the shipment of ore and concentrates during that me. The Ross smelter was closed during the entire year.

That there was considerable progress in the county, notwithstand-g, is shown by the increase in number of producing mines to 42 1908 from 27 in 1907. The production from new shippers was in nall lots taken out in the course of development, and the aggregate d not greatly increase the output for the county.

Animas district.—There was little development done on the Aspen ine, and only a small tonnage was milled and smelted. The ore was illed in the plant of the Silver Lake mines. The Garfield Smelting ompany, controlling the Silver Lake mines, treated a slightly creased tonnage in the 300-ton concentrating plant, which was mpleted in 1907.

The Bullion King Mining Company, with a tunnel 4,000 feet long, which 1,508 feet were driven in 1908, shipped a small lot of ore for st purposes. The Congress Gold and Copper Company shipped veral cars during the year. The Ross Mining and Milling Company ade two large mill runs. Work was pursued steadily on a crosscut nnel to cut the Champion vein, 550 feet below the present workings. he Hercules Consolidated Mining Company, with a 160-ton concen-rating plant, made a greatly increased output. A smaller tonnage of

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ore was treated by the Iowa Gold Mining and Milling Company from the Iowa and Tiger claims. The plant is a 150-ton concentrating mill, with crushers, coarse and fine rolls, jigs, Chile mill for regrinding, Wilfley tables, and a canvas slimes plant. The Iowa mine is developed by a tunnel 1,045 feet long to the shaft, which is 250 feet deep; the Tiger mine by a tunnel 1,340 feet long and a shaft 375 feet deep.

The Hamlet Mining and Milling Company, with a 50-ton concentrating mill, was operated part of the year. Lead-silver ore was shipped by the Little Nations Mining Company and by the Gold Tunnel and Railway Company. The latter company's 100-ton mill was idle the entire year.

The Contention Mining Company's property, under lease, and the mine and mill of the Old Hundred Mining Company, were operated for a part of the year. The latter mine is opened by 3 adit tunnels. The mill has 40 stamps, amalgamating plates, and concentrators. The Pride of the West mine was worked under lease, and ore was shipped. Other small producers were the Ridge, Dewey, Cambria, Ridgway group, and Arpad mines.

King Solomon district.—The operators of the Dives and Shenandoah No. 3 mines continued shipments from this district.

Eureka district.—The production of the Gold King Consolidated Mines Company, at Gladstone, was below that of 1907. In June, 1908, the upper terminal of the tramway and other surface buildings were burned, and the mill only commenced running in October. The Gold Prince mine and mill were in the hands of a receiver during the entire year and made no production. The Sunnyside Mines and Mill Company made an increased production. The Martin Gold Mining and Power Company, operating the Tom Moore, did considerable development work, and shipped lead-silver and zinc ores during the year. Small shipments were made from the Minnehaha and Tantallon mines.

The Kittimac Mines Company is developed by 2 tunnels, one 1,000 feet long and the other 1,500 feet. The company completed a 100-ton concentrating mill.

SAN MIGUEL COUNTY.

Mine production of gold, silver, and associated metals in San Miguel County, Colo., in 1907 and 1908.

Metal.	1907.		1908.		Increase (+) or decrease (−).	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold.....fine ounces..	119,366.09	$2,467,516	112,116.37	$2,317,651	−7,249.72	−$149,865
Silver.....do....	1,438,299	949,277	1,543,187	817,889	+ 104,888	− 131,388
Copper.....pounds..	14,905	2,981	382,402	50,477	+ 367,497	+ 47,496
Lead.....do....	5,274,641	279,556	5,555,049	233,312	+ 280,408	− 46,244
Zinc.....do....	.....	.....	952,872	44,785	+ 952,872	+ 44,785
	.....	3,699,330	.....	3,464,114	.....	− 235,216

As compared with that of 1907, the metal output of San Miguel County showed an increase in production of all the metals except gold. The total value of the metals produced, however, fell off $235,216.

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MINERAL RESOURCES

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CALENDAR YEAR

1911

PART I—METALS

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Contents of zinc ores sold or treated in Colorado in 1911, by counties.

County.	Tonnage.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Short tons.	*Fine ozs.*	*Fine ozs.*	*Pounds.*	*Pounds.*	*Pounds.*
Chaffee	398					200,509
Clear Creek	12,642	27.01	46,274		339,854	793,810
Fremont	231	.49	137	3,596		140,526
Gunnison	95					48,895
Lake	96,223	135.17	8,299	3,763	36,058	49,612,673
Park	628					407,772
Saguache	67		668	850	24,854	46,561
San Juan	372	1.87	591	3,674	6,241	24,438
Summit	189					113,681
Total	110,845	164.54	55,969	11,883	407,007	51,388,865

Contents of copper-lead ores sold or treated in Colorado in 1911, by counties.

County.	Tonnage.	Gold.	Silver.	Copper.	Lead.
	Short tons.	*Fine ozs.*	*Fine ozs.*	*Pounds.*	*Pounds.*
Chaffee	54		757	4,610	35,895
Clear Creek	86	155.56	1,397	7,293	43,668
Dolores	24	.47	292	1,478	4,268
Fremont	151	8.12	1,208	10,380	19,904
Gilpin	7	7.88	407	959	1,838
Hinsdale	32	5.09	2,572	1,834	6,179
Lake	232	100.28	7,355	17,683	27,875
Ouray	115	521.75	7,735	7,402	11,637
Park	4	.04	198	367	593
Saguache	31	14.88	385	2,447	23,547
San Juan	662	67.98	68,005	38,572	151,117
Total	1,398	882.05	90,311	93,025	326,521

Contents of lead-zinc ores sold or treated in Colorado in 1911, by counties.

County.	Tonnage.	Gold.	Silver.	Copper.	Lead.	Zinc.
	Short tons.	*Fine ozs.*	*Fine ozs.*	*Pounds.*	*Pounds.*	*Pounds.*
Clear Creek	16,667	854.93	84,536	30,918	860,044	623,734
Dolores	873	3.28	11,932	299	351,485	525,333
Eagle	27,592	87.97	7,856		541,833	5,097,597
Gunnison	803	12.06	13,800	3,564	281,157	508,561
Hinsdale	500	24.22	1,210	8,636	108,801	36,439
Lake	67,078	1,114.87	176,427	87,552	8,469,181	21,997,783
Mineral	45,528	7,609.49	57,265	19,649	6,537,493	1,258,561
Pitkin	4,740	10.51	9,455	7,408	279,814	
San Juan	11,568	209.38	9,703	2,809	979,806	614,870
Summit	39,036	288.64	103,865		5,277,983	7,561,494
Total	214,385	10,215.35	476,049	160,835	23,687,597	38,224,372

MINING INDUSTRY OF COLORADO IN 1911.

A review of the sources of the gold, silver, copper, lead, and zinc output of Colorado for 1910–11, according to the classes of ore and method of treatment, shows that in 1911, as compared with 1910, there was a smaller tonnage of ore sent to amalgamating, cyaniding, and chlorination mills, with less gold in bullion, but a slight increase in silver content. A slightly increased tonnage was sent to mills for concentration only, but the tonnage of concentrates from all classes of mills was less than in 1910, and the content of the concentrates was less in every metal except copper. With the exception of zinc carbonate ore, the tonnage of ore shipped directly to smelters decreased.

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From a metallurgical standpoint, it was found that 77 per cent (as compared with 79 per cent in 1910 and with 76 per cent in 1909) of the tonnage was milled; that 10.9 per cent of this tonnage, or 8 per cent of the total tonnage, was the resulting tonnage in concentrates which were treated at smelters, and that 23 per cent of the ore (as compared with 21 per cent in 1910 and with 24 per cent in 1909) was sent crude direct to smelters, a total percentage treated by the smelters of 31 per cent (the same as in 1909 and in 1910) of the total tonnage. It is found, therefore, that smelters treating the same percentage of a smaller tonnage treated a decreased tonnage in 1911, and recovered 33 per cent of the gold, nearly 95 per cent of the silver, and all the copper, lead, and zinc, or 60 per cent of the total value of the metals from deep mines.

The smelting situation in 1911 in Colorado remained practically as it was at the close of 1910. The Globe, Leadville, and Pueblo smelters were operated continuously, but, as has been the case for several years, not at full capacity. Owing to the floods in the San Juan region and the consequent damage to the railroads, ore from Silverton, Rico, and Telluride was not available, and the Durango smelter was closed in November for the winter. The Salida smelter was active during the year. The semipyritic plant at Golden was in operation almost continuously until November, and treated a larger tonnage than in 1910. The United States Zinc Co.'s plant at Pueblo was steadily operated. The United States Smelting Co.'s zinc-oxide plant at Canon City, closed in October, 1909, was not reopened as a custom plant, but some experimental work toward the treatment of the slag dump was essayed at the beginning of 1912.

To the Salida plant of the Ohio & Colorado Smelting Co. have been added three Godfrey mechanical roadsters and Dwight-Lloyd sintering machines. The Huntington-Heberlein roasters are used at Leadville and Pueblo.

The following list gives the smelting plants in Colorado in 1911:

List of active smelting plants in Colorado in 1911.

City.	Plant.	Owner.
Denver	Globe	American Smelting & Refining Co.
Pueblo	Pueblo	Do.
Pueblo [a]	United States Zinc Co	Do.
Leadville	Arkansas Valley	Do.
Durango [b]	Durango	Ohio & Colorado Smelting & Refining Co.
Salida		North American Smelter & Mines Co.
Golden [c]		

[a] Zinc-copper ores.
[b] Temporarily closed, November, 1911.
[c] Closed, November, 1911.

The yield of gold from the Cripple Creek district decreased $439,600. Conditions in the district were much the same in 1911 as in 1909 and 1910. Although the Roosevelt tunnel, as originally planned, was completed early in 1911, the subsidence of the water was very slow and it became apparent that the tunnel must be driven farther. Work was resumed in October, with satisfactory results to all except those mines in the far eastern portion of the district. In March the Stratton's Independence mill reached a capacity of 10,000 tons of

dump ore per month, and in December the Portland mill, at Victor, reached over 12,000 tons. A new mill, using the Clancy process, was completed in December on the Ajax property.

The three custom mills at Colorado Springs did not yield as much bullion as in 1910. The Golden Cycle handled the bulk of the ore and the Portland and the United States Reduction and Refining Co.'s plants treated the remainder. The chlorination mill of the Portland plant was being gradually transformed to a cyanide plant. Both the chlorination and the cyanide plants of the United States Reduction & Refining Co. were closed at the end of the year. The use of chlorination in the mills of Colorado thus seems near the end.

Lake County (chiefly Leadville) produced a smaller tonnage, with comparatively small decreases in the yield of gold, silver, and lead, but an increase of 15,243,011 pounds of zinc, making a total increase for the county yield valued at $782,975. The tonnage of zinc carbonate produced, chiefly from Carbonate Hill, but also from Fryer, Breece, Iron, Printer Boy, and Rock Hills, increased from 8,059 tons in 1910 to 83,905 tons in 1911, but the output of zinc sulphide decreased from 163,218 tons to 79,376 tons. The tonnage of iron sulphide produced remained practically stationary, but the tonnage of lead and iron-manganese oxide ores decreased, while output of siliceous ores increased somewhat. The American Zinc Co.'s mill at the portal of the Yak tunnel was closed in July.

The San Juan region—Dolores, La Plata, Ouray, San Juan, and San Miguel Counties combined—showed a decreased yield in all the metals except zinc, San Juan County contributing most heavily to the decrease. For gold, San Juan County showed a decrease of $374,064, Ouray a decrease of $242,889, and La Plata $103,907. The Camp Bird mine, in the Sneffels district, Ouray County, produced a somewhat decreased tonnage, with a material decrease in gold-silver bullion and a decreased tonnage of concentrates. San Juan County output showed heavy decreases for all the metals. San Miguel County's output showed a comparatively small decrease for the year 1911 as compared with the output of 1910, but a considerable increase as compared with the yield of 1909. The upper San Miguel district, in which are the three large properties of the Liberty Bell, Smuggler-Union, and Tomboy Cos. (these yielding 90 per cent and more of the county yield), showed a slight increase for 1911. La Plata County's gold and silver yield showed a material decrease because of litigation between owners of two of its principal properties. Dolores County showed a small total increase for 1911, there being important increases for lead and zinc but decreases for the other metals. Hinsdale County, also part of the San Juan group of counties, showed a heavy decrease for all the metals except zinc; the output of copper, the chief metal produced in the county, fell off heavily. Mineral County (Creede), also part of the San Juan region,[1] has been considered alone. Silver, lead, and zinc yields decreased considerably, while gold made a comparatively large increase.

Boulder County increased the yield of gold bullion and also its ore and concentrate shipments, with an increase in total output. Clear Creek County showed an increased yield of the base metals but a decrease in gold and silver. The lower Clear Creek mines

[1] Cross, Whitman, Silverton folio (No. 120), Geol. Atlas U. S., U. S. Geol. Survey, 1905, p. 1.

showed an increase for all the metals and upper Clear Creek mines showed a decrease for all the metals except zinc. Owing to the closing of all but three custom amalgamating mills near Black Hawk, the Gilpin County bullion yield fell off considerably, but the tonnage of concentrates increased very heavily, particularly from the treatment of ore from the Russell district, the contents showing heavy gains in all the metals, resulting in appreciable increases in total metal output for the county.

The Pitkin County (Aspen) yield of lead and silver decreased. The Summit County gold output from dredge operations decreased, but the production of all the other metals showed an appreciable increase, particularly zinc. This county ranks second in zinc yield. Owing to decreased operations at the London mine, the metal output from Park County ore showed a considerable decrease, although there was an increase from hydraulic placer mines. The total value of the yield from Gunnison County showed a decrease, chiefly from a decrease in gold; lead and zinc yields showing increases. Eagle County's yield, chiefly zinc, showed a considerable increase, there being also increases in the yield of the other metals except copper. Chaffee County made a decreased production for 1911, all the metals except lead decreasing. The gold decrease from this county came from placer mines, owing to the closing of the Twin Lakes placer by injunction obtained by cities below the placer operations against the pollution of Arkansas River.

The following table shows the production of gold, silver, copper, lead, and zinc in Colorado, by counties:

Mine production of gold, silver, copper, lead, and zinc in 1911 in Colorado, by counties.

County.	Producing mines.	Tonnage of deep mines.	Gold.		Silver.	
			Quantity.	Value.	Quantity.	Value.
		Short tons.	*Fine ounces.*		*Fine ounces.*	
Boulder	115	15,816	7,893.54	$163,174	53,753	$28,489
Chaffee	19	7,459	3,178.92	65,714	92,098	48,812
Clear Creek	95	105,774	25,116.64	519,207	437,841	232,056
Costilla	3	.....	1,056.12	21,832	96	51
Custer	8	3,670	265.96	5,500	13,179	6,985
Dolores	12	3,276	365.96	7,565	56,202	29,787
Douglas	2	.....	8.03	166	.....	.....
Eagle	11	33,177	1,991.12	41,160	116,109	61,538
Fremont	1	382	8.61	178	1,345	713
Gilpin	162	103,038	37,673.19	778,774	292,659	155,109
Gunnison	20	11,926	7,016.26	145,039	32,541	17,247
Hinsdale	6	723	185.27	3,830	7,753	4,109
Lake	94	438,419	54,830.26	1,133,442	3,007,296	1,593,867
La Plata	19	10,058	13,880.58	286,937	69,438	36,802
Mesa	1	.....	1.35	28	.....	.....
Mineral	9	65,932	8,668.61	179,196	545,319	289,019
Montezuma	2	1	.77	16	6	3
Moffat	4	.....	239.07	4,942	21	11
Ouray	31	133,252	94,474.34	1,952,958	512,800	271,784
Park	25	5,780	2,846.00	58,832	69,072	36,608
Pitkin	11	88,823	26.22	542	450,772	238,909
Routt	1	.....	56.74	1,173	26	14
Saguache	8	184	24.77	512	4,664	2,472
San Juan	38	108,088	16,276.40	336,463	325,604	172,570
San Miguel	28	429,354	118,414.31	2,447,841	1,000,834	530,442
Summit	44	55,904	13,750.16	284,241	182,957	96,967
Teller	92	756,900	510,968.34	10,562,653	57,783	30,625
Total	861	2,377,936	919,220.54	19,001,975	7,330,168	3,884,989

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List of reduction mills in Colorado in 1911, by counties—Continued.

Name.	District.	Process.	Equipment.	Approximate maximum capacity per day.
MINERAL COUNTY.[a]				*Short tons.*
Amethyst	Creede	Concentration	Rolls, jigs (Hartz type), Card tables, Chilean mills, trough classifier, Callow tanks, canvas tables.	100
Humphreys	do	do	Crusher, coarse and fine rolls, trommels, 12 four compartment Hartz jigs, 3 Chilean mills, trough hydraulic classifier, and 12 Wilfley tables.	250–300
Ridge	do	do	No crusher, disintegrating screen, trommels, 3 four compartment Hartz jigs, 3 Wilfley tables.	50–60
MONTEZUMA COUNTY.				
Doyle [b]	La Plata	Cyanidation	Roaster, cyanide equipment.	50
OURAY COUNTY.				
Barstow	Red Mountain	Concentration	10 stamps	50
Atlas	Sneffels	Amalgamation	20 stamps (10 added late in 1911), plates, Wilfley tables, Callow settlers, Deister tables, Frue vanners, canvas plant.	100
Camp Bird	do	Amalgamation, concentration, cyanidation.	60 stamps (1,050-pound), silvered copper plates, 24 Frue vanners, Huntington mills, 11 Wilfley tables, cyanide mill (150 tons.) [c]	240
Revenue	do	Amalgamation, concentration.		
O. & N	Uncompahgre	do	One 3½-foot Huntington mill, plates, Wilfley table.	
Wanakah	do	Concentration	20 stamps	80
PARK COUNTY.				
Paris	Buckskin	Amalgamation	20 stamps, plates	50
PITKIN COUNTY.				
Smuggler	Aspen	Concentration	Crusher, rolls, Hartz jigs, pulverizers, classifiers, tables.	125
Tam O'Shanter[d]	Ashcroft	do	Crusher, rolls, trommels, Hartz jigs, tube mill, 5 concentrating tables, Frue vanners, Richards classifiers, Callow tanks.	100
PUEBLO COUNTY.				
U. S. Zinc Co	Pueblo	Magnetic separation		
SAGUACHE COUNTY.				
Rawley	Kerber Creek	Concentration	Crushers, rolls, jigs, tables.	80
SAN JUAN COUNTY.				
Silver Lake	Animas	do	Crushers, trommels, rolls, jigs, classifiers, Wilfley tables, Chilean mill, Wilfley tables, Frue vanners, canvas tables.	300
North Star	do	Amalgamation, concentration.		
Old Green Mountain.	Animas	Concentration	Crushers, 10 stamps, Wilfley tables.	50

[a] See Parmalee, H. C.—Zinc ore dressing in Colorado; the Creede district: Metall. and Chem. Eng., December, 1910, pp. 677–680.
[b] Idle in 1911.
[c] See description in Min. and Sci. Press, Dec. 31, 1911, p. 866.
[d] See Mines and Minerals, March, 1912, p. 492.

List of reduction mills in Colorado in 1911, by counties—Continued.

Name.	District.	Process.	Equipment.	Approximate maximum capacity per day.
SAN JUAN COUNTY—continued.				*Short tons.*
Green Mountain [a]	do	do	Crusher, rolls, trommels, jigs, 10 card tables.	100–180
Hercules	do	Amalgamation, concentration.	Blake crusher, rolls, trommels, jigs, Wilfley tables, 40 stamps, plates, Wilfley tables, Frue vanners.	140
Intersection	do	Concentration	5 stamps, 1 concentration table, 1 vanner.	20
Iowa-Tiger	do	do	Crushers, rolls, trommels, jigs, Chilean mill, Wilfley tables, canvas plant.	125
Old Hundred [a]	do	Amalgamation, concentration.	40 stamps, plates, tables	200
Kittimac	Eureka	Concentration		50–100
Ledge [b]	do	do	Blake crusher, rolls, trommels, Hartz jigs, Chilean mill, Callow tanks, Richards classifier, 20 Wilfley tables.	125
Gold King	do	Amalgamation, concentration.	Gates crusher, 80 stamps (950-pound), plates, 32 card tables, 4 tube mills.	300–400
Gold Prince	do	do	Gates crusher, 100 stamps, (950-pound), plates, classifiers, 70 card tables, 5 tube mills.	500
Sound Democrat	Eureka	do		30
Sunnyside	do	do	40 stamps, plates, Wilfley tables, Deister tables. Magnetic plant installed 1912; Ruggles-Coles dryer, trommels, Huff electrostatic machine.	100
Vermilion [b]	do	Concentration	Crusher, rolls, trommels, Hartz jigs, Chile mill, Richards classifier, Callow tanks, 2 Card tables.	75
SAN MIGUEL COUNTY.				
Butterfly-Terrible	Iron Springs	Amalgamation, concentration.	Thirty 1,050-pound stamps, plates, 9 Frue vanners.	75
Carribeau	do	Concentration	20 stamps	45
Lake Superior-Ophir.	do	Amalgamation, concentration.	20 stamps, plates, Wilfley tables.	100
Suffolk	do	Amalgamation	20 stamps, 1 Dorr classifier and 5 Dorr thickeners.	100
Alta	do	Concentration	30 stamps, Wilfley tables	150
Black Bear	Upper San Miguel.	Amalgamation, concentration.	20 stamps	100
Cimarron	do	do	40 stamps	200
Iona [a]	do	30 stamps		150
Japan Flora	do	Concentration	Rolls, trommels, jigs, Wilfley tables.	50
Junta	do	Amalgamation	Denver quartz mill	
Lewis	do	Concentration	Rolls, jigs, tables	50
Liberty Bell	Upper San Miguel (at Pandora).	Amalgamation, concentration, cyanidation.	80 stamps (850-lb.) (stamping in cyanide solution); amalgamation, regrinding in tube mills, concentrating and treating in cyanide plant; 2 Dorr classifiers and 7 thickeners. Moore filter. [c]	400
Nellie (Thomas mill).	Upper San Miguel.	Amalgamation	5 stamps, plates (Wilfley tables, 1912).	
Smuggler Union	Upper San Miguel (at Pandora).	Amalgamation, concentration, cyanidation.	140 stamps (1,040-lb.), classifying cones, Butters distributers, 2 Frue and 2 Gates vanners, Wilfley table, 106 canvas tables. [c] Cyanide leaching plant, 4 Dorr thickeners.	600

[a] Idle in 1911.
[b] For description, see Mines and Minerals, October, 1911, pp. 487–489.
[c] See description of mills, Min. and Sci. Press, Mar. 11, 1911, p. 360.

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PITKIN COUNTY.

Mine production of gold, silver, copper, and lead in Pitkin County, Colo., in 1910 and 1911.

Metal.	1910		1911		Decrease (−).	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold.....fine ounces..	31.25	$646	26.22	$542	− 5.03	− $104
Silver.....do....	477,813	258,019	450,772	238,909	− 27,041	− 19,110
Copper.....pounds..	24,843	3,155	7,408	926	− 17,435	− 2,229
Lead.....do....	13,408,250	589,963	11,084,334	498,795	−2,323,916	− 91,168
Total.....	.....	851,783	.....	739,172	.....	−112,611

The production of both lead and silver in Pitkin County in 1911 decreased, with decrease also in the yield of the two less important metals of the county—gold and copper. The ore sold or treated in 1911 amounted to 88,823 short tons, against 89,037 tons in 1910 and 112,448 tons in 1909. The tonnage concentrated was larger than in 1910, but the tonnage sent crude to smelters decreased considerably.

Pitkin County maintained its place as fifth in rank in the production of silver, and was second to Lake County in the production of lead.

Ore carrying over 4.5 per cent lead carried 291,636 ounces of silver, and ore carrying lead under 4.5 per cent carried 149,681 ounces of silver. Lead-zinc ore carried 9,455 ounces of silver. The average content of all the ore sold or treated was 5.07 ounces of silver per ton and 6.24 per cent of lead.

Roaring Fork (Aspen) district.—The Aspen district furnishes the bulk of the tonnage from Pitkin County. From the Smuggler mine there was a decreased tonnage mined, the proportion of milling ore to smelting ore showing a considerable increase. Smelting ore was shipped from the Argentum-Juniata, Aspen, Durant, Millinee, Mineral Farm, and Spar group mines.

Ashcroft (or Columbia) district.—An increased tonnage from the Tam O'Shanter-Montezuma mine was treated in the 100-ton concentration plant on the property, lead concentrates being shipped and zinc middlings being held for re-treatment.

Lincoln district.—In Lincoln district, in the southeast corner of the county, a shipment of silver ore, carrying lead and a little gold, was made from the Ruby mine.

ROUTT COUNTY.

Hahns Peak district.[1]—Sluicing operations on the Blackburn placer produced an appreciable quantity of gold.

Much development was done on the Royal Flush deep mine.

Slater district.—Development work was done on the mines near Slater.

SAGUACHE COUNTY.

From 8 mines in Saguache County in 1911 there were produced 184 tons of smelting ore, with a total value for the five metals of $9,616, as compared with $11,407 in 1910. There were decreases in the output of all the metals except zinc, which was produced in this county for the first time.

[1] See George, R. D., and Crawford, R. D., The Hahns Peak region, Routt County, Colo.: First Rept. Colorado Geol. Survey, for 1908, 1909, pp. 189–229.

Crystal Hill district (Del Norte).—A small shipment was made from the Crystal Hill district in 1911.

Embargo district.—A small shipment of lead ore was made from the Comet mine.

Kerber Creek district (Bonanza).—Lead ores were shipped from the Antoro mines and the Saguache Mining Co.'s mines. Lead-zinc and lead ores were shipped from the Yellow Type mine. Copper-lead ore, from the Elizabeth mine, and copper and dry ores from the Shawmut mine, were shipped to smelters. Active development was done on the Rawley mine, developing ores carrying lead, zinc, copper, silver, and gold. There is an 80-ton concentration mill on this property.

SAN JUAN COUNTY.

Mine production of gold, silver, copper, lead, and zinc in San Juan County, Colo., in 1910 and 1911.

Metal.	1910		1911		Decrease (−).	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold.....fine ounces..	34,371.74	$710,527	16,276.40	$336,463	−18,095.34	−$374,064
Silver.....do....	782,250	422,415	325,604	172,570	− 456,646	− 249,845
Copper.....pounds..	1,208,496	153,479	470,912	58,864	− 737,584	− 94,615
Lead.....do....	10,688,386	470,289	6,933,822	312,022	−3,754,564	− 158,267
Zinc.....do....	3,781,259	204,188	2,224,351	126,788	−1,556,908	− 77,400
Total.....	.....	1,960,898	.....	1,006,707	.....	− 954,191

The yield of each of the five metals in San Juan County in 1911 showed material decrease, the decrease in total value being $954,191.

There were 37 producing mines in 1911, as against 53 in 1910. The output from deep mines was 108,088 short tons, as compared with 206,272 tons in 1910, a decrease for 1911 of 98,184 tons.

The siliceous-ore output was 82,333 tons, as compared with 178,565 tons in 1910. The copper-ore production decreased from 157 tons to 23 tons, the lead ore increased from 2,436 tons to 13,130 tons, and the copper-lead ores decreased from 1,999 tons to 662 tons. Ores mainly valuable for lead and zinc contents amounted to 11,568 tons in 1911, as against 23,115 tons in 1910. There were also 372 tons of zinc ore produced in 1911. The bulk of the zinc yield came from concentrates from ore chiefly valuable for its gold and silver content.

The average metal value per ton of siliceous ore was $7.82, of which $3.33 was gold; of copper ores, $44.96, of which $3.39 was gold; of lead ores, $16.83, of which $4.29 was gold; of zinc ores, $6.68, of which $0.11 was gold; of copper-lead ores, $74.12, of which $2.12 was gold; and of lead-zinc ores, $7.69, of which $0.37 was gold.

During 1911 there were treated at amalgamation and cyanide mills 62,473 tons, with an average recovery per ton in bullion of $1.90 in gold and $0.02 in silver. There were also 43,696 tons of ore sent to mills for concentration only, a total of 106,169 tons milled (98.2 per cent of all the ore mined) yielding 17,916 tons of concentrates averaging $11.03 per ton in gold, $6.06 in silver, $2.82 in copper, $16.52 in lead, and $7.08 in zinc, with a total gross value per ton of $43.51, as compared with $39.47 in 1910.

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The milling ore averaged in value of recovered metals $2.98 per ton in gold, $1.03 in silver, and $4.46 in copper, lead, and zinc, a total of $8.47, as against $7.91 in 1910. Crude ore shipped to smelter—1,919 tons—averaged per ton $10.29 in gold, $32.72 in silver, and $12.66 in copper and lead, a total of $55.67 per ton, as compared with $62.32 per ton in 1910.

The value in 1911 in gold, silver, copper, lead, and zinc of the entire tonnage averaged $9.31 per ton, of which $3.11 was for gold, $1.60 for silver, $0.54 for copper, $2.89 for lead, and $1.17 for zinc.

Animas district (including the mines in the immediate vicinity of Silverton, and south and east of Animas River from Silverton to Middleton).—There were 25 producing mines in the Animas district in 1911, as compared with 37 in 1910. The Iowa-Gold Tiger group was the largest producer in 1911, the bulk of the ore being treated by concentration only. The second largest tonnage was from the Silver Lake mines, the bulk of this tonnage also being concentrated. A greatly decreased tonnage from the Hercules property was treated by amalgamation and concentration. Ore from the Intersection mine was treated by amalgamation and concentration, and ore from the North Star and the Old Green Mountain group mines was treated by concentration only. Lead ore was shipped from the Aspen and Dives mines, and copper-lead ore from the Highland Mary mine. Small shipments were made from the Big Giant, Brooklyn, Buffalo Boy, Champion, Kansas City, Queen City, Shenandoah, Slide, and other mines.

From the district there was sold or treated in 1911 a total of 34,849 tons of ore, from which were recovered $116,408 in gold, 184,736 ounces of silver, 330,175 pounds of copper, 3,032,488 pounds of lead, and 38,214 pounds of zinc, valued at $394,230, as compared with $964,987 in 1910.

Eureka district (north of Silverton, including Chattanooga, Gladstone, Animas Forks, and Eureka).—There were 12 producing mines in the Eureka district in 1911, as against 16 in 1910. Nearly all the ore in this district is milled. A large and increased tonnage was milled in the Sunnyside mill, which recovered about 60 per cent of the gold and a small quantity of silver on the amalgamating plates, the remainder being recovered as lead and lead-zinc concentrates. A zinc middling is also made, which was stored in 1911. In 1912 a new zinc plant was built, utilizing the Huff electrostatic machine. Lessees operating the Gold King mine and amalgamation and concentration mill marketed bullion and concentrates. Ore from the Silver Ledge mine, at Chattanooga, chiefly valuable for its lead and zinc contents, was treated by concentration only, the product being lead and lead-zinc concentrates. Ore of similar character, from the Bonanza mine, was also treated by concentration. Small outputs were made from the Esmeralda, Joe and John, Kittimac, Paris, and San Juan Queen mines.

From this district there were sold or treated in 1911 a total of 73,239 tons of ore, from which were recovered $219,826 in gold, 140,862 ounces of silver, 140,737 pounds of copper, 3,901,334 pounds of lead, and 2,186,137 pounds of zinc, valued at $612,245, as compared with $779,016 in 1910.

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SAN MIGUEL COUNTY.

Mine production of gold, silver, copper, lead, and zinc in San Miguel County, Colo., in 1910 and 1911.

Metal.	1910		1911		Increase (+) or decrease (−).	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold.....fine ounces..	120,685.61	$2,494,793	118,414.31	$2,447,841	− 2,271.30	−$46,952
Silver.....do....	1,144,050	617,787	1,000,834	530,442	− 143,216	− 87,345
Copper.....pounds..	544,189	69,112	971,064	121,383	+ 426,875	+ 52,271
Lead.....do....	7,791,841	342,841	6,456,333	290,535	−1,335,508	− 52,306
Zinc.....do....	2,193,981	118,475	3,386,088	193,007	+1,192,107	+ 74,532
Total.....	.....	3,643,008	.....	3,583,208	.....	− 59,800

The value of the metallic production of San Miguel County in 1911 was $3,583,208, a decrease, as compared with the yield in 1910, of $59,800, but an increase, as compared with the output of 1909, of $278,120. The Upper San Miguel district showed a small increase in total value of output in 1911, but the Iron Springs and Lower San Miguel districts showed decreases.

The output from 28 mines was 429,354 tons of ore, as compared with 481,000 tons from 43 mines in 1910. The average value per ton in 1911 was $8.35, as compared with $7.57 in 1910, with $7.80 in 1909, with $8.08 in 1908, with $9.08 in 1907, with $10.31 in 1906, and with $9.58 in 1905. In 1911 the average content per ton in gold was $5.70 and 2.33 ounces of silver, as compared with $5.19 in gold and 2.38 ounces of silver in 1910.

The siliceous ore produced amounted to 428,043 tons, being 99.7 per cent of the entire output. Practically all the gold and the bulk of the silver came from this class of ore. The output of lead ores was 1,306 tons.

San Miguel County in 1911, in quantity of output, fell slightly behind Lake County, which was second to Teller County. In gold yield, San Miguel County maintained its place as second to Teller, and in silver, held second place after Lake County. In value of metals produced, San Miguel stood third, with Teller first, Lake second, and Ouray fourth.

During 1911 there were treated at amalgamation and cyanide mills 390,568 short tons of ore, or 91 per cent of all the ore mined; an average per ton of $4.83 in gold and $0.43 in silver was saved as bullion. The gold and silver saved as bullion in 1911 represented 69 per cent of the gold and silver produced in the county.

There were 37,438 tons of ore sent to mills for concentration only, a total of 428,006 tons milled (99.7 per cent of all the ore mined), which yielded 25,994 tons of concentrates, averaging $21.62 in gold, $11.94 in silver, $4.59 in copper, $9.94 in lead, and $7.42 in zinc, a total per ton of $55.51, as compared with $49.98 in 1910.

Milling ore averaged $5.71 in gold, $1.12 in silver, and $1.34 in copper, lead, and zinc, a total of $8.17 per ton, as compared with $7.46 per ton in 1910.

Crude ore shipped to smelters—1,348 tons—averaged $1.66 in gold, $37.42 in silver, $1.51 in copper, $23.90 in lead, or $64.49 per ton, as compared with $45.63 in 1910.

Reference 6c

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Mine Adits, Mine-Waste Dumps, and Mill Tailings as Sources of Contamination

By J. Thomas Nash and David L. Fey

Chapter E6 of

Integrated Investigations of Environmental Effects of Historical Mining in the Animas River Watershed, San Juan County, Colorado

Edited by Stanley E. Church, Paul von Guerard, and Susan E. Finger

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Chapter E6
Mine Adits, Mine-Waste Dumps, and Mill Tailings as Sources of Contamination

By J. Thomas Nash and David L. Fey

Abstract

The long history of exploration and mining in the upper Animas River basin has produced thousands of prospects and now-inactive mines that range in size from small exploration pits to large mines with tens of miles of workings and mine waste with a corresponding range in size. The recovery of metals required the milling of 18.6 million tons of ore that created large volumes of mill tailings, part of which were placed in streams, or placed in impoundments after 1935. The high precipitation—particularly snowfall—in this area infiltrates mine workings, mine-waste dumps, and mill tailings to create acidic drainage that in places carries high concentrations of metals. To characterize the magnitude of acidic drainage and the concentrations of contaminants, we sampled 97 mine-waste sites, 18 mill-tailings sites, and 60 mine-adit drainages—the most significant ones that we could identify on public lands. Detailed descriptions of the geochemical determinations made on mine water and mine waste enabled us to rank sites for their potential to contaminate the watershed. We utilized three scores—acid generation, metal release in leach tests, and size—to rank waste dumps and mill tailings. For mine-adit water, we utilized metal-loading scores for copper and zinc to rank the potential to contaminate water and degrade aquatic habitat.

Our geochemical characterization results and rankings of sites suggest a wide range in potential to contaminate the watershed. Out of the more than 500 identified sites on public land, only about 40 sites have sufficient size, adit discharge, or waste reactivity to be significant sources of contamination. Sites that have high rankings as sources and those identified by tracer studies of the main streams deserve attention for remediation work.

Introduction

Degraded water quality in streams of the Animas River watershed study area is well documented (Church and others, 1997; J.R. Owen, Unpublished report on water quality and sources of metal loading to the upper Animas River Basin, Colorado Department of Public Health, Water Quality Control Division, 1997; Kimball and others, this volume, Chapter E9; Wright, Simon, and others, this volume, Chapter E10), but the sources of the contaminants are numerous and difficult to quantify. Mining at large and small mines and excavating at countless prospects have disturbed millions of tons of mineralized rock in the Silverton area and resulted in chemical reactions that release acid and metals to receiving waters in the watershed. In this chapter we describe sources of contaminants from inactive mines, mine-waste dumps, and mill tailings that are on public land. The larger sources of contaminants from mining on lands administered by the U.S. Bureau of Land Management (BLM) and United States Department of Agriculture (USDA) Forest Service have been previously described by Nash (1999a, 1999b).

Although biologic criteria drive the standards for desired water quality in the Animas River watershed study area (Besser and others, this volume, Chapter D; Besser and Leib, this volume, Chapter E19), chemical methods are routinely used to measure water quality relative to biologic standards. In this study we used field and laboratory methods to obtain chemical analyses of mine-drainage water that can be evaluated in the context of water-quality standards. In addition, leach tests of mine waste (Fey, Desborough, and Church, 2000) provide a measure of *potential* for acid generation and metal release; those test results can be used to evaluate which waste materials are most reactive and possibly in need of remediation. Whereas leach tests provide reproducible and reliable chemical measurements, physical factors at the site such as the amount of rain and snowfall and the permeability of waste material can affect numerical estimates of potential acid or metals sources. The actual water quality measured from a mine adit or below a mine-waste dump is emphasized in this report because that is a real measure of conditions at a site. However, even these determinations are only an approximation of the effect on the watershed because they do not include processes that may improve or further degrade water quality after it leaves the mine adit, mill, or dump site. Whereas reactions of mine-adit water with mine-waste materials commonly add acid and metals to water, beneficial reactions with wallrocks and mixing of mine-adit drainage with

shallow ground water commonly improve water quality before the mine-related water enters a stream (Nash, 2002; Plumlee and others, 1999). Water-quality investigations by Kimball and others (this volume) indicate that only a few of the sites on public land described here provide major contributions of mine drainage to the major streams of the study area.

Purpose and Scope

The purpose of this study was to describe the magnitude of contamination contributed by mines (mine-adit water), mine-waste dumps, and mill tailings on public land.

1. Field observations and sampling were designed to obtain representative information for mine sites on public land and to compare and rank them as sources of contamination. A limited number of samples were collected at private sites, with the owner's permission. Mines with no road access and located more than about 2 mi from streams were not sampled because this situation was considered not amenable to remediation.

2. Sites were visited a second time for additional observations and sampling if the initial samples suggested a substantial source of contaminants.

3. Mine and mill-tailings sites were evaluated by two class-based ranking methods, rather than by numerical methods, to address uncertainties in field measurements and sampling.

Field Methods

Mine-waste and mill-tailings samples were collected with a protocol designed to provide a statistically reliable, representative sample of the upper 30 cm of a waste pile by combining 30 or more subsamples taken at uniform intervals across the pile and sieving through a 2-mm screen (Smith, Ramsey, and Hageman, 2000). Field studies from 1996 to 2000 included one or more visits to more than 300 sites (mines or prospects). At some sites we collected replicate samples at the same time, by a second sampler, or else during the following year. A total of 173 mine-waste dump and mill-tailings samples were collected from 97 mine-waste dump sites and 18 mill-tailings sites, most of which are on public land. Sites with mine-waste dumps smaller than approximately 100 tons generally were not sampled. Twenty samples of unmined, altered rock were also collected. Representative samples of dump rocks and mill tailings from 113 sites were analyzed chemically. A total of 193 samples of mine-waste dump material, mill tailings, and altered rocks were studied using a passive leach method. Laboratory methods used in leach tests of mine waste and rock are described by Fey, Desborough, and Church (2000), and analytical results are reported in Fey, Nash, and others (2000).

Water samples were collected using a simplified method described by Ficklin and Mosier (1999); we used a disposable 60 mL syringe and 0.45 µm (micrometer) cellulose filter and the addition of ultrapure nitric acid to stabilize metals until analysis by inductively coupled plasma–mass spectroscopy (ICP-MS) and inductively coupled plasma–atomic emission spectroscopy (ICP-AES) (Nash, 1999a; Nash, 2002). The analytical results for our samples of mine-adit drainage water and mineralized surface water are reported in the database (Sole and others, this volume, Chapter G). All adits on public land known to have flowing mine drainage were sampled, along with a limited number of samples from private sites for comparison. All water samples were collected in August or September, during low-flow conditions (as defined by von Guerard and others, this volume, Chapter B).

Discharge at mine portals, an important parameter in metal load calculations, is not easily measured. Discharges were measured carefully by Mast and others (2000), but in our work were based simply on a visual estimate by Nash. Herron and others (Jim Herron, Bruce Stover, and Paul Krabacher, Unpublished Lower Animas River reclamation feasibility report, Upper Animas River Basin, Colorado Division of Mines and Geology, 2000, and similar reports for Mineral Creek, Cement Creek, and Upper Animas River reclamation, 1997, 1998, and 1998) determined mine-adit drainage discharges using a portable weir. Comparison of the estimates by Nash with discharges measured by Mast and others (2000) at the same sites for similar dates suggests that the differences are between about 20 and 50 percent. We emphasize that all measurements and estimates at mine portals are minimum values, because water commonly is lost into alluvium or into fractures in bedrock. This is evident at sites discussed later, including Grand Mogul (mine # 35, caved adit, with flow through a waste dump on alluvium), the Lark and the Joe and Johns (mines # 86 and # 87, with caved adits on alluvium), and the Bandora (mine # 332, with caved adit on mine-waste dump and talus). Because of the loss of mine water through alluvium and bedrock fractures, discharge values used in this report may err on the low side by 25–75 percent at some sites. The effect of these errors in the calculated loads, discussed later, is not easily computed but could be large for the absolute values. However, because we use ranked metal-load score classes, the relative scores are less affected by erroneous discharge values than would be numerical scores. They could change the ranking score by as much as one class (for example, "very high" would be "high").

Site names are those in Church, Mast, and others (this volume, Chapter E5) insofar as possible, but many small mines and prospects on BLM land do not have accepted names. For those sites we use the numeric code employed by Hite (Barbara Hite, Unpublished mine land inventory report for the U.S. Bureau of Land Management, U.S. Bureau of Mines, 1995) with the prefix B, such as B015.

Mineral Deposits Classification and Changes in Mining Technology

Mineral deposits of the Animas River watershed study area and vicinity can be considered to be of just a few types, or they can be split into many subtypes for special purposes such as economic geology or mining engineering (Burbank and Luedke, 1969; Casadevall and Ohmoto, 1977; Guilbert and Park, 1986; Bove and others, this volume, Chapter E3). For the purposes of this report, we used a simple three-part classification of deposits.

1. Polymetallic veins, rich in pyrite, and having variable proportions of chalcopyrite, galena, sphalerite, and gold- and silver-bearing sulf-arsenide minerals as in the Sunnyside mine and the majority of mines and prospects in the study area. These deposits tend to be along major faults inside and outside the Silverton caldera that have moderate argillic alteration halos of pyrite and clay minerals 5–10 m wide (Bove and others, this volume). Manganese minerals (pyroxmangite and rhodochrosite) are locally abundant in some veins, and tungsten (as wolframite, an iron-tungsten-oxide) and fluorine (fluorite) are abundant in some places.

2. Polymetallic breccia pipes, similar in composition to the veins but tending to be richer in sulfide and arsenide minerals, as at the Lark mine (mine # 86, Prospect Gulch) and National Belle mine (northwest of the study area, at Red Mountain Pass). These deposits are restricted to the caldera fault zone, are highly localized as intense bodies of alteration and ore minerals, and are associated with broad alteration halos of the acid-sulfate type with disseminated pyrite-alunite-clay minerals, as in the Red Mountain area (Bove and others, this volume). “Polymetallic” is an appropriate descriptor for virtually all of the deposits of the Animas River watershed study area because many base metals and metalloids (collectively called metals for simplicity) are concentrated in these deposits, even if miners emphasized silver, gold, copper, lead, or zinc for economic reasons.

3. Porphyry deposits containing shattered zones filled by copper-molybdenum quartz-sulfide veinlets, as, the peak 3,792 m and Anvil Mountain areas; these mineralized areas, having large vertical and horizontal dimensions, have been drilled, but none has been mined in this area. Weathering of pyrite in the peripheral alteration halo is a source of acidic drainage today (Yager and others, 2000; Bove and others, 2000; Bove and others, this volume).

Placer deposits of gold in alluvial gravel were mined in a few places such as Arrastra Creek; placer deposits will not be mentioned further, as they were small and made only a minor contribution to the total production in the watershed. They are, however, a reminder that mineralized rocks and veins contributed metals to streams of the area prior to mining activity. Studies by Church, Fey, and Unruh (this volume, Chapter E12) have shown elevated metal concentrations in premining sediment collected throughout the watershed.

Changes in mining and milling technology through the years have had important influences on the materials left behind in the mines or placed on mine-waste dumps and mill-tailings piles (Jones, this volume, Chapter C). In the watershed at least two stages of technology can be highlighted:

1. Early (1871–1913), small-volume mining of high-grade ore zones, with small associated milling infrastructure. The miners lacked powered equipment, created very narrow stopes, and generally brought only hand-picked high-grade ore to the surface. Mine-waste dumps were small relative to the amount of ore removed.

2. Later (after 1913), increasingly large scale mining of lower grade ores was made possible by consolidation of workings, availability of electric- and pneumatic-powered machines, and new milling technology. Selective flotation was developed to recover specific sulfide minerals. The change in milling style was first made at Sunnyside with a new flotation mill built in 1917. Zinc, one of the toxic metals of prime concern in the Animas River (Besser and Brumbaugh, this volume, Chapter E18), was not deemed economic and therefore not recovered before 1904. Significant amounts of zinc are found in all of the ores and mine-waste dumps, and zinc-rich materials were intentionally left underground in many of the older workings because smelters levied a surcharge if the concentrates contained more than 10 percent sphalerite (Ransome, 1901). In this stage, mine tunnels became many miles in length (some crossing under natural drainage divides), tramways were used to carry distant ore to centralized mills, and large mine-waste dumps and mill-tailings piles were made. Tailings handling policies changed in 1935 when regulations required that mill tailings be confined to so-called “tailings ponds” rather than be allowed to go directly into surface streams (Chase and Kentro, 1938). The very large (millions of cubic yards) tailings piles of some of the large mills in the region are physically stable today (the older ones as at Eureka were breached during storm events; Vincent and Elliott, this volume, Chapter E22). Their contents remain a matter of study and concern, however, because the piles were not built on impermeable pads (thus infiltrating water can escape through the base into alluvium). This brief review of the history and technology of mineral extraction in the study area is a reminder that individual site evaluations must consider the mode of mining and milling used at the site before remediation technologies are considered.

Geochemical Characterization of Mining-Related Contamination

Passive Leach Tests and Rankings

Two procedures for determining leachable metals in mine waste and other material were applied to samples in this study. One of the leaching methods was the EPA-1312 protocol, which involves mixing mine-waste material with a dilute-acid extractant and tumbling for 18 hr. This procedure is designed to approximate the effect of rainfall on mine-waste material (U.S. Environmental Protection Agency (USEPA), 1986). Because the EPA-1312 procedure is more labor intensive than the passive leach described in the next section, it was not applied to all samples from this study. Results of the EPA-1312 method are not described here but are compared with results of other methods in Fey, Nash, and others (2000). Results for the EPA-1312 leach are in Fey, Nash, and others (2000) and in the database (Sole and others, this volume). The passive leach method, developed by Desborough and Fey (1997), is a simpler approach to determining leachable metals and was applied to all samples from sites described here. A chemical ranking method utilizing the pH and soluble metals derived from the passive leach was described in Desborough and Fey (1997) and was applied in this study.

The passive leach method was applied to samples collected in the 1997, 1998, and 1999 field seasons. Selected results for some of the more significant sites on public land are presented here. In the passive leach tests, a 100-g sample was exposed to 2L of laboratory de-ionized water (pH of 5.0±0.2) in an open 4L beaker, resulting in a sample/extractant ratio of 1:20. Samples were left at rest for 1 hr, and then gently stirred for 5 s (seconds) to prevent stratification of the leachate. The pH of the leachate was measured after 24 hr and then a 60 mL sample of the leachate was filtered through a Gelman 0.45-µm (micrometer) filter using a disposable 60 mL syringe, acidified with 6 drops of ultra-pure HNO_3, and refrigerated prior to analysis by ICP-MS.

Results from the passive leach tests show that the mine-waste materials generate a wide range of metal concentrations and pH values (table 1; fig. 1). The metal concentrations in the leachate solutions are a measure of the mobile metals in the sample, and the leachate pH is one measure of the acidity generated by the sample. The acidity produced in the passive leach is predominantly from the dissolution of water-soluble acid salts. These salts are mostly hydrous iron sulfate salts such as melanterite ($FeSO_4 \cdot 7H_2O$), copiapite (Fe, Mg) $Fe_4(SO_4)_6(OH)_2 \cdot 20H_2O$) and jarosite ($KFe_3(SO_4)_2(OH)_6$), formed as a result of the oxidation of pyrite (FeS_2) and other sulfides in the waste material. To characterize and rank the waste materials, we utilized the method of Desborough and Fey (1997), with slight modification, which assigns scores for pH and summed metal concentrations Σ(As+Cd+Cu+Pb+Zn, in µg/L). For pH values greater than 6.0, a score of 0 is given; for pH between 4.5 and 6.0, the score is 1; for pH between 3.5 and 4.5, the score is 2; and for pH less than 3.5, the score is 3. Similarly for summed metal content, scores are assigned as follows: less than 500 µg/L, 0; between 500 and 1,000 µg/L, 1; between 1,000 and 5,000 µg/L, 2; and greater than 5,000 µg/L, 3. Because both acid generation and metal release are significant characteristics of mine waste, we added the factors to represent the relative chemical potential for waste to adversely affect water quality. These chemical score values are shown in figure 1. For example, samples plotting in the upper left field of figure 1 score a six (three from the low pH, and three from the summed metals), and have the most potential for adversely affecting water quality. Sum scores of two, three, four, or five may result from the different possible combinations of pH and summed metal scores. Note that no samples plot in the upper three fields on the right hand side of the figure, where the high pH limits the concentrations of metals in the leachates. Although mine-adit drainage water or leachate solutions with high pH can have substantial zinc concentrations, none of our waste sample leachates had both high pH and high zinc concentrations.

The size of a mine-waste dump is also significant in estimation of its potential for contamination and should be included in the waste ranking. Size, in (2,000 lb) tons, was calculated from field estimates of length, width, and thickness; uncertainties in dump geometry and waste density suggest that the size value carries an error of roughly ±25 percent. We utilized five size categories to cover the large range in dump sizes in the study area, ranging from 1 (less than 300 tons)

Table 1. Summary of leachate chemistry for mine waste and mill tailings.

[pH in standard units; elements in µg/L (micrograms per liter)]

	pH	Al	As	Cd	Cu	Fe	Mn	Pb	Zn
Dump samples (*n*=150)									
Minimum	2.28	0.60	0.04	0.02	0.40	0.20	5.2	0.020	0.50
Median	3.44	150	1.20	5.50	28	500	188	120	300
Maximum	8.13	14,000	3,570	165	6,960	144,000	37,400	30,000	30,900
Mill tailings (*n*=25)									
Minimum	2.57	0.10	0.20	0.02	1.0	30	6.7	0.06	0.70
Median	3.90	11	0.30	14	111	35	405	8,000	1,710
Maximum	7.78	6,400	3.5	95	1,500	55,000	20,000	31,000	25,200

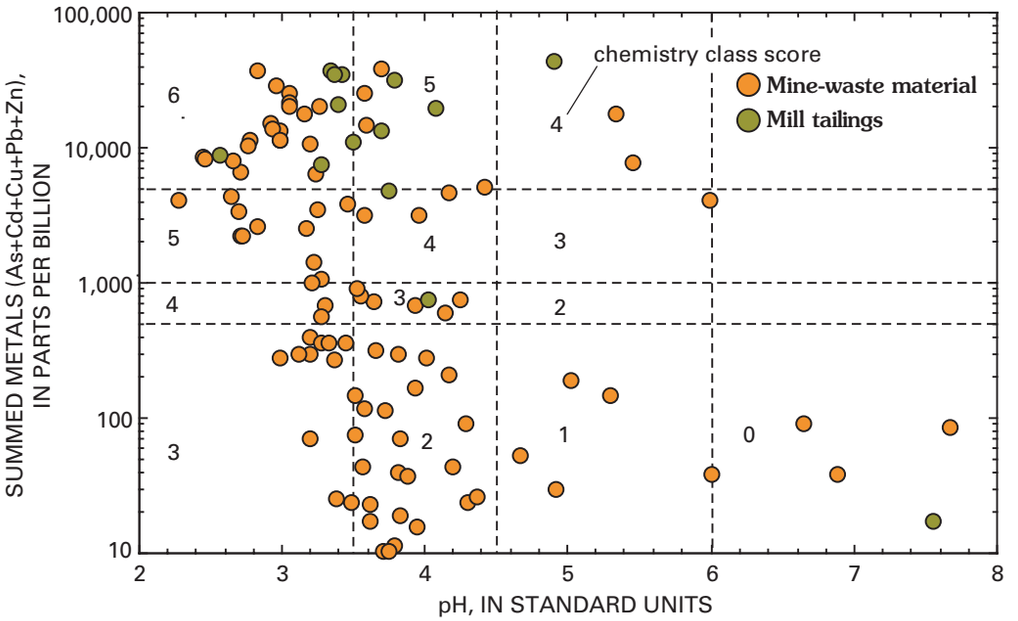

Figure 1. Composition of leachate solutions and classification of mine waste.

to 5 (greater than 50,000 tons), as shown in table 2. An overall *mine-waste score* is obtained by multiplying the dump size score by the chemistry score (sum of the pH and metal scores). Not included in the waste score are other factors such as proximity to stream, surface water flowing across waste material, draining adit water contacting waste material, proximity to ground water, substrate hydrologic conductivity, or other factors that are known to influence mine-related contamination—these attributes are considered in the verbal site descriptions later in this chapter. Finally, the mine-waste scores are converted into five classes that we define as *mine-waste rank*. The five mine-waste ranks, from "low" to "very high," connote the approximate potential to create contamination. Each of the three parameters in the waste score carries uncertainty and error; a numerical value was not used because it might appear to be more precise than its constituent measurements could support. The locations and rankings of mine-waste dump sites on public land are in figure 2.

Geochemistry of Mill Tailings and Tailings Drainage

Mills were numerous in the Animas River watershed study area, especially along the upper Animas River where waterpower was abundant and railroad transportation available (Jones, this volume). Physical evidence remains for more than 50 mills and about 23 mill-tailings sites (Nash, 2000). Mills and associated mill-tailings impoundments fall into three stages of operation: (1) early stage (pre-1913) relatively small stamp mills and unconfined mill tailings that were mostly lost to the nearby river (either poured into the river or washed away during storms); (2) middle stage (c. 1913–1935), larger mills that used flotation to recover zinc and created larger mill-tailings impoundments, many of which failed during major storm events; and (3) late stage (post-1935), large mills that placed tailings into designed impoundments after the Executive Order in 1935 instituted regulations on mill-tailings disposal; most of these tailings are in place today. Tailings from early stage 1 mills are not candidates for remediation because they have been dispersed downstream, where they contribute to the postmining baseline geochemistry of the watershed. Some of the stage 2 tailings pose problems today, either in place or as overbank fluvial deposits transported by flood water (Vincent and Elliott, this volume; Vincent and others, 1999). Some fluvial mill tailings have been reclaimed, such as those south of Eureka. Stage 3 mill tailings, notably the large tailings impoundments of the Mayflower mill, are mostly in place (Jones, this volume).

One estimate of the potential for contamination from mill tailings comes from leach tests. In our studies of 20 representative mill-tailings samples, half of the samples created leachate solutions of high acidity (pH <3.6), and these acidic solutions contained high to very high concentrations of cadmium, copper, lead, zinc, and other metals (fig. 1).

Samples of water that has reacted with mill tailings are difficult to obtain because seeps from tailings impoundments are rare in this area. In places one can collect pore water from within impounded mill tailings (from an auger hole) or water seeping from the sides of an impoundment. Pore water samples from two impoundments had pH values of 5.9 and 4.0, and high to extremely high concentrations of cadmium,

Table 2. Ranking of mine-waste sites based on size and passive leach test results.

[Site name and # from Church, Mast, and others (this volume); (3), number of samples in average. Size score, acid score, metal score, and waste score explained in text. Waste rank, VH, very high; H, high; M, medium; L, low]

Site name	Mine or site number	Size score	Acid score	Metal score	Waste score	Waste rank
Brooklyn (3)	141	5	3	3	30	VH
Kittimack tailings	192	5	2	3	25	VH
B157		4	3	3	24	VH
Grand Mogul (3)	35	4	3	3	24	VH
Lackawanna tailings	287	4	3	3	24	VH
Lark (6)	86	4	3	3	24	VH
Henrietta 700 (2)	85	4	3	2	20	VH
Henrietta 800	505	4	3	2	20	VH
May Day (2)	181	5	3	1	20	VH
Ruby Trust	169	4	3	2	20	VH
Clipper	114	3	3	3	18	VH
Bandora (3)	332	5	1.7	2	18	VH
Brooklyn tailings		3	3	3	18	VH
Monarch	180	3	3	3	18	VH
Ben Butler	9	3	2.7	3	17	H
Minnesota Gulch	144	3	3	2.5	17	H
Little Ida	15	4	3	1	16	H
Kittimack mine	201	4	3	1	16	H
Frisco tunnel	19	3	2	3	15	H
Mammoth tunnel	148	4	3	0.5	14	H
Silver Crown (2)	133	4	3	0.5	14	H
Bonner (3)	172	5	2.7	0	13	H
B237		3	2	2	12	H
Burbank	207	4	2	1	12	H
Joe and Johns	87	2	3	3	12	H
Sultan tunnel	266	4	2.5	0	10	H
Upper Brooklyn		2	3	2	10	H
B213		3	2	1	9	M
N. Denver Lake		3	2	1	9	M
Legal Tender	189	3	2.5	0.5	9	M
Forest Queen (2)	195	3	3	0	9	M
Henrietta 900	506	3	3	0	9	M
Imogene (3)	136	4	2.3	0	9	M
North Star tailings	310	3	1.5	1	9	M
Paradise West		3	3	0	9	M
Paradise (3)	168	4	2.3	0	9	M
Independence	171	3	3	0	9	M
Early Bird	8	4	2	0	8	M
Avalanche (2)	149	3	2.5	0	8	M
Last Chance	289	3	2	0.5	8	M
Columbine	260	3	2.5	0	8	M
B021 (2)		1	3	3	6	L
Mighty Monarch	285	3	2	0	6	L
East Burro bridge		3	2	0	6	L
Elk tunnel (2)	147	3	2	0	6	L
Ruby Trust tailings		1	3	3	6	L
Eveline	91	1	2	3	5	L
Ferricrete mine	137	2	2	0	4	L
Eagle Chief	14	3	1	0	3	L
B183		3	1	0	3	L
B229		3	1	0	3	L
B182		3	0	0	0	L
Highland Mary dump	357	5	0	0	0	L
Highland Mary tailings	351	5	0	0	0	L

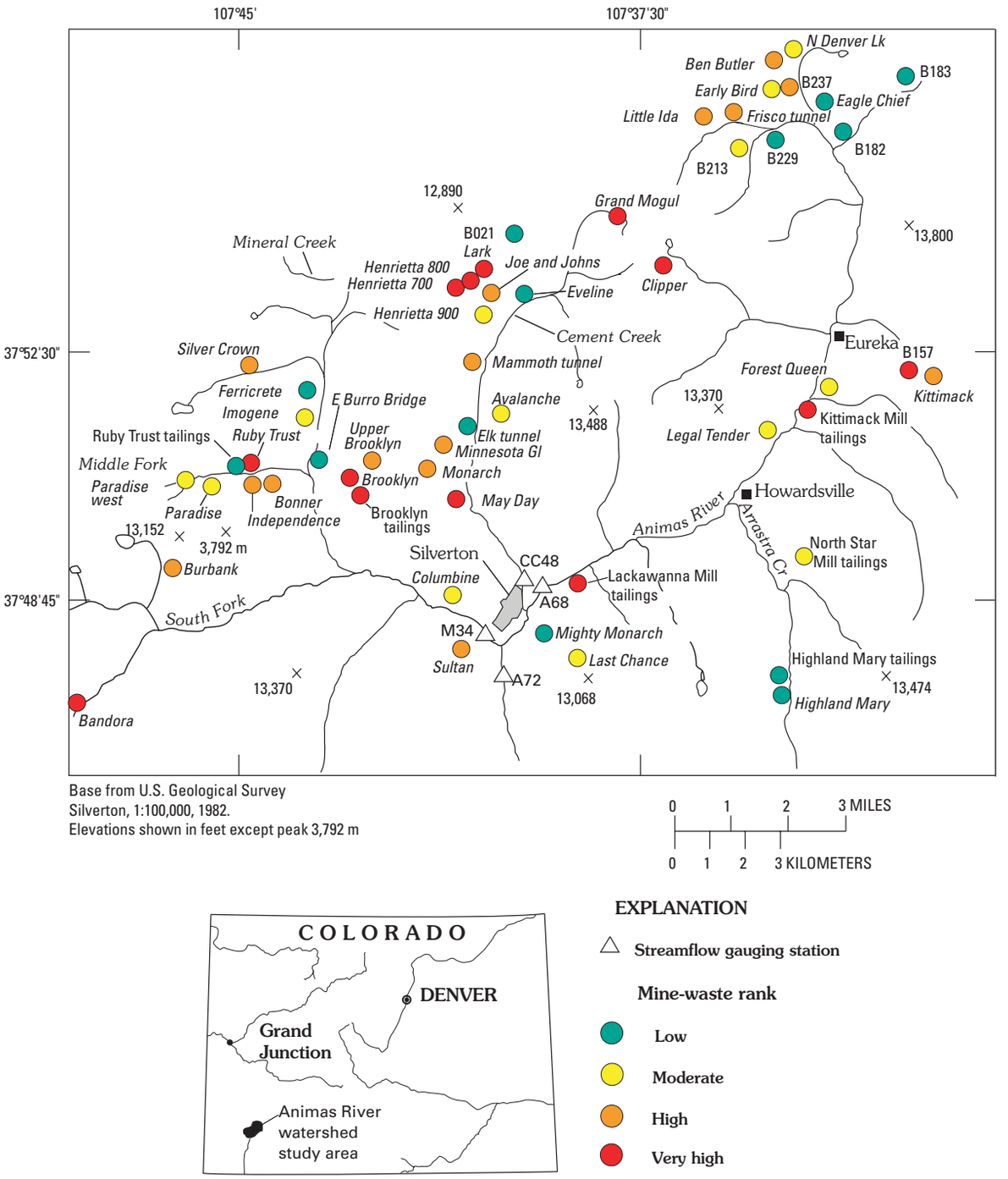

Figure 2. Location and ranking of mine-waste materials at sites on public land in the Animas River watershed study area. Rank is based on size, metal release, and acid-generating potential described in table 2. Map elevations are in feet, except for the prominent peak between Middle and South Forks Mineral Creek, designated as peak 3,792 m (its elevation shown in meters).

copper, lead, and zinc. Springs and diffuse inflows on the west bank of the upper Animas River near the Powerhouse (1 mi northeast of Silverton) are acidic, highly conductive, and rich in metals (Paschke and others, 2005; Kimball and others, this volume; J.T. Nash, unpub. data, 2000); these inflows and possible relations to mill tailings warrant further investigation. Water samples of this type, collected from geologically similar mill tailings elsewhere on the Western Slope of Colorado (Nash, 2002) also tended to be acidic (pH from 2 to 4), with high to extremely high concentrations of base metals.

Mine-Adit Drainage and Ranking

Mine-adit drainage is more common in this area than in most mining areas of the United States. The combination of high precipitation, extensive fracturing (Yager and Bove, this volume, Chapter E1; McDougal and others, this volume, Chapter E13), and high relief creates numerous springs and drainage from mine tunnels. Mine tunnels are common in the study area because they afforded efficient access to deep mine workings while also draining water from the mine. Vertical mine shafts in the study area are also commonly full of water, but this water does not usually flow from the shafts and will not be considered further. Mine tunnels, on the other hand, discharge from 1 to more than 400 gpm (gallons per minute); the water quality is highly variable, and most is degraded relative to water-quality standards for drinking water or for wildlife use. All observations and sampling were conducted in late August or early September of 1997 to 2000, during lower flow stages of the hydrograph (von Guerard and others, this volume). Repeated measurement and sampling of mine-adit drainage show that some adit drainages are relatively consistent in discharge or composition, but that others vary substantially through the year. Seasonal variations in discharge and water quality were studied in detail by Mast and others (2000) and are discussed elsewhere in this report (Wright, Simon, and others, this volume, Chapter E10; Leib and others, this volume, Chapter E11; Mast and others, this volume, Chapter E7). Variations in mine-adit discharge estimates and measurements may explain some differences in ranking by various studies discussed later.

The range in geochemical data from mine-adit drainages is summarized in table 3 and figure 3. Both highly acidic and moderately acidic mine-drainage water sampled in this investigation contains dissolved metal concentrations that could be threats to aquatic life. Based on the percentage of sampled water that exceeds chronic aquatic life water-quality standards (table 3), the most common problems are with zinc, pH, and iron, followed by aluminum, manganese, copper, and cadmium; other investigations have found similar tendencies. The concentrations of lead and arsenic are much less likely to exceed water-quality standards. Because base-metal concentrations generally correlate with acidity (fig. 3; Plumlee and others, 1999), drainage water with pH values from 2 to 4 tend to have highest *concentrations* of toxic metals such as cadmium, copper, and zinc. However, metal *loadings* in the study area tend to be highest from draining adits with water having pH values from 4 to 6 with discharges greater than about 50 gpm.

Highly acidic water (pH 2.3–3.5 observed, fig. 3) is found in 27 percent of mine-adit drainages in this study; some springs have pH values in this range (Mast and others, this volume). Moderately acidic mine-adit drainage (pH 3.5–5.5) is found in 38 percent of mine-adit water in this study; springs flowing from altered red rock in the study area also commonly have pH values in this range. Near-neutral pH values (5.5–7.9) are found in 35 percent of draining mine adits, generally where tunnels have cut sedimentary rocks or propylitically altered volcanic rocks (Yager and Bove, this volume, pl. 1; Bove and others, this volume). Metal concentrations range greatly, but in general increase with acidity.

Table 3. Summary of mine-adit drainage geochemistry.

[Elements determined by ICP-MS, in parts per billion (µg/L); 108 samples; µS/cm, microsiemens per centimeter]

	Minimum	Median	Maximum	Percent exceeding ALWQ[1]
pH	2.3	5.2	7.4	84
Conductivity µS/cm	17	380	>2,000	nc
Al µg/L	1.8	380	52,850	64
As µg/L	<0.03	1.1	186	5
Cd µg/L	<0.01	2.4	1,600	45
Co µg/L	0.06	9.4	154	nc
Cu µg/L	<0.1	15	12,000	51
Fe µg/L	20	4,000	28,800	75
Mn µg/L	1.4	1,030	87,200	53
Ni µg/L	0.1	8.8	105	nc
Pb µg/L	<0.1	2.0	2,520	19
Zn µg/L	8	980	76,000	87

[1]ALWQ, Aquatic life water quality standard (chronic) of CWQCD (2001) for other parts of Colorado; nc, not computed.

Metal Concentrations

Eight metals are generally considered to be potentially harmful to aquatic health—aluminum, arsenic, cadmium, copper, iron, manganese, lead, and zinc (Manahan, 1994; U.S. Environmental Protection Agency, 1999; 2001). For aquatic biota of the Animas River watershed study area, the two metals of prime concern are copper and zinc (J.R. Owen, unpub. report, CDPH, 1997). Besser and Leib (this volume) have shown that dissolved zinc and copper have the greatest effect on aquatic biota in the study area. Other potentially toxic metals, such as silver, cobalt, mercury, molybdenum, nickel, and selenium, were detected at low concentrations

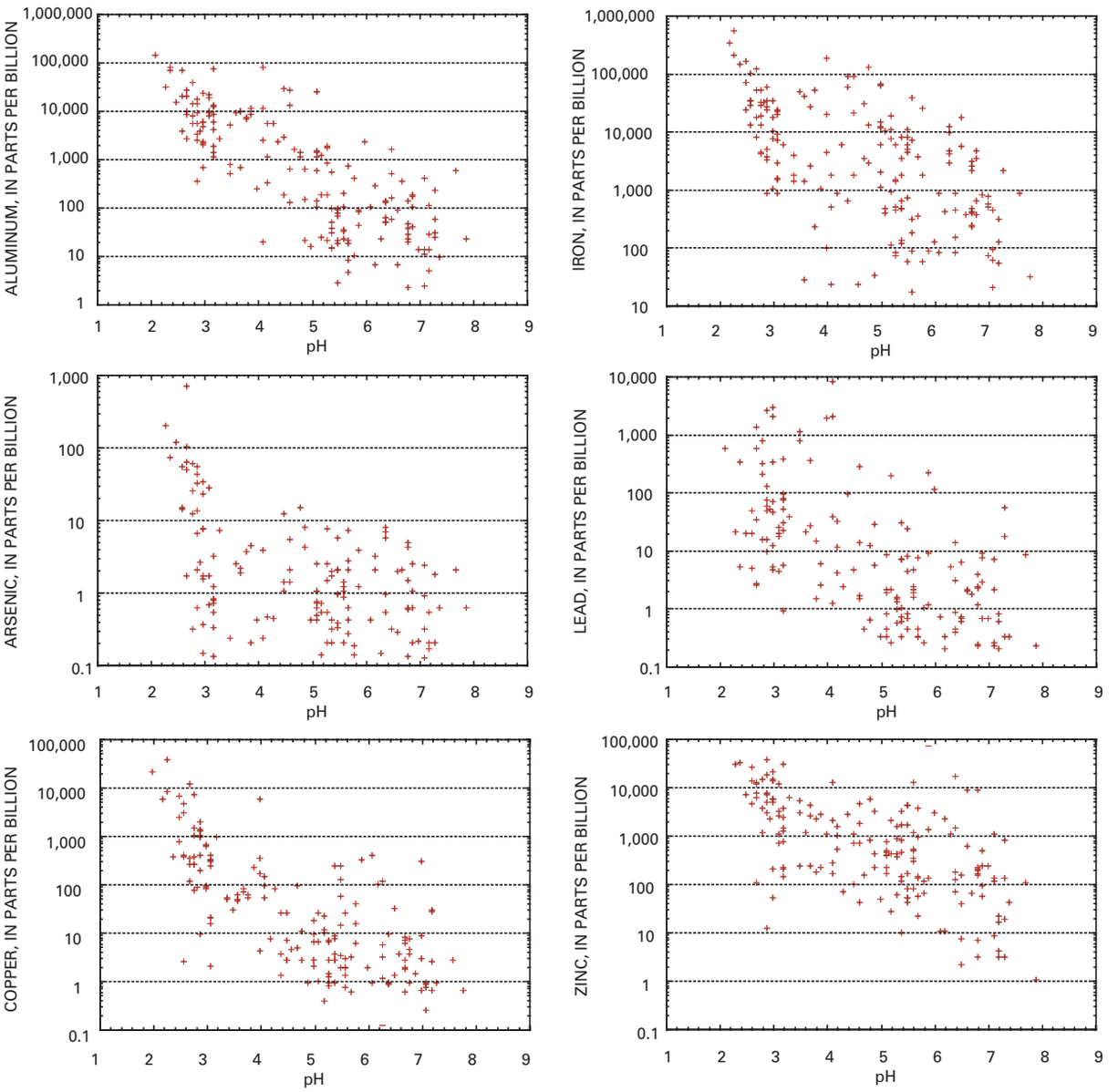

Figure 3. Composition of mine drainage water as a function of pH (standard units).

relative to standards for human and aquatic health; only in a few cases of extremely acidic mine-adit drainage water were these elements sufficiently concentrated to merit concern. Of the potentially toxic metals, some have elevated concentrations more commonly than others. Comparing our analyses of 108 water samples at mine portals and mine-waste dumps with chronic water-quality standards for aquatic life (table 3; CWQCD, 2001; Besser and others, this volume, Chapter D), we note that for more than half of the mine sites, water compositions exceeded the standards for aluminum, copper, iron, manganese, and zinc, whereas concentrations of arsenic and lead rarely exceeded the standards. In the descriptions of mine sites later in this chapter, metal concentrations in water will be described as “high” or “very high” relative to our analyses of mine-adit water (summarized in table 3): “high” denotes values greater than the median and “very high” denotes values greater than the 80th percentile of our analyzed samples. Water measurements termed “very high” are usually substantially in excess of chronic water-quality standards for aquatic life.

Metal Loads

Another measure of the degree of contamination from mine sites is the magnitude of metal loads. A metal load is the product of metal concentration and the discharge of a stream or mine adit (Mast and others, this volume; Kimball and others, this volume). Although health effects on wildlife and humans generally are related to metal concentrations, loads provide an alternative way of evaluating metal budgets in watersheds. We have calculated metal loads for representative examples of mine-adit drainage where the water composition has been determined and the discharge has been measured or estimated. Because of the time variability in discharge and metal concentrations over the year (Mast and others, 2000) and uncertainties in our discharge estimates, we have expressed the loads as ranked values (table 4). The calculated loads for sites sampled at similar times of the year over a 3-year period demonstrate substantial variations, but not enough to significantly change the relative rankings. For example, the loads calculated for the Grand Mogul mine (site # 35) for our three sample events all ranked it among the top eight sites.

Metal loads of mine-adit drainage from 49 sites have been ranked into four classes, from "very high" to "low" (fig. 4). These metal load ranks are an approximate measure of probable contamination to the watershed. The mine-adit drainage ranking (table 4) reflects the sum of scores for copper and zinc loads. The load scores for copper and zinc individually are shown in table 4. The locations and ranks of mine-adit drainages are shown in figure 4. Additional metals could be included in the ranking system, as was done by Butler, Owen, and Simon (Peter Butler, Robert Owen, and William Simon, Unpublished report to Colorado Water Quality Control Commission, Animas River Stakeholders Group, 2001). Arsenic was not included because most drainage water in the watershed has low arsenic concentrations relative to water-quality standards.

Mines on Public Land and in the Animas River Watershed Study Area: Contamination Potential from Waste Material and Adit Drainage

The following is an itemized discussion of inactive mines located on public land in the Animas River watershed study area. The discussion is broken down by basin: the upper Animas River basin, the Cement Creek basin, and the Mineral Creek basin. For each site, we present both the mine waste ranking (where waste material is present) and the mine drainage ranking (where applicable), along with field observations and other pertinent information from other reports.

Mines on Public Land in the Upper Animas River Basin

Setting

The majority of mine production in the study area was from the upper Animas River basin (Animas River upstream from Silverton), possibly as much as 80 percent of the total (estimated from production records; Nash, 2000). Much of this basin is underlain by weakly altered (propylitic) volcanic rocks in the central and eastern part of the Silverton caldera (Bove and others, this volume). Some of the large vein deposits in this subbasin are in radial faults east of the caldera, in weakly altered volcanic rocks; these weakly altered rocks provide some acid-neutralizing capacity from minerals such as calcite and chlorite. Tailings in several settings—private sites, public land, and fluvial deposits—are a significant source of contamination in this basin.

Most of the large and famous historical mines of the area, such as the Sunnyside (mine # 116), Mayflower (mine # 304), and Shenandoah-Dives (mine # 355), are on private land (Church, Mast, and others, this volume). Public land in this basin is administered by the U.S. Bureau of Land Management (BLM); more than 200 small mines and prospects are on BLM land, and 11 of these were considered to have waste piles large enough in tonnage and of sufficient reactivity to be candidates for remediation (Nash, 1999b). Fifteen mines on public land in this basin release adit drainage, and they are ranked in table 4. More than 30 historical mills were located in this basin, but most of these sites have little or no remaining mill tailings, because either (1) the tailings were not impounded and were lost to the Animas River by fluvial transport, or (2) some impounded tailings were removed and reprocessed during World War II (Jones, this volume). Fluvial mill tailings are still common in and along the upper Animas River, redeposited after floods breached mill-tailings impoundments. Fluvial mill tailings in the flood plain of the upper Animas River 1–3 mi south of Eureka are described in detail elsewhere (Vincent and Elliott, this volume).

Kittimack Mill and Lackawanna Mill Tailings

Two mill-tailings sites on (or partly on) BLM land, in close proximity to the upper Animas River, are among the largest sources of contaminants from public land in this basin. These are the Kittimack Mill tailings (site # 192) and the Lackawanna Mill tailings (site # 287). The magnitude of contamination is difficult to quantify, but geochemical analysis of the tailings materials shows them to be reactive and rich in metals of concern. Because of the large volume of mill tailings at these sites, they rank as very high sources of contaminants (table 2). Leach tests on one sample from each of these mill-tailings piles show similar results: the samples generate acidic leachate solutions with extremely high dissolved

Table 4. Ranking of mine-adit discharge for sites on public land.

[Site name and mine number from Church, Mast, and others, this volume; (3), samples in average; site names with B from Hite (unpub. report, U.S. Bureau of Mines, 1995); Cu R and Zn R, copper and zinc load ranks; MD rank, mine discharge rank; MD class, mine discharge class (VH, very high; H, high; M, medium; L, low); Cond., specific conductance in µS/cm (microsiemens per centimeter); Q, adit discharge in liters per minute]

Adit site	Mine No.	Sample ID	Cu R	Zn R	MD rank	MD class	pH	Cond	Q L/m
Grand Mogul (3)	35	NAW 530	1	2	1	VH	3.1	470	100
Natalie/Occidental	153	NAW 551	3	1	2	VH	5.2	498	1,600
Joe and Johns	87	NAW 217	2	4	3	VH	2.7	740	80
Brooklyn (3)	141	NAW 508	5	7	4	VH	3.5	590	80
Big Colorado	150	NAW 552	9	6	5	VH	3.6	960	400
Henrietta 800 (2)	505	NAW 213	4	9	6	VH	2.5	1,651	22
B 219 prospect		NAW 713	12	5	7	VH	3.2	1,110	20
Ben Butler (3)	9	NAW 156	8	11	8	VH	3.0	453	11
Kittimack (3)	201	NAW 235	7	14	9	VH	5.8	236	93
Henrietta 700	85	NAW 215	11	10	10	VH	2.5	1,550	20
Bandora (3)	332	NAW 399	21	3	11	VH	6.3	484	93
Bonner (3)	172	NAW 517	13	12	12	VH	2.9	545	53
Monarch	180	NAW 321	6	16	13	H	4.1	270	40
Paradise (3)	168	NAW 520	22	8	14	H	4.7	1,010	533
Lark	86	NAW 204	10	21	15	H	3.2	380	20
Mammoth	148	NAW 227	18	13	16	H	4.7	983	160
Ruby Trust (2)	169	NAW 524	17	15	17	H	6.0	272	1,200
Eveline	91	NAW 201	15	26	18	H	3.1	370	40
N. Denver Lake (3)		NAW 161	24	17	19	H	3.6	182	17
Elk tunnel (3)	147	NAW 311	25	19	20	H	6.0	938	400
U.S. Basin	143	NAW 582	14	33	21	H	5.6	807	20
Mogul South	30	NAW 329	23	25	22	H	4.4	380	12
Paradise small		NAW 869	32	18	23	H	5.1	605	160
Ferricrete (2)	137	NAW 512	28	22	25	M	5.2	280	140
Avalanche (3)	149	NAW 309	16	36	26	M	3.8	372	40
Early Bird	8	NAW 150	19	34	27	M	3.2	339	6
Little Giant	303	NAW 721	30	23	28	M	5.2	120	20
Burbank (2)	207	NAW 603	26	28	29	M	3.8	388	500
King Solomon	306	NAW 883	20	41	30	M	3.2	40	40
Little Ida	15	NAW 380	27	32	31	M	5.2	90	20
Imogene (3)	136	NAW 511	33	29	32	M	6.6	219	147
NW Burro Bridge		NAW 598	34	30	33	M	7.3	201	40
Chattanooga Curve	135	NAW 579	37	31	34	M	7.3	282	40
Sultan tunnel	266	NAW 298	29	39	35	M	5.4	494	100
Legal Tender	189	NAW 396	42	27	36	M	5.3	337	93
Paradise west		NAW 868	35	37	37	L	4.9	183	400
Forest Queen (2)	195	NAW 232	46	24	38	L	7.2	990	80
Silver Crown	133	NAW 577	36	38	39	L	5.2	360	40
Mighty Monarch	285	NAW 735	39	40	40	L	5.5	183	200
B015		NAW 412	38	47	41	L	5.2	600	12
Bandora east		NAW 647	48	35	42	L	3.2	505	20
Minnesota Gulch	144	NAW 878	40	37	43	L	5.6	264	40
Highland Mary	359	NAW 741	41	45	44	L	2.9	239	40
Chattanooga Moly		NAW 872	40	46	45	L	5.8	581	40
Last Chance	289	NAW 064	44	42	46	L	6.7	230	240
East Burro Bridge		NAW 597	43	48	47	L	7.2	148	12
Eagle Chief	169	NAW 144	45	44	48	L	4.6	80	20
Mazeba		NAW 651	49	43	49	L	5.7	210	20
Picayune prospect		NAW 852	47	49	50	L	6.8	164	20

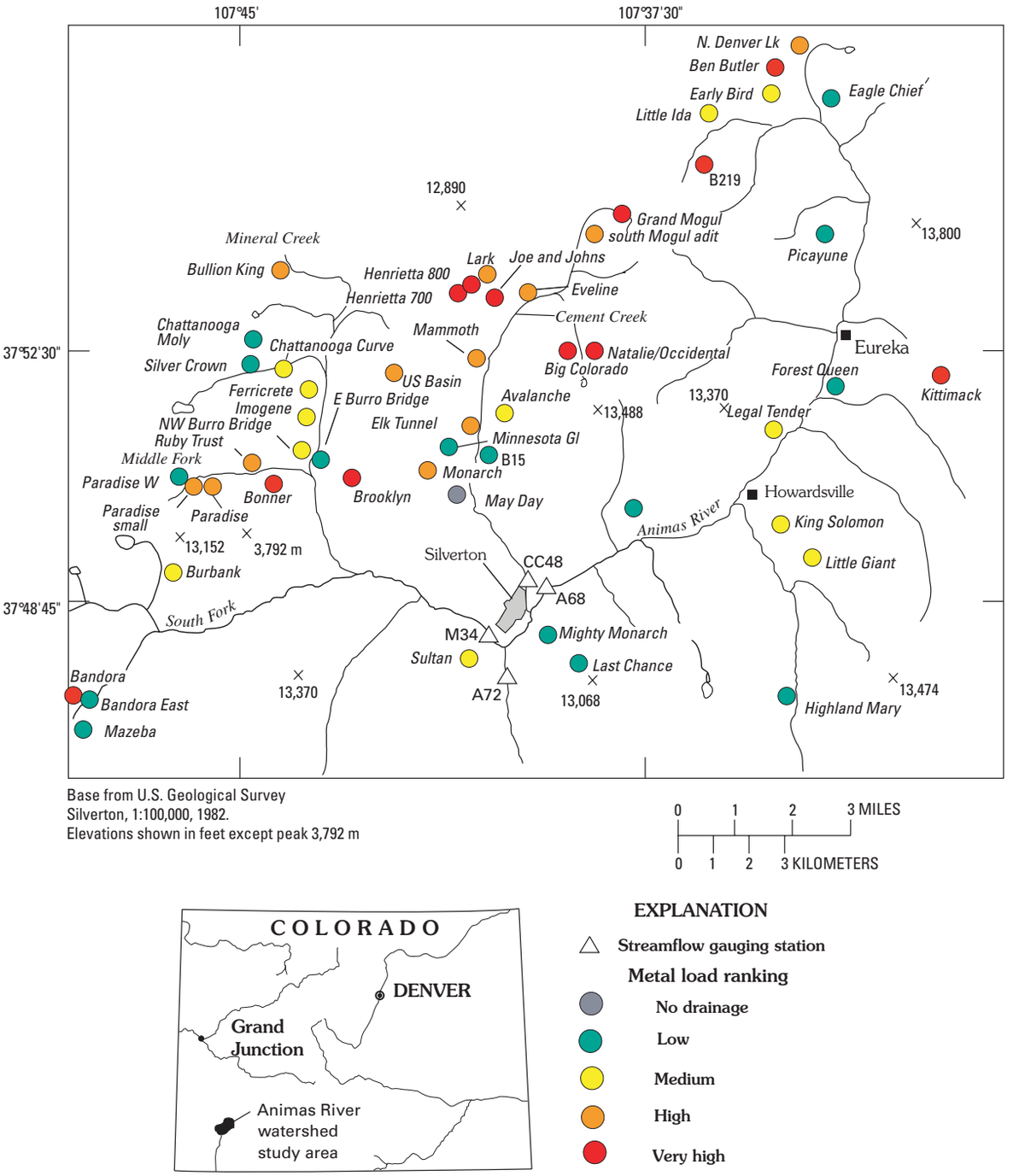

Figure 4. Location and ranking of mine drainage sites on public land, Animas River watershed study area. Ranking explained in text and in table 4. Map elevations are in feet, except for the prominent peak between Middle and South Forks Mineral Creek, designated as peak 3,792 m (elevation shown in meters).

concentrations of copper, manganese, lead, and zinc. Pore water from the Kittimack Mill tailings (site # 192, fig. 5) had a pH of 4.0, high cadmium, and very high copper, lead, and zinc concentrations. Pore water from the Lackawanna Mill tailings (site # 287, fig. 6) had a pH of 5.9, high copper and lead concentrations, and extremely high cadmium, iron, manganese, and zinc concentrations. These chemical results suggest a high potential for contamination. Results from a tracer study by Kimball and others (this volume) show that downstream from the Kittimack Mill tailings, colloidal Fe and dissolved Ca, Mg, Mn, Cu, Zn, and SO_4 increase. Their location on the flood plain made them vulnerable to erosion in extreme storms, and seepage or runoff from these impoundments can travel straight into the Animas River with little or no chance for natural attenuation. A series of shallow wells is needed to test for actual infiltration of contaminated water into alluvium beneath the mill tailings and the magnitude of ground-water flow toward the river.

Leach tests on one sample from the Lackawanna Mill tailings impoundment showed high acid generation and high metal release, for a waste rank of very high. Likewise, a leach test of one sample from the Kittimack Mill tailings impoundment showed moderate acid generation and high metal release; the Kittimack waste ranking is also very high because the volume of tailings appears to be larger than that at the Lackawanna site.

The Lackawanna Mill tailings, entirely on public land, were removed by the BLM in the fall of 2000 and transported to a new repository at the May Day mine site (# 181) on Cement Creek. Similar removal action or substantial remediation work should be considered for the Kittimack Mill tailings, which are partly on BLM land.

North Denver Lake and Ben Butler Mines

Two small mines on BLM land in the northern part of the upper Animas River basin are moderate sources of contamination (Nash, 1999b) because the dump materials are highly sulfidic and mine workings release acidic water. The adit north of Denver Lake (site B233, fig. 7) releases water with a pH of 3.0 and high to extremely high concentrations of cadmium, copper, lead, and zinc; the drainage load ranking is high. The open trench at the Ben Butler mine (mine # 9; fig. 8) contains water with a pH of 3.5 and very high cadmium, copper, lead, and zinc concentrations; the load ranking is very high. The acidic drainage from North Denver Lake mine infiltrates alluvium before it reaches wetlands at the headwaters of the upper Animas River. The water at the Ben Butler mine trench flows only slightly and cannot be traced on the surface to Burrows Creek, a tributary to the upper Animas River. Passive leach tests show that these sulfidic waste materials generate acidic leachate solutions (pH values 3.55 and 2.83) carrying high

Figure 5. Tailings from Kittimack Mill (site # 192) cover tens of acres in flood plain of upper Animas River. Because the mill tailings were piled on alluvial gravels, metals leached from the tailings would probably migrate through the permeable gravels to the river.

Figure 6. Yellow and gray tailings from Lackawanna Mill (site # 287) were placed in flood plain of the upper Animas River, east of Silverton. Because of evidence that the tailings were releasing contaminants to the river, the BLM removed the tailings in 2001 and emplaced them in a repository at the May Day mine.

Figure 7. A small mine north of Denver Lake was the source of the pile of sulfide-rich rocks in foreground. A small flow of water from the adit gains acid and metals on the dump, then flows east to wetlands at the source of the upper Animas River. Drainage in foreground is about ½ m across.

Figure 8. Large quartz-sulfide veins that were mined at the Ben Butler mine are exposed in these shallow trenches, and sulfidic mine waste covers the adjacent slope. Little water from the trenches flows onto the surface, but some may flow into the subsurface. Trench is about 2 m across.

concentrations of base metals. More specifically, the sample from Ben Butler mine released extremely high concentrations of lead and zinc and high concentrations of cadmium and copper. The waste leach ranking for North Denver Lake mine is medium and for Ben Butler mine is high (table 2).

Little Ida Mine

Major quartz-sulfide veins under Tuttle Mountain, west of the Ben Butler mine, were worked by several major mines. Other smaller mines explored parts of the vein system and produced sulfide-rich mine-waste dumps of moderate size. The Little Ida mine (site # 15) and a mine adjacent to the Frisco tunnel (site # 19) are on public land. Leach tests on mine waste from the Little Ida mine showed high acid generation and low metal release, for a waste rank of high. The leach test on waste from the mine near the Frisco tunnel showed moderate acid generation but high metal release, for a waste rank of high.

Kittimack Mine

This mine adit (mine # 201) high above Minnie Gulch (fig. 9) releases a moderate discharge of water with a pH of 5.5, but the metals are sufficiently concentrated to produce a load ranking of very high. Leach tests on mine-waste material showed high acid generation and relatively low metal release; the summary waste rank is very high. The relatively high metal loadings rank suggests that the mine-adit drainage merits attention. However, the fact that the rocks and alluvium in this area are propylitically altered suggests that natural attenuation of metals may occur as the mine-drainage water flows toward the upper Animas River, about 2 mi to the west.

Site B157

West of the Kittimack mine several north-trending adits explored sulfide veins. One of the dumps, B157, is of moderate size and highly sulfidic. The collapsed adit at site B157 does not release mine drainage. Leach tests on waste-dump material from B157 showed high acid generation and high metal release, for a very high waste score. Because this site is relatively dry, it may pose a lower risk of contamination than chemically similar waste dumps that are wet.

Clipper Mine

In the alpine Sunnyside Basin the Clipper mine (mine # 114) workings are small in comparison with others nearby. However, the medium-sized waste dump is highly sulfidic and produces a notable kill zone (an area downslope

Figure 9. The Kittimack mine has a dump of modest size and relatively low sulfide content, but water flowing from the caved adit (left side of photo) is of concern. Although the pH of the water (5.8) is not highly acidic, the water carries substantial amounts of zinc.

of a dump where vegetation has been killed and cannot be reestablished, due to mine drainage or the presence of waste material) for several hundred feet downslope, indicating acidic runoff. The workings release no mine drainage. Leach tests show high acid production and high metal release, for a waste rank of very high (table 2).

Site B219

Drainage from a small prospect in California Gulch has a drainage load ranking of very high because the small flow of water contains especially high metal concentrations. This prospect is so small as to be virtually a natural outcropping; a small mine tunnel explored a quartz vein 3 ft wide. No mine waste was studied because the volume is so small; thus we have no waste ranking for site B219.

Forest Queen

The Forest Queen mine (site # 195) was a problem because the mine tunnel released a substantial flow of water, and it formerly ran over the mine-waste dump into nearby wetlands. This site has been studied by several scientists (Stanton, Fey, and others, this volume, Chapter E25). Remediation was undertaken by the BLM in 1999 as a technology demonstration project. The mine-adit drainage was not unusually acidic, but the water quality was degraded. This drainage was measured and sampled at least 21 times by Mast and others (2000), who recorded pH values in the range of 3.7–6.6 during a 4-year period. In August 1997, the mine-adit drainage at the collapsed portal had a pH of 5.1 and high concentrations of cadmium, iron, and zinc (concentrations of arsenic, copper, and lead were lower than in most mine water). Concentrations of dissolved zinc ranged from 355 to 709 ppb (Church, Mast, and others, this volume, table 7); the one Nash sample contained 435 ppb zinc. The load ranking is low. Passive leach studies of two samples yielded similar results, a high score for acid generation and a very low score for metal release. The mine-waste rankings are medium. A water sample collected below the mine-waste dump in 1997 (prior to remediation) contained lower metal concentrations than did the water at the portal.

Mighty Monarch and Last Chance Mines

Two mine tunnels on Kendall Mountain east of Silverton release high flows of near-neutral water that contains only slightly elevated metal concentrations. The drainage load rankings are low for the Mighty Monarch (site # 285) and low for the Last Chance mine (site # 289). Leach tests on waste from the Mighty Monarch mine showed moderate acid generation but low metal release; the waste ranking is low. Tests on two samples of waste from the Last Chance mine showed moderate acid generation and low metal release, for waste rankings of medium (table 2).

Mines on Public Land in the Cement Creek Basin

Setting

Mine production from this basin was substantially smaller than from the adjacent upper Animas River basin, and only seven mills and one smelter were built. Although major production came out of the American tunnel, the ore was hauled to the Mayflower Mill on the upper Animas River and very little waste was placed nearby. Historical mill tailings impounded at Gladstone, prior to use of the American tunnel, were removed in 1996. Most of the public land in this basin is administered by the BLM. A high percentage of this basin is underlain by highly altered volcanic rocks, including parts of the three Red Mountains that contain acid-sulfate alteration and abundant disseminated pyrite (Bove and others, 2000; Bove and others, this volume). The seven mill sites were evaluated for remediation (Nash, 1999a). Fifteen sites in this basin are ranked by drainage loads in table 4.

Lark-Henrietta Mine Area

Four problematic sites are adjacent mines in upper Prospect Gulch: the Lark, Henrietta, and Joe and Johns mines, and the 1970s mine-waste dump from the 800 level of the Henrietta mine (site # 505). The Lark (site # 86) and the Joe and Johns (site # 87) mine workings are connected by a crosscut tunnel, and some evidence indicates that this crosscut carries mine drainage from the Lark workings to the Joe and Johns mine. This may explain why only a small discharge of water is released at the lowest level of the Lark mine (Lark Number 3 adit). Discharges from the Lark and the Joe and Johns adits are relatively small, but an unknown amount infiltrates into alluvium and bedrock fractures behind the collapsed portals. Remediation work in 1999 was directed at the discharge from the Joe and Johns adit. Surface water in Prospect Gulch has been studied in detail using tracer methods (Wirt and others, 1999; 2001) to quantify the sources of contamination. The work by Wirt and others demonstrates a large inflow of acidic, metal-rich water into Prospect Gulch creek in the vicinity of the Lark-Henrietta mines (fig. 10). However, these detailed studies coupled with reconnaissance studies by Nash do not provide conclusive evidence for the flow path of the acidic water. This area of about 60 acres, including both private mining claims and public land, is one of the larger sources of contamination in the Prospect Gulch subbasin and is so complex that it is difficult to reliably distinguish among many possible sources.

Mine-drainage load rankings (table 4) show how the drainages in Prospect Gulch compare with others in the study area. Drainage water from the Joe and Johns mine and the seep from the Henrietta 800-level waste pile are extremely

Figure 10. Lark mine on flank of Red Mountain # 3 created a dump of modest size but relatively high sulfide content; the dump was reclaimed by BLM in 2002. More complex are springs in the hillslope below the mine that are highly acidic and rich in metals; the springs are of uncertain origin despite several detailed studies.

high in metals and have load rankings of very high. Mine-adit drainage sampled at the portals of the Lark and Henrietta 700 (site # 85) tunnels has lower metal concentrations and load rankings of high and very high, respectively. These rankings do not consider details such as variability through the year or possible errors in flow estimates due to infiltration into bedrock fractures or alluvium that would lower the load values. The seeps in and near the Henrietta 800 waste dump are especially complex (Wirt and others, 2001).

Leach tests were made of six samples from the Lark mine upper and lower dumps (two levels of site # 86); all six samples showed high acid generation. Some variation occurred in metal release: high in three samples and medium in three samples. Considering the range in composition visible at the dump surface, the differences among samples and test results are not surprising. The average waste ranking for the Lark site is very high. Leach tests on two samples from the Joe and Johns waste dump (site # 87) showed high acid generation and high metal release, but the relatively small size of the dump makes the waste ranking high, instead of very high.

The waste dump between the Lark and Henrietta mines contains abundant sulfides and is generally less weathered than most dump piles in the area, which is consistent with reports that a lessee created this waste while exploring the 800 (deepest) level of the Henrietta mine in the 1970s. This waste pile is so close to Prospect Gulch that material slides into the creek, and runoff flows directly into the creek. A leach test on waste from the 800 mine-waste dump showed high acid generation and moderate metal release; the waste ranking is very high. Less clear is the nature of very acidic water that flows from the long narrow waste pile in several places. One possibility is that the acid and associated metals are leached from the dump when surface runoff crosses the dumps. However, there is also evidence for a series of acidic seeps between the dump and the road; these seeps have pH values near 2 and extremely high metal concentrations. Surface water, after flowing over and through the dump, has lower metal concentrations, but the higher flow volumes result in higher loadings. This surface water flows into Prospect Gulch, and related acidic, metal-rich seeps may enter the creek as diffuse inflows, which would explain at least part of the increases measured by Wirt and others (1999; 2001). A series of wells would be required to document the flow and composition of this shallow ground water and its flow path.

The Henrietta 900 tunnel (site # 506) was driven in the 1970s from a lower elevation in Prospect Gulch with the goal of intercepting ore under the Henrietta 700 level. The tunnel is dry, which is difficult to explain, and the dump contains sparse sulfide minerals, suggesting that the target was not reached (as described by Jim Herron, Bruce Stover, and Paul Krabacher, Unpublished Cement Creek reclamation feasibility report, Upper Animas River Basin, Colorado Division of Mines and Geology, 1998). The waste was tested by passive leach and found to generate acid, but it released very little metal; the waste ranking is medium. Remediation is needed to minimize the slumping of waste into Prospect Gulch, but the waste is not as problematic as most mine waste in the study.

Grand Mogul Mine

This mine (site # 35) in the northern part of the Cement Creek basin is one of the larger sources of contamination among all sites on public land. Drainage from the collapsed mine tunnel seeps through the sulfidic dump and emerges at the edge of Cement Creek (fig. 11). Because the flow is diffuse, it was difficult to determine the discharge, suspected to be on the order of 10–20 gpm but possibly higher. The dump is in the flood plain of the creek and there is no chance for natural attenuation before the mine drainage enters the stream. The mine drainage was detected as an acidic inflow enriched in aluminum, iron, copper, and zinc in the tracer studies of Cement Creek (Kimball and others, this volume). Three seep samples were collected and analyzed in 1997 and 1998 (Nash, two; Mast and others, 2000, one). The pH values ranged from 2.9 to 3.4, and concentrations of cadmium, copper, iron, manganese, lead, and zinc ranged from very high to extremely high. Computed metal loads for the Grand Mogul seepage are the highest in this study (load rank very high). Loads calculated for several repeat sampling events differ by about 20 percent, but they all rank in the very high group.

The Grand Mogul dump is highly sulfidic, and sphalerite and galena are visible. Leach tests on three samples show similar results: high acid generation and high metal release. The leach solutions were highly acidic (pH values 3.3 and 2.7) and carried extremely high concentrations of lead and zinc and very high amounts of cadmium and copper. The waste ranking is very high. The drainage water carried high concentrations of lead but not as high as suggested by the leach tests.

The flow paths of mine-adit drainage and dump seepage at the Grand Mogul are not well defined but sufficient to guide remediation planning. Ownership of the mine and waste dump is in question; the dump itself appears to be on public land.

May Day Mine

This site on lower Cement Creek (site # 181) has a relatively large dump that is rich in sulfide minerals (fig. 12; Stanton, 2000). The mine adit is dry, but water of uncertain origin flows below the dump according to piezometer data and geophysical studies (Smith and others, 2000; Wright, Kimball, and Runkel, this volume, Chapter E23). No mine-adit drainage was sampled by us, thus we have no load ranking for comparison with other sites. Leach tests on two samples of dump materials from upper and lower levels showed very different compositions, as expected from the visible differences in mineralogy. The sample from the upper level yielded an acidic solution near pH 3 that carried very high concentrations of cadmium and copper, and extremely high concentrations of lead and zinc. The second sample from the lower level,

Figure 11. Grand Mogul mine in headwaters of Cement Creek looks like hundreds of other mine sites, but tests show that the waste dump is highly reactive, capable of high acid generation and metal release. Of more direct concern is water flowing from the base of the dump, probably related to the mine workings northeast (left) of the dump; metal loadings from these seeps are among the highest found in this study.

Figure 12. May Day mine, excavated to explore veins west of Cement Creek, created these large waste piles of sulfidic rock. To minimize reactions from snowmelt and rain, the BLM reclaimed the dump in 2001 by emplacing a geosynthetic liner and covering with clean soil. Lackawanna Mill tailings were also emplaced there at that time.

with low sulfide and jarosite content, yielded much less acid and metals. The average of the two waste samples yields a mine-waste ranking of very high. In the summer of 2001, this site was made into a repository by the BLM for mill tailings from the Lackawanna Mill. A geosynthetic clay liner was installed and the site covered with clean soil for revegetation (Rob Robinson, BLM, oral commun., 2004).

Elk Tunnel

This tunnel on the west side of Cement Creek (site # 147) was driven westward to access vein deposits. The material on the dump is weakly mineralized, suggesting that the target vein was not reached. Today, the adit releases a large flow (135–260 gpm; Mast and others, 2000) of water that deposits conspicuous orange iron deposits outside the mine and down the slope to Cement Creek (fig. 13). The dump is relatively small and composed mostly of propylitically altered volcanic rocks with low sulfide content. A leach test showed moderate acid generation and very low metal release; the waste rank is low. The mine-adit drainage flows along the edge of the dump but does not appear to react with the waste materials. The mine-adit drainage has been sampled many times (10 samples, Church, Mast, and others, this volume, table 7; 3 by Nash; and several by Herron and others (Unpub. Cement Creek reclamation feasibility report, CDMG, 1998)). The pH values ranged from 6.1 to 7.2, and analyses show consistently low concentrations of most metals. Iron concentrations are high, ranging from about 2,200 to 10,000 ppb, possibly because dissolved oxygen content is very low. The metal of prime concern, zinc, ranges in concentration from about 140 to 210 ppb. The mine-drainage load rank of this site is high.

Figure 13. Elk tunnel, driven west of Cement Creek, did not intersect veins of value but does collect water from deep in the mountain. The pH of the water and the metal concentrations are not extreme, but because of the high flow, the metal loads are high.

Natalie/Occidental and Big Colorado Mines

These mines on South Fork Cement Creek release large quantities of mine-adit drainage (fig. 14) that flow directly into the creek. The weakly acidic water carries high iron concentrations and substantial concentrations of other metals. The loading ranks are among the highest in this study (very high), largely due to the high discharge. The dumps at the Big Colorado (site # 150) may be contributing metals to the drainage, but the dump at the Natalie/Occidental (site # 153) does not appear to react much with the mine water. Because of uncertainties in property status when we sampled in 1998, no waste samples were collected at these sites.

These mines clearly are significant sources of contamination in the Cement Creek basin and rank among the highest loaders in the entire study area. The Natalie/Occidental tunnel in particular should be evaluated for remediation. It is one of about eight sites in this study that release a large flow (>100 gpm) of near-neutral pH water with substantial concentrations of copper and zinc and thus are high copper and zinc loaders (table 4).

Avalanche Mine

This small site (# 149), in a canyon east of Cement Creek, is of concern chiefly because the adit releases acidic drainage. Three samples (Nash, two; Mast and others, 2000, one) show pH values ranging from 3.6 to 3.8 and very high concentrations of copper, iron, and zinc. The acidic water flows over a small mine-waste dump and into a small tributary east of Cement Creek. The drainage load rank is medium, near the median for all draining mines on public land. Leach tests on two samples produced solutions with pH values of 3.6 and 3.8, and low metal concentrations relative to other samples in this study. Concentrations of iron and cadmium in the leachates were elevated relative to biologic criteria. The average waste rank for this site is medium.

Figure 14. Collapsed adit of Natalie/Occidental mine releases one of the larger flows of mine water in the study area. Metal concentrations of the pH 6 water are not unusually high, but because of the high flow rate, loads of copper and zinc are high. Adit is about 1½ m across.

Eveline Mine

This very small mine (site # 91) on Dry Gulch, about 1,000 ft north of the west-flowing reach of Cement Creek, releases a small volume of pH 3.1 water carrying high concentrations of metals. Despite the low discharge, the load ranking is high. The dump is small, but reacts with mine-adit drainage. The leach test on one waste sample shows high metal release and moderate acid generation; because the volume of waste is small, the waste rank is medium.

This site is atypical in that it creates a high loading from a small flow of water. The mine is one of several sites studied here that was excavated into a zone of ferricrete. The co-location in and along the ferricrete zone probably indicates that this mine is along a natural flow path of mineralized water. (See Wirt and others, this volume, Chapter E17.) Partial remediation of the low discharge should be feasible, but if the metal-rich flow is largely related to unmined altered rocks on Red Mountain, then remediation might not achieve the intended results.

Minnesota Gulch Mines

Several small mines in Minnesota Gulch (site # 144) created small dumps with very high concentrations of sulfide minerals, and one adit creates drainage with a pH of 2.9. Although small in size, these mines and dumps create drainage that is rich in base metals. The metal load rank of low reflects the small discharge. This drainage enters the Minnesota Gulch creek at the base of the mine-waste dumps; the creek disappears into the alluvial fan before it can reach Cement Creek, but the subsurface flow must eventually enter Cement Creek. Minnesota Gulch was determined in a tracer study to add substantial loads of aluminum, manganese, copper, and zinc to Cement Creek (Kimball and others, this volume).

Leach tests on two samples collected from two adjacent and compositionally similar waste dumps show similar results: very high acid generation and high to moderate metal release. The average waste rank for this site is very high.

Another very small prospect, site B015, just a few meters from Cement Creek, also creates a small flow of metal-rich, pH 3.2 water that flows into the creek. Due to the small discharge, the drainage load ranking for this site is low.

Monarch Mine

The Monarch mine (site # 180) in Porcupine Gulch was the site of relatively recent mining, possibly the 1970s. The collapsed lower tunnel releases a small flow of drainage, and because of high metal concentrations its drainage rank is high. Leach tests on two samples from the Monarch mine-waste dumps (upper and lower levels) showed high acid generation and high metal release; the average waste ranking for the site is very high. Mine-adit drainage and dump runoff from this site have ample opportunity to react with propylitically altered volcanic rocks before entering Cement Creek. The relatively small size of the mine and waste dumps and good road access suggest that the site would be amenable to remediation.

Mines on Public Land in the Mineral Creek Basin

Setting

Mines in this basin are much smaller than in the central part of the study area, and the amount of patented land is less than in the basins to the east. The majority of the public land in this basin is administered by the USDA Forest Service. The geology of this basin is more diverse than the other basins as it lies astride the western margin of the Silverton caldera, includes several intrusive centers and associated highly altered rocks with prominent red colors, and is the only basin with a

Reference 6c

significant amount of sedimentary rock. Seven mills were built in this basin, but all were quite small; the largest two mills were on Mineral Creek near Silverton, not far from the confluence with the upper Animas River. Mill tailings do not appear to be a significant factor in this basin. The metal load rankings of 19 sites in this basin are in table 4.

Brooklyn Mine Area

An area of about 100 acres in Browns Gulch in the vicinity of the Brooklyn mine (site # 141) is one of the most highly disturbed areas in the Mineral Creek basin and clearly is degrading the water quality of the creek. This mined area, of mixed private and public ownership, has evidently been worked by several operators over the years, with more activity in the past 20–40 years than has taken place in most of the Animas River watershed study area. The most significant problems relate to sulfidic mine-waste dumps, a small mill and tailings pond, and drainage from the major mine adit.

Water drains from the adit at about 10–20 gpm; composition of the water at the adit mouth appears to be variable over time, as analyses of pH and metals reported by Lovekin and others (Jonathan Lovekin, Michael Satre, William Sheriff, and Matthew Sares, Unpublished abandoned mine land report for San Juan Forest, Columbine Ranger District, Colorado Geological Survey, 1997), Mast and others (2000), Herron and others (Jim Herron, Bruce Stover, Paul Krabacher, and Dave Bucknam, Unpublished Mineral Creek reclamation feasibility investigations report, Upper Animas River Basin, Colorado Division of Mines and Geology, 1997) and from our work differ and show a larger range than for most mine-adit drainages. Measured pH values range from 3.2 to 4.8, and metal concentrations range from relatively low for mine water (near aquatic life standards) to highly degraded (4 to more than 20 times the aquatic life standards). The bigger problem is what happens to this water after it leaves the adit and reacts with sulfidic waste rocks on the long face of a large mine-waste dump (fig. 15).The mine-adit drainage reacts with the waste to become more acidic, dropping to a pH of 2.9, and metal concentrations rise dramatically. Iron, copper, and zinc are the most significant contaminants; zinc, at about 150 times the aquatic life standard, is possibly most problematic. The load ranking for the Brooklyn adit drainage is among the highest in this study (very high), and the loads are even higher after the water's reaction with dump materials.

Leach tests on three waste-dump samples showed consistent results: very high acid generation and moderate to high metal release. The averaged waste ranking for this site is very high. The ranking for the mill tailings also is very high; the tailings behave like the mine waste and release large amounts of metal and acid.

The Upper Brooklyn mine dump, north of the Brooklyn mine, created waste that is chemically similar to that of the Brooklyn mine, and likewise released a high amount of acid

Figure 15. Drainage from Brooklyn mine flows down over sulfidic waste rocks for more than 100 m, gaining acid and metals. Water quality degrades considerably between the adit and the base of the dumps.

in the leach test. The mine-waste ranking for the upper dump site rank is high, but the score is considerably lower than for the Brooklyn mine dump because the amount of waste is much smaller.

Browns Gulch was noted as a substantial contribution of aluminum, manganese, lead, and zinc in the Mineral Creek tracer study (Kimball and others, this volume). Multiple sources of contamination lie in this subbasin, including mines and altered rocks above and below the Brooklyn mine, but the mine and dump drainage from the Brooklyn mine area appear to be the largest source of contaminants.

Bandora, Burbank, Imogene, and Ruby Trust Mines

These four mines are problems chiefly from their release of relatively large amounts (approximate range 50–200 gpm) of near-neutral-pH but contaminated water; they will be discussed together because of their geochemical similarities. Median flow volumes include: Bandora, 45 gpm; Burbank, 39 gpm; Imogene, 75 gpm (Mast and others, 2000); Ruby Trust, 100–150 gpm (Nash estimate). Seven samples from these four sites were collected by Nash from 1997 to 1999, and 15 samples are described by Mast and others (2000). The water from these mines has near-neutral pH values (5.4–7.4), but zinc concentrations are sufficiently large to create substantial loadings. Most metal concentrations are low, but iron and manganese are high, and zinc ranges to more than 15,000 ppb. The high iron concentrations are reflected by the red iron oxyhydroxides that precipitate from the drainage water. The drainage load rankings are as follows: Bandora, very high; Ruby Trust, high; Imogene, medium; and Burbank, medium.

Bandora Mine

Leach tests were made on three samples from the Bandora mine (site # 332; fig. 16). Two samples yielded similar results—high metal release and moderate acid generation, for waste rankings of very high. One of the leachate solutions carried the highest lead concentration of this study; however, lead concentrations in mine-adit drainage water were relatively low in this study. A sample of predominantly gray sedimentary rock on one of the lower dumps released little metal and a low amount of acid, for a ranking of low. The average waste ranking for the Bandora site is very high.

Burbank Mine Tunnel

The Burbank mine tunnel (site # 207) was excavated about 20 years ago to access veins identified higher on the mountain, but our examination of the dump rocks suggests that little ore was encountered. The tunnel collects a large amount of water (fig. 17), and the pH of 6.6–7.4 suggests that much of the water had reacted with propylitically altered volcanic rocks of the type that crop out at the site. The load rankings for copper and zinc (table 4) were medium, suggesting that this is not a major source of those two metals of concern. A leach test on one dump sample showed moderate acid generation and low metal release, and a waste rank of high.

Figure 16. The Bandora mine created a series of mine-waste dumps that are relatively unreactive because they are calcareous sedimentary rocks. However, the mine tunnels collect and release water with substantial amounts of zinc, despite the near-neutral pH.

Figure 17. The Burbank mine tunnel failed to intersect veins exposed higher on the mountain, but it continues to release a large flow of water carrying enough zinc at pH 5.4–6 to be a significant loader.

Imogene and Ferricrete Mines, and Unnamed Mine Northwest of Burro Bridge

These mines are on the west side of Mineral Creek in an area of extensive ferricrete deposits. They release relatively large flows (20–100 gpm) of near-neutral-pH water that immediately deposits prominent iron oxhydroxide floc (fig. 18). Ferricrete is exposed at the mine portals, suggesting that the tunnels were made to explore fracture zones that were premining water pathways. The mine workings appear to be relatively small, judging from the small volume of waste at the portals, and the mine waste is not highly sulfidic. The concern at these sites is for the drainage waters; the drainage load rankings for all three mines are medium.

Leach tests on three samples from the Imogene mine (site # 136) showed very low metal release and moderate to high acid generation. The average waste ranking for this site is medium. A sample from the Ferricrete mine (site # 137) dump showed moderate acid generation and low metal release, for a waste ranking of low. No leach test was made of waste from the site northwest of Burro Bridge.

Although metal-enriched water flows from these tunnels, the source of metals in these mine waters may be largely from unmined altered rocks. Although remediation methods such as plugging the tunnels would be expected to reduce metal loads, analyses of flow paths and fracture systems are needed to design effective seals.

Silver Crown Mine

Near Chattanooga horseshoe curve are several prospects for molybdenum and base metals related to an intrusive complex (Bove and others, this volume). The Silver Crown mine (site # 133) is in volcanic rocks, like the majority

Figure 18. The Ferricrete mine adit was driven to explore large outcrops of ferricrete but found no ore. The mine water is typical of many in the study area with near-neutral pH but high iron content. Although zinc concentration in the water is lower than in many mine-adit waters, high flow volume creates a substantial zinc load.

of mines in the study area, but has a mineral assemblage that suggests higher temperatures of a contact or skarn-type deposit. At the surface, the volcanic rocks are not highly altered (propylitic). The predominant green colors on the dump do not suggest that acid is being generated by waste or mine discharge, but two leach tests show high acid generation; metal release was relatively low. The waste rank is high, in part because the site is relatively large. Mine-adit discharge is ranked low (table 4) and is clear; it has a pH value of 5.7, seemingly buffered by the propylitic rocks. Seepage through the dump has essentially the same pH, suggesting little or no reaction with the dump waste. The site is close to a tributary of Mineral Creek, and mine drainage and dump seepage waters flow directly into the tributary.

Ruby Trust Tunnel

The Ruby Trust tunnel (site # 169) was driven northward to intersect veins that crop out higher on the mountain. The tunnel facilitated haulage of ore to the mill and also served to drain water from the mine workings. As with numerous other deep tunnels in the area, this one continues to carry a large volume of water. Load ranking is high. The pH of 5.5–6.0 and the composition of the water suggest that the mine drainage reacted with propylitically altered rocks cut by the tunnel. Because mine-adit drainage flows over the dump and into nearby Middle Fork Mineral Creek, work to minimize reactions with the mine waste may reduce metals loading.

A leach test on one dump sample showed high acid generation and moderate metal release, for a waste ranking of very high. A leach test on a sample of mill tailings showed similar acid generation but high metal release; only a small volume of mill tailings remains at the site.

Bonner Mine

This mine (site # 172) on Middle Fork Mineral Creek had workings and dumps on several levels, and drainage is released on three levels (fig. 19). Based on 11 water samples collected from 1997 to 1999 (Nash, 4; Mast and others, 7), we know that the pH values are consistently acidic (from 2.7 to 3.4) and concentrations of cadmium, copper, iron, manganese, and zinc are high. Concentrations of zinc ranged from about 1,500 to 3,700 ppb. Concentrations of copper also were very high. Remediation work in 2000 was designed to improve water quality and water management. Information gained during excavation in September 2000 (William Simon, oral commun., 2000) suggests that the several mine levels were not interconnected, or had become sealed off, because water in the upper levels did not drain through the lowest tunnel. Mine water at three levels flowed out over mine waste prior to remediation.

Figure 19. Lower adit of Bonner mine, and drainage discharge that flows to Middle Fork Mineral Creek.

Leach tests on three Bonner mine-waste samples showed high acid generation and very low metal release; the average waste rank is high. The concentrations of copper and zinc in leachates were above the median for the study. Because these dumps are close to the creek, runoff can enter the creek with little or no attenuation. The dump may also be adding acid and metals to the percolating mine-adit drainage water.

Independence Mine

Independence mine (mine # 171), west of the Bonner mine complex, has a mine-waste dump that is much smaller than those at the Bonner, but the mineralogy and host rocks are similar. Leach tests show high acid generation, but low metal release, similar to waste samples from the Bonner. The waste rank is medium.

Paradise Mine Area

Several small adits near the headwaters of Middle Fork Mineral Creek release large flows of water (pH 4.7–5.2) that create prominent white and red deposits close to the portals. The largest of these, the Paradise mine (site # 168), is famous for the extremely high aluminum concentration in mine-adit drainage and the snow-white precipitate that forms on the dump (fig. 20). Mineralogical studies show that the white material is the hydrous aluminum-sulfate mineral basaluminite [$Al_4(SO_4)(OH)_{10}\bullet 5H_2O$]. This mine-adit drainage has a metal-load ranking of high. Load ranking for aluminum is the highest of mine-adit waters in this study, but zinc and copper loads are not as high. Load ranking for the Paradise adit is high. Nearby adit drainages (informally here named Paradise small and Paradise west) have similar compositions but lower flow. Paradise west had lower metal load rankings.

Figure 20. The white color and high flow from the Paradise mine make it famous. Several research investigations have documented the very high aluminum concentration in this water; the bright white material is an aluminum oxyhydroxide phase (basaluminite) that precipitates from the mine water.

Leach tests were made on three samples from the Paradise waste dump and one sample from the smaller dump to the west. The tests of dump waste showed moderate acid generation and low metal release; the average mine-waste rank for this site is medium. One sample of red iron floc on the Paradise mine-waste dump showed high acid generation but low metal release. A sample of the white aluminum-rich precipitate showed moderate acid generation and low metal release.

The Paradise mine workings are relatively small, judging from the size of the dumps, and the pH of the water (5.1) is relatively high. Arguments were made (Nash, 1999a; Mast, Verplanck, and others, 2000) that most of the water has reacted with unmined, altered rocks of peak 3,792 m. Steep topography and the large volume of altered rocks that make up that peak (Bove and others, this volume) produce metal-enriched shallow ground water that can flow into the mine workings or fractures. One remediation option, sealing the tunnel, would minimize water contact with mineralized rocks in the workings, but we suspect that water of similar character would be released along other fractures and that the net improvement in water quality in Middle Fork Mineral Creek would be small.

Sultan Tunnel

This site (# 266) is unusual for the study area in that the tunnel and mine workings are in a stock of granitic rock (Yager and Bove, this volume). The waste dump contains abundant pyrite, but few base-metal sulfide minerals were visible. A leach test showed high acid generation, but low release of copper and zinc; the waste rank is high because of the large dump size and high acidity. Mine drainage from the adit has substantial flow, a pH value of 6.2 (quite high), and moderate copper and zinc concentrations. The mine drainage is diverted into a simple ditch, which to some extent minimizes the interaction of mine drainage with the dump waste.

Discussion and Conclusions

Comparison with Other Studies of Mine Waste

The study of mines and their waste dumps in the Animas River watershed study area by Herron and others (Jim Herron, Bruce Stover, and Paul Krabacher, Unpublished Lower Animas River reclamation feasibility report, Upper Animas River Basin, Colorado Division of Mines and Geology, 2000) included leach analyses of waste materials from more than 130 sites in which leachate solution pH, metal concentrations, and total acidity were determined. The waste characterization studies by Herron and others are similar to our studies, and the rankings are generally similar. Comparison of rankings for 32 sites that both groups studied showed most to be similar, but rankings were substantially different for some sites. The discrepancies may reflect differences in sampling or leach protocols. If the discrepancies influence remediation planning,

further studies should be made to resolve the rankings in question. Herron and others (Unpub. Mineral Creek feasibility investigation report, 1997; Unpub. Cement Creek reclamation feasibility report, 1998; Unpub. Upper Animas River reclamation feasibility report, 1999; Unpub. Lower Animas River reclamation feasibility report, 2000) are the sole source of information for mine-waste sites that are on private land.

Mine waste from representative mines and mill tailings in 22 adjoining mining districts on the Colorado Western Slope were studied by the same techniques as used here (Nash, 2002). Passive leach results for 116 samples from those mining areas span a larger range than reported here, including more values that would rank as low in the scale used here. That study supplements the results described here, and suggests that release of acid and high concentrations of heavy metals is characteristic of polymetallic mine-waste dumps in the region.

Comparison with Other Studies of Mine-Adit Drainage

Previous studies of mines on BLM land (Barbara Hite, unpublished mine land inventory report for the U.S. Bureau of Land Management, U.S. Bureau of Mines, 1995) and on USDA Forest Service land (Unpub. abandoned mine land inventory report, San Juan Forest, Columbine district, CGS, 1997) provide additional descriptions, hydrogeochemical data, and interpretations that are generally similar to those of this study. Differences of data or opinion for some specific sites have been discussed elsewhere (Nash, 1999a, 1999b). Some of those differences are matters of emphasis placed on metal concentrations rather than metal loads; the previous studies tended to emphasize problems of some mine-adit drainages having high concentrations but discharges of less than 10 L/m, whereas we emphasized the importance of sites with higher discharges and higher loads.

The metal-load rankings determined (table 4) are in fair accord with the results from Herron and others (Unpub. Mineral Creek feasibility investigation report, CDMG, 1997; Unpub. Cement Creek reclamation feasibility report, CDMG, 1998; Unpub Upper Animas River reclamation feasibility report, CDMG, 1999; Unpub. Lower Animas River reclamation feasibility report, CDMG, 2000), but the rankings for some drainage sites differ substantially. Explanations of the differences could involve numerous factors, such as time of sampling, sampling protocol, or analytical methods. Hydrogeochemical results, discharges, and computed metal loads vary in time; thus, no single sampling event should be used to determine remediation strategy.

Mine-drainage water in the headwaters of the Uncompahgre River and San Miguel River (Nash, 2002), just a few miles north and west of the Animas River watershed study area, spans a compositional range that is similar to the mine-adit drainages described here and includes some extremely acidic water that is even more metal-rich than any sampled in our study area. The Western Slope study (Nash, 2002) included sampling and chemical analysis of 180 surface-water samples; no loads were calculated. The compositional similarities are especially strong for the mine-adit drainages in Red Mountain Creek basin, north of Red Mountain Pass. This area is geologically continuous in the Red Mountain acid-sulfate alteration system (Dalton and others, this volume, Chapter E2; Bove and others, this volume) and is characterized by acidic springs and very acidic mine-adit drainage that mimic the springs and mine-adit drainages of the Prospect Gulch area (Wirt and others, 2001) and the Koehler tunnel–Carbon Lakes area (Kimball and others, this volume). Iron-rich mine-adit drainages, natural springs, and ferricrete deposits continue west from Middle Fork Mineral Creek into the Howard Fork of San Miguel River in the Iron Springs mining area near Ophir. A regional pattern of acid, iron-, copper-, and zinc-rich spring and surface waters radiates from the Red Mountain complex.

Mine Sources in Relation to In-Stream Loads

Quantification of the amount of contamination from mine-adit drainages and mine-waste dumps that moves into streams is difficult. Although great effort was made to sample inflows to streams, especially in the vicinity of the area's inactive mines, the tracer studies of Kimball and others (this volume) were not able to directly quantify the contributions from most mines in the watershed. Even for draining mine adits within a few hundred feet of the streams, the contributions of loads are ambiguous because the hydrology and chemical reactions that add or attenuate metals in surface and shallow subsurface flows are very complex in the setting of these mines (Kimball and others, this volume). Most of the mines described here are more than a mile from the major streams that were characterized by tracer studies, and for them the contributions are especially ambiguous.

Out of the 40 or so mine sources that we identify as potentially significant, only a few are close enough to streams studied by tracer methods to possibly allow quantification of their contributions. The substantial discharges of contaminated water from mines such as Bandora, Paradise, and Bonner flow into the South and Middle Forks of Mineral Creek, streams that were not subjected to a tracer study. Two of the sites highlighted here (Grand Mogul and Kittimack Mill tailings) were among the 24 major sources of loadings detected in the tracer studies (Kimball and others, this volume), and eight of the mine sites that we ranked high or very high for mine drainage presumably contributed to high loadings on five tributaries highlighted by the tracer studies (Prospect Gulch, Minnesota Gulch, Browns Gulch, South Fork Cement Creek, and Middle Fork Mineral Creek). Three mines close to Cement Creek that are highlighted in our rankings (Mammoth tunnel, Elk tunnel, and May Day mine) were detected in the 1996 Cement Creek tracer study (Kimball and others, 2002). The contributions from the Lark, Joe and Johns, Henrietta, Minnesota Gulch, Natalie/Occidental, Brooklyn, Bonner, and Paradise mines cannot be ascertained at the point of mixing with the major

streams. More detailed studies, possibly utilizing tracers injected into underground mine workings, would have to be made to quantify the influence of these and similar mines.

Significant Sources for Remediation

The Animas River watershed study area contains hundreds of potential sources of mining-related contamination (Church, Mast, and others, this volume, fig. 1), but the majority of the excavated sites shown on topographic maps are exploration prospects that disturbed less than about 50 tons of rock. The majority of mines with substantial underground workings and waste dumps are patented claims, on private property. Fewer than 100 mines and prospects on public land were of substantial size, with hundreds of meters of workings and hundreds of tons of mine waste. Out of these sites on public land, fewer than 40 create mine-adit drainage or are situated close enough to major streams to introduce contamination to the watershed that we consider to be significant.

Problematic mining sites on public land were discussed by Nash (1999a, 1999b). Two new sites have been added here, mill tailings placed on public land from the Lackawanna Mill and the Kittimack Mill. Remediation activities at these or other sites will be decided when restoration goals are defined. Dozens of mine sites in the study area release water that at times exceeds water-quality standards set by CWQCD or the Clean Water Act—at the point of discharge. However, these sources of contamination may not be measurable in major streams or at gauging station A72 south of Silverton.

The magnitude of contamination from "dry" sites—those with no obvious surface discharge—is difficult to determine. The monitor wells and detailed studies of the May Day mine (Wright, Kimball, and Runkel, this volume) demonstrate what technologies are needed to evaluate subsurface discharge from either dry or draining sites. Because reactions take place in surface and ground water between the sources and the streams, the contamination predicted by mine site water samples, or from laboratory leach tests, may not accurately reflect what enters the streams. If the abundant geochemical information available for sites on public land is insufficient to guide remediation decisions, then detailed engineering studies will have to be conducted. If required, those studies should include the drilling of wells to document shallow ground water in the vicinity of mine adits, waste dumps, and mill-tailings impoundments. Also, further study is needed on methods to identify the flow paths from mine sources to streams and the water:rock reactions along those paths that change water quality.

This study has addressed issues of mine waste and mine-adit drainage on public land administered by the BLM or the USDA Forest Service, but the same issues obviously exist for mines on private property. Studies of representative private sites by Herron and others (Unpub. Mineral Creek feasibility investigation report, CDMG, 1997; Unpub. Cement Creek reclamation feasibility report, CDMG, 1998; Unpub. Upper Animas River reclamation feasibility report, CDMG, 1999; Unpub. Lower Animas River reclamation feasibility report, CDMG, 2000), using methods similar to those described here, provide data for evaluating the private sites. Such an evaluation was done by Peter Butler, Robert Owen, and William Simon (Unpublished report to Colorado Water Quality Control Commission, Animas River Stakeholders Group, 2001). Although questions of detail may remain about the magnitude or ranking of some individual private or public sites, a general trend seems clear: most of the waste or mine-adit drainage sites with highest potential for watershed contamination (highest loads or leachate concentrations) are on private or mixed private-public sites.

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History of Mining and Milling Practices and Production in San Juan County, Colorado, 1871–1991

By William R. Jones

Chapter C of
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Chapter C
History of Mining and Milling Practices and Production in San Juan County, Colorado, 1871–1991

By William R. Jones[1]

Abstract

The history of mining and milling practices and production in San Juan County, Colorado, can be divided into four time periods based on the changes in milling technology. These periods are defined as (1) the Smelting Era 1871–1889, (2) the Gravity Milling Era 1890–1913, (3) the Early Flotation Era 1914–1935, and (4) the Modern Flotation Era 1936–1991. During these periods mining production was influenced by national and world events such as war, metals prices, government policies, and mining and milling technology. During the Smelting Era, mines were small, milling was rarely done, and most ore was shipped as crude ore directly to the smelters. Selective mining left mineralized rock on surface dumps, and underground as stope backfill. Production in this period was an estimated 93,527 short tons. During the Gravity Milling Era, higher capacity mining technologies were developed, and milling of low-grade ores became common. New technologies, including aerial tramways, air-powered drills, electrical devices, and an integrated narrow gauge railroad system helped increase productivity. Mine production in the period increased to 4.3 million short tons, of which more than 96 percent was waste; that 96 percent was discharged directly into the Animas River and tributaries as mill tailings. During the Early Flotation Era, continued mining technology improvements allowed bulk mining of low-grade ore, which was milled rather than discarded on dumps. Tunnels and workings increased in extent. Production in this era totaled 4.2 million short tons. Mill tailings continued to be discharged into rivers and streams. In the Modern Flotation Era, milling efficiencies improved and production tonnages increased further, but owing to changes in the attitudes of the public and the courts, mill tailings were impounded in tailings ponds, rather than discharged to the Animas River. Long haulage tunnels became practical and drained ground water in the vicinity of the mine workings. Mining in the county increased as a result of World War II and Korean War government incentives, but it decreased after 1953, as costs increased and metals prices failed to keep pace. Increased environmental regulation of mining impacted the industry as reclamation costs reduced profitability. High gold prices and ore grades helped the Sunnyside mine remain in production until 1991 when mining ended in the county after 121 years. Production for the modern flotation era totaled 9.5 million short tons.

Total ore production for 1871–1991 is estimated at 18.1 million short tons, of which an estimated 8.6 million short tons of mill tailings was discharged into the Animas River and tributaries.

Introduction

Silverton and San Juan County have a history of mining production that spans more than 120 years, from initial discoveries in 1871 to the end of major production in 1991. During this time the industry evolved and grew, owing to a complex mix of technology and economics influenced in the broadest sense by America's need for metals. The mining industry has always been a leader in technological innovation and the industry around Silverton was no exception. Four distinct periods of mining and milling practices can be identified: 1871–1889; 1890–1913; 1914–1935; and 1936–1991. Total production for the mines in San Juan County is listed in table 1.[2] These four periods are best defined by the ore processing and milling methods in use during the period. Mining techniques changed somewhat more gradually, but they maintained a clear connection to the demands placed on the mines by the rapid innovations of mineral processing technology. Mines in the study area are shown in figure 1, and the mills and smelters in figure 2. (See Church, Mast and others, this volume, Chapter E5.) Data on the type of mill, capacity, and processes used and dates of construction or expansion are in table 2. Tramways (table 3 and fig. 2) were constructed to provide efficient transport of the ore to larger and more efficient mills, and narrow gauge railroads (table 4 and fig. 2) facilitated in moving the ore concentrate to smelters outside the upper Animas River, Mineral Creek, and Cement Creek basins.

[1]Silverton, Colo.

[2]Owing to space constraints, values for each commodity (troy oz × $/oz; lb × $/lb) are omitted here, and average values for silver, copper, and lead, originally computed to three decimal places, were rounded. The complete table appears on the database disk that accompanies the volume.

Table 1. Summary of metal production from mines in San Juan County, Colorado from 1871 to 1991.

[Data from 1871 to 1908 are estimated when italicized, see notes for details; total value of metals italicized where calculated from commodity prices; --, no data; $/T Oz, dollars per troy ounce; $/lb, dollars per pound]

Year	No. of lode mines	Crude ore treated	Total ore treated	Gold		Silver		Copper		Lead		Zinc	
		Short tons	Short tons	Troy ounces	Average value ($/T Oz)	Troy ounces	Average value ($/T Oz)	Lb	Average value ($/lb)	Lb	Average value ($/lb)	Lb	Average value ($/lb)
1871	--	--	27	196	$20.67								
1872	--	--	100	701	$20.67								
1873	--	--	*100*	629	$20.67								
1874	--	--	*100*	461	$20.67	3,166	$1.28						
1875	--	--	*1,100*	483	$20.67	68,547	$1.24			120,000	$0.06		
1876	--	--	*800*	242	$20.67	48,465	$1.16			249,348	$0.06		
1877	--	--	*800*	242	$20.67	34,010	$1.20	8,664	$0.19	400,000	$0.06		
1878	--	--	*600*	290	$20.67	24,569	$1.15	36,145	$0.17	400,000	$0.04		
1879	--	--	*900*	290	$20.67	30,938	$1.12	100,000	$0.19	500,000	$0.04		
1880	--	--	*700*	290	$20.67	11,602	$1.15	100,000	$0.21	430,000	$0.05		
1881	--	--	*600*	242	$20.67	19,336	$1.13	100,000	$0.18	140,000	$0.05		
1882	--	--	*1,100*	483	$20.67	46,406	$1.14	100,000	$0.19	320,000	$0.05		
1883	--	--	7,400	1,693	$20.67	270,703	$1.11	100,000	$0.17	1,137,000	$0.04		
1884	--	--	8,000	1,935	$20.67	464,062	$1.11	300,000	$0.13	3,400,000	$0.04		
1885	--	--	*14,000*	1,935	$20.67	700,000	$1.07	100,000	$0.11	5,300,000	$0.04		
1886	--	--	*14,700*	6,908	$20.67	718,523	$0.99	100,000	$0.11	4,300,000	$0.05		
1887	--	--	*9,000*	5,865	$20.67	401,760	$0.98	300,000	$0.14	2,040,145	$0.05		
1888	--	--	*7,500*	9,208	$20.67	223,339	$0.94	240,000	$0.17	2,382,358	$0.04		
1889	--	--	*26,000*	19,103	$20.67	508,328	$0.94	135,018	$0.14	4,096,887	$0.04		
1890	--	--	*67,000*	9,064	$20.67	321,340	$1.05	147,354	$0.16	3,462,158	$0.05		
1891	--	--	*121,000*	9,294	$20.67	769,545	$0.99	235,467	$0.13	6,857,544	$0.04		
1892	--	--	*73,000*	7,204	$20.67	397,589	$0.87	136,768	$0.12	6,406,665	$0.04		
1893	--	--	*89,000*	12,611	$20.67	327,153	$0.78	1,125,826	$0.11	8,000,000	$0.04		
1894	--	--	*76,000*	16,450	$20.67	351,114	$0.63	1,118,222	$0.10	4,000,000	$0.03		
1895	--	--	*230,000*	41,094	$20.67	1,894,453	$0.65	2,057,588	$0.11	8,098,800	$0.03		
1896	--	--	*241,000*	43,962	$20.67	2,228,031	$0.68	845,094	$0.11	5,634,586	$0.03		
1897	--	--	*163,000*	33,591	$20.67	1,101,907	$0.60	1,435,203	$0.12	8,021,414	$0.04		
1898	--	--	*232,000*	54,794	$20.67	1,048,499	$0.59	2,252,421	$0.12	14,659,999	$0.04		
1899	--	--	*237,000*	48,199	$20.67	1,191,857	$0.60	1,197,661	$0.17	16,011,677	$0.05		
1900	--	--	*205,000*	36,633	$20.67	681,317	$0.62	1,972,087	$0.17	17,579,177	$0.04		
1901	--	--	242,850	46,588	$20.67	784,218	$0.60	2,740,042	$0.17	15,473,187	$0.04		
1902	--	--	230,000	73,741	$20.67	838,102	$0.53	3,012,283	$0.12	7,699,883	$0.04		
1903	--	--	*249,500*	82,758	$20.67	781,358	$0.54	2,939,018	$0.14	6,969,093	$0.04		
1904	31	--	233,663	83,997	$20.67	1,042,044	$0.58	3,467,124	$0.13	9,288,643	$0.04	1,384,340	$0.05
1905	20	--	204,139	50,840	$20.67	750,844	$0.61	2,274,109	$0.16	8,045,126	$0.05	248,627	$0.06
1906	26	--	196,438	43,545	$20.67	690,076	$0.68	1,549,663	$0.19	4,515,317	$0.06	584,476	$0.06
1907	27	--	235,639	46,814	$20.67	1,175,176	$0.66	2,450,280	$0.20	12,483,507	$0.05	237,677	$0.06
1908	42	4,411	202,643	48,269	$20.67	1,004,287	$0.53	2,282,738	$0.13	8,402,569	$0.04	10,131	$0.05
1909	40	6,100	187,041	33,053	$20.67	793,637	$0.52	1,653,192	$0.13	9,085,068	$0.04	786,518	$0.05
1910	53	6,052	206,272	34,371	$20.67	782,250	$0.54	1,208,496	$0.13	10,688,386	$0.04	3,781,259	$0.05
1911	37	1,919	108,088	16,276	$20.67	325,604	$0.53	470,912	$0.13	6,933,822	$0.05	2,224,351	$0.06
1912	41	--	140,917	25,327	$20.67	714,974	$0.62	1,063,291	$0.17	9,114,334	$0.05	2,478,594	$0.07
1913	38	10,832	123,343	31,811	$20.67	880,409	$0.60	1,221,516	$0.16	9,508,979	$0.04	1,664,999	$0.06
1914	29	4,675	117,988	24,597	$20.67	493,917	$0.55	825,180	$0.13	5,199,000	$0.04	971,177	$0.05
1915	42	5,952	147,878	28,235	$20.67	430,637	$0.51	1,054,463	$0.18	6,791,596	$0.05	2,259,226	$0.12
1916	46	11,748	146,128	21,218	$20.67	502,342	$0.66	1,615,167	$0.25	7,285,304	$0.07	4,014,403	$0.13
1917	46	--	145,685	15,383	$20.67	658,261	$0.82	1,665,923	$0.27	10,515,535	$0.09	3,270,500	$0.10

Total value of metals produced	Sources of data	Important historical events
$4,050.00	Ransome (1901)	Discovery of Little Giant mine.
$14,500.00	Ransome (1901)	
$13,000.00	Henderson (1926)	
$13,586.00	Henderson (1926)	
$101,958.00	Henderson (1926)	Greene Smelter opens in Silverton.
$76,429.00	Henderson (1926)	
$69,458.00	Henderson (1926)	
$54,654.00	Henderson (1926)	Bland-Allison Silver Purchase Act.
$79,751.00	Henderson (1926)	Smelter moved to Durango.
$62,242.00	Henderson (1926)	
$51,770.00	Henderson (1926)	
$97,683.00	Henderson (1926)	D&RG Railroad arrives in Silverton.
$400,871.00	Henderson (1926)	
$719,909.00	Henderson (1926)	
$1,006,500.00	Henderson (1926)	
$1,063,037.00	Henderson (1926)	
$648,176.00	Henderson (1926)	
$545,411.00	Henderson (1926)	Silverton RR built to Red Mountain district.
$1,050,707.00	Henderson (1926)	
$703,548.00	Henderson (1926)	Sherman Silver Purchase Act passed.
$1,278,973.00	Henderson (1926)	
$766,943.00	Henderson (1926)	
$933,436.00	Henderson (1926)	Repeal of Sherman Silver Purchase Act.
$799,456.00	Henderson (1926)	
$2,560,129.00	Henderson (1926)	Silverton Northern RR built to Eureka for Sunnyside mine.
$2,684,076.00	Henderson (1926)	
$1,816,465.00	Henderson (1926)	
$2,587,586.00	Henderson (1926)	
$2,636,712.00	Henderson (1926)	SG&N RR built to Gladstone for Gold King mine.
$1,280,471.00	Henderson (1926)	
$2,556,439.00	Henderson (1926)	
$2,651,614.00	Henderson (1926)	
$2,827,888.00	Henderson (1926)	
$2,860,421.00	Henderson (1926)	
$2,251,535.00	Henderson (1926)	
$1,969,695.00	Henderson (1926)	
$2,999,623.00	Henderson (1926)	Financial Panic of 1907.
$2,184,801.00	Henderson (1926)	
$1,744,003.00	Henderson (1926)	
$1,960,898.00	Henderson (1926)	
$1,006,707.00	Henderson (1926)	
$1,719,894.00	Henderson (1926)	
$1,890,349.00	Henderson (1926)	
$1,143,653.00	Henderson (1926)	WWI begins in Europe.
$1,585,894.00	Henderson (1926)	
$2,207,116.00	Henderson (1926)	
$2,553,137.00	Henderson (1926)	America enters WWI.

Table 1. Summary of metal production from mines in San Juan County, Colorado from 1871 to 1991.—Continued

Year	No. of lode mines	Crude ore treated	Total ore treated	Gold		Silver		Copper		Lead		Zinc	
		Short tons	Short tons	Troy ounces	Average value ($/T Oz)	Troy ounces	Average value ($/T Oz)	Lb	Average value ($/lb)	Lb	Average value ($/lb)	Lb	Average value ($/lb)
1918	37	--	132,927	12,432	$20.67	477,322	$1.00	1,120,178	$0.25	9,485,775	$0.07	3,410,308	$0.09
1919	20	2,849	64,899	6,412	$20.67	279,667	$1.12	661,667	$0.19	5,443,906	$0.05	1,833,768	$0.07
1920	19	2,016	201,671	12,904	$20.67	746,100	$1.09	1,361,391	$0.18	16,601,025	$0.08	11,837,395	$0.08
1921	17	1,164	1,164	400	$20.67	64,179	$1.00	28,558	$0.13	557,555	$0.05	-	$0.05
1922	26	2,758	8,808	1,246	$20.67	77,864	$1.00	110,348	$0.14	1,651,982	$0.06	1,300,000	$0.06
1923	16	627	153,114	11,706	$20.67	471,750	$0.82	1,005,441	$0.15	10,738,943	$0.07	9,540,000	$0.07
1924	13	497	233,790	19,557	$20.67	689,656	$0.67	1,601,748	$0.13	1,755,913	$0.08	17,579,000	$0.07
1925	17	748	274,783	15,089	$20.67	808,254	$0.69	1,502,000	$0.14	2,083,400	$0.09	22,200,000	$0.08
1926	15	372	289,401	14,309	$20.67	869,963	$0.62	1,560,400	$0.14	18,460,600	$0.08	22,423,000	$0.08
1927	10	290	282,824	12,235	$20.67	726,291	$0.57	1,549,214	$0.13	17,271,016	$0.06	22,869,000	$0.06
1928	9	255	326,110	15,739	$20.67	827,318	$0.59	1,755,653	$0.14	16,694,449	$0.06	25,427,000	$0.06
1929	13	130	346,866	20,869	$20.67	871,544	$0.53	2,157,000	$0.18	19,012,224	$0.06	22,858,000	$0.07
1930	12	245	403,801	31,994	$20.67	1,067,496	$0.39	2,678,000	$0.12	17,788,600	$0.05	19,677,000	$0.05
1931	10	26	172,430	31,308	$20.67	430,793	$0.29	1,250,505	$0.08	1,134,000	$0.04	-	$0.04
1932	9	--	191,051	24,724	$20.67	339,965	$0.28	1,367,000	$0.06	1,031,000	$0.03	-	$0.03
1933	12	61	199,612	23,474	$25.56	389,642	$0.35	1,184,000	$0.06	1,198,400	$0.04	-	$0.04
1934	16	781	210,489	16,592	$34.95	303,012	$0.65	819,300	$0.08	2,051,000	$0.04	2,000	$0.04
1935	15	1,038	177,373	16,128	$35.00	282,418	$0.72	624,000	$0.08	2,418,200	$0.04	-	$0.04
1936	25	868	204,281	22,162	$35.00	432,603	$0.78	991,400	$0.09	3,112,900	$0.05	-	$0.05
1937	20	473	283,859	25,099	$35.00	484,362	$0.77	1,102,000	$0.12	6,680,000	$0.06	3,856,000	$0.07
1938	21	482	331,725	26,516	$35.00	647,712	$0.65	2,021,000	$0.10	8,011,000	$0.05	8,549,000	$0.05
1939	20	510	199,271	16,152	$35.00	286,150	$0.68	1,013,000	$0.10	2,092,000	$0.05	1,166,000	$0.05
1940	33	--	231,630	16,098	$35.00	362,662	$0.71	739,000	$0.11	5,378,000	$0.05	2,971,000	$0.06
1941	25	216	265,232	17,384	$35.00	532,731	$0.71	870,000	$0.12	6,145,000	$0.06	1,680,000	$0.08
1942	16	341	197,404	17,094	$35.00	394,657	$0.71	575,000	$0.12	4,297,000	$0.07	784,000	$0.09
1943	19	180	202,100	21,214	$35.00	327,098	$0.71	498,000	$0.13	5,397,000	$0.08	1,004,000	$0.11
1944	11	85	176,695	28,523	$35.00	233,027	$0.71	348,000	$0.14	4,594,000	$0.08	1,258,000	$0.11
1945	12	94	196,106	21,923	$35.00	306,374	$0.71	466,000	$0.14	5,371,000	$0.09	1,690,000	$0.12
1946	15	127	242,841	17,396	$35.00	361,328	$0.81	757,000	$0.16	7,084,000	$0.11	3,757,000	$0.12
1947	20	184	236,817	20,123	$35.00	417,451	$0.91	789,900	$0.21	5,797,100	$0.14	3,607,600	$0.12
1948	30	2,969	228,386	16,471	$35.00	542,490	$0.91	654,000	$0.22	6,004,000	$0.18	3,332,000	$0.13
1949	31	403	244,368	11,549	$35.00	584,068	$0.91	608,000	$0.20	7,026,000	$0.16	3,198,000	$0.12
1950	25	426	278,152	13,902	$35.00	596,149	$0.91	690,000	$0.21	6,784,000	$0.14	2,590,000	$0.14
1951	28	322	243,917	9,998	$35.00	453,327	$0.91	1,102,000	$0.24	9,064,000	$0.17	3,684,000	$0.18
1952	20	55	190,599	10,203	$35.00	363,530	$0.91	1,190,000	$0.24	8,446,000	$0.16	2,942,000	$0.17
1953	12	--	55,943	2,696	$35.00	122,462	$0.91	272,000	$0.29	2,958,000	$0.13	1,264,000	$0.12
1954	7	217	6,900	491	$35.00	20,395	$0.91	24,000	$0.30	458,000	$0.14	166,000	$0.11
1955	8	14	10,408	455	$35.00	35,829	$0.91	78,000	$0.37	938,000	$0.15	492,000	$0.12
1956	8	17	19,780	841	$35.00	37,283	$0.91	85,600	$0.43	1,665,800	$0.16	1,287,400	$0.14
1957	8	165	17,245	2,180	$35.00	54,757	$0.91	131,700	$0.30	1,124,800	$0.14	624,100	$0.12
1958	7	--	17,049	1,205	$35.00	33,336	$0.91	96,000	$0.26	782,000	$0.12	548,000	$0.10
1959	3	--	6,049	310	$35.00	7,303	$0.91	46,000	$0.30	290,000	$0.12	220,000	$0.12
1960	5	--	39,861	1,206	$35.00	50,284	$0.91	322,000	$0.32	778,000	$0.12	84,000	$0.13
1961	12	--	2,531	221	$35.00	5,740	$0.93	32,000	$0.30	80,000	$0.11	44,000	$0.12
1962	4	--	42,716	411	$35.00	31,306	$1.08	78,000	$0.31	1,578,000	$0.10	2,104,000	$0.12
1963	4	--	134,971	1,249	$35.00	127,497	$1.28	528,000	$0.31	5,878,000	$0.11	8,188,000	$0.12
1964	7	--	174,333	1,239	$35.00	194,724	$1.29	1,064,000	$0.32	8,214,000	$0.14	13,452,000	$0.14

Total value of metals produced	Sources of data	Important historical events
$1,994,845.00	Henderson (1926)	Sunnyside Flotation Mill at Eureka begins production.
$991,249.00	Henderson (1926)	
$3,617,422.00	Henderson (1926)	
$101,225.00	Henderson (1926)	Post war recession closes most mines.
$283,479.00	Henderson (1926)	
$2,117,067.00	Henderson (1926)	Sunnyside mine reopens.
$3,623,610.00	USBM Min.Res. of the U.S. 1924, commodity prices from Ingram (1932)	
$4,585,890.00	USBM Min.Res. of the U.S. 1925, commodity prices from Ingram (1932)	
$4,215,674.00	USBM Min.Res of the U.S. 1926, commodity prices from Ingram (1932)	
$3,419,371.00	USBM Min.Res.of the U.S. 1927, commodity prices from Ingram (1932)	Shenandoah-Dives mine opens.
$3,583,035.00	USBM Min.Res of the U.S. 1928, commodity prices from Ingram (1932)	
$3,981,967.00	USBM Min.Res of the U.S. 1929, commodity prices from Ingram (1932)	Stock Market Crash; Mayflower Mill built.
$3,254,428.00	USBM Min.Res of the U.S. 1930, commodity prices from Ingram (1932)	Sunnyside mine closes, S-D mine and Mayflower Mill start production.
$927,892.00	USBM Min.Res of the U.S. 1931, commodity prices from Ingram (1932)	Great Depression begins.
$724,013.00	USBM Minerals Yearbook 1932-33	
$741,740.00	USBM Minerals Yearbook 1934	
$917,294.00	USBM Minerals Yearbook 1935	Gold price increased to $35.00 per ounce.
$915,988.00	USBM Minerals Yearbook 1936	
$1,345,123.00	USBM Minerals Yearbook 1937	Tailings pond operations sucessful.
$2,031,242.00	USBM Minerals Yearbook 1938	Sunnyside mine reopens.
$2,323,685.00	USBM Minerals Yearbook 1939	Sunnyside mine closes.
$1,023,863.00	USBM Minerals Yearbook 1940	Strike closes Shenandoah-Dives mine.
$1,360,903.00	Vanderwilt (1947)	
$1,566,196.00	USBM Minerals Yearbook 1941	
$1,309,321.00	USBM Minerals Yearbook 1942	America enters WWII; premiums paid on metal production.
$1,553,145.00	USBM Minerals Yearbook 1943	
$1,721,925.00	USBM Minerals Yearbook 1944	
$1,704,337.00	USBM Minerals Yearbook 1945	
$2,253,957.00	USBM Minerals Yearbook 1946	
$2,519,279.00	USBM Minerals Yearbook 1947	Premium price plan expires.
$2,727,256.00	USBM Minerals Yearbook 1948	
$2,559,262.00	USBM Minerals Yearbook 1949	
$2,453,255.00	USBM Minerals Yearbook 1950	Korean War begins.
$3,265,458.00	USBM Minerals Yearbook 1951	
$2,822,276.00	USBM Minerals Yearbook 1952	
$816,116.00	USBM Minerals Yearbook 1953	Shenandoah-Dives mine closes, Korean War armistice.
$123,398.00	USBM Minerals Yearbook 1954	
$277,724.00	USBM Minerals Yearbook 1955	
$537,463.00	USBM Minerals Yearbook 1956	
$398,742.00	USBM Minerals Yearbook 1957	
$244,953.00	USBM Minerals Yearbook 1958	
$90,335.00	USBM Minerals Yearbook 1959, USGS (1999)	Standard Uranium Corp. begins American tunnel.
$292,847.00	USBM Minerals Yearbook 1960, USGS (1999)	
$35,681.00	USBM Minerals Yearbook 1961, USGS (1999)	American tunnel completed at Sunnyside mine.
$459,266.00	USBM Minerals Yearbook 1962, USGS (1999)	Production begins from Sunnyside mine through American tunnel.
$1,945,755.00	USBM Minerals Yearbook 1963, USGS (1999)	
$3,547,585.00	USBM Minerals Yearbook 1964, USGS (1999)	

Table 1. Summary of metal production from mines in San Juan County, Colorado from 1871 to 1991.—Continued

Year	No. of lode mines	Crude ore treated	Total ore treated	Gold		Silver		Copper		Lead		Zinc	
		Short tons	Short tons	Troy ounces	Average value ($/T Oz)	Troy ounces	Average value ($/T Oz)	Lb	Average value ($/lb)	Lb	Average value ($/lb)	Lb	Average value ($/lb)
1965	9	--	182,704	2,052	$35.00	218,665	$1.29	906,000	$0.35	8,656,000	$0.16	17,316,000	$0.15
1966	13	--	197,989	3,364	$35.00	252,979	$1.29	710,000	$0.36	9,492,000	$0.15	16,678,000	$0.14
1967	8	--	211,979	1,742	$35.00	261,873	$1.55	738,000	$0.38	11,054,000	$0.14	17,084,000	$0.14
1968	9	--	194,888	3,026	$40.06	247,123	$2.14	778,000	$0.41	7,948,000	$0.13	14,998,000	$0.14
1969	5	--	214,735	6,090	$41.51	266,579	$1.79	888,000	$0.47	10,572,000	$0.15	15,416,000	$0.15
1970	7	--	242,695	14,884	$36.41	271,758	$1.77	1,386,000	$0.58	13,138,000	$0.16	17,454,000	$0.15
1971	5	--	191,154	14,703	$41.25	219,790	$1.55	1,096,000	$0.52	9,574,000	$0.14	10,402,000	$0.16
1972	1	--	180,112	31,424	$58.60	291,204	$1.68	898,958	$0.51	10,040,542	$0.15	15,532,814	$0.18
1973	2	--	191,350	30,926	$97.81	290,316	$2.56	686,000	$0.60	9,474,000	$0.16	12,872,000	$0.21
1974	2	--	192,041	28,493	$159.74	237,476	$4.71	642,000	$0.77	7,062,000	$0.22	11,616,000	$0.36
1975	2	--	186,615	27,689	$161.49	206,287	$4.42	584,000	$0.64	6,734,000	$0.21	9,324,000	$0.39
1976	1	--	214,134	23,555	$125.32	235,547	$4.35	728,050	$0.70	7,280,555	$0.23	11,991,500	$0.37
1977	7	--	268,957	49,410	$148.31	329,968	$4.62	1,004,000	$0.67	9,648,000	$0.31	9,878,000	$0.34
1978	1	--	122,702	18,405	$193.55	196,323	$5.40	711,670	$0.66	4,908,080	$0.34	8,098,330	$0.31
1979	3	--	20,082	2,410	$307.50	26,106	$11.09	80,330	$0.92	602,460	$0.53	923,770	$0.37
1980	3	--	126,541	31,635	$612.56	202,466	$20.63	759,240	$1.01	4,302,390	$0.43	6,327,050	$0.37
1981	3	--	198,616	35,070	$459.64	216,099	$10.52	846,820	$0.84	5,554,100	$0.37	6,407,680	$0.45
1982	3	--	224,067	37,953	$375.91	284,391	$7.95	973,400	$0.73	9,151,220	$0.26	12,169,180	$0.39
1983	1	--	274,579	39,739	$424.00	348,095	$11.44	1,155,740	$0.77	8,946,920	$0.22	12,054,980	$0.41
1984	1	--	237,969	27,337	$360.66	360,510	$8.14	1,432,000	$0.67	9,632,000	$0.26	11,706,000	$0.49
1985	1	--	19,360	4,840	$317.66	44,528	$6.14	174,240	$0.67	1,200,320	$0.19	1,626,240	$0.40
1986	1	--	133,016	22,112	$368.24	211,183	$5.47	822,000	$0.66	4,730,000	$0.22	9,663,060	$0.38
1987	1	--	255,712	47,093	$477.95	446,330	$7.01	2,251,620	$0.83	13,816,760	$0.36	18,422,350	$0.42
1988	1	--	197,504	31,291	$438.31	395,033	$6.53	1,909,540	$1.21	10,695,320	$0.37	14,483,720	$0.60
1989	1	--	179,391	29,612	$382.58	367,723	$5.50	1,817,800	$1.31	10,226,820	$0.39	16,037,060	$0.82
1990	1	--	237,829	21,784	$384.93	346,378	$4.82	1,787,720	$1.23	10,632,700	$0.46	15,509,220	$0.75
1991	1	--	141,534	19,940	$363.29	227,613	$4.04	1,267,500	$1.09	7,220,560	$0.34	10,807,640	$0.53
TOTAL		73,694	18,136,276	2,288,923		51,306,907		112,279,546		765,645,442		604,213,443	

Total value of metals produced	Sources of data	Important historical events
$4,553,906.00	USBM Minerals Yearbook 1965, USGS (1999)	
$4,554,795.00	USBM Minerals Yearbook 1966, USGS (1999)	
$4,661,184.00	USBM Minerals Yearbook 1967, USGS (1999)	
$4,048,972.00	USBM Minerals Yearbook 1968, USGS (1999)	Standard Metals announces plan to close Sunnyside mine.
$4,978,000.00	USBM Minerals Yearbook 1969, USGS (1999)	Gold discovered in Sunnyside mine.
$6,548,203.00	USBM Minerals Yearbook 1970, USGS (1999)	
$4,512,584.00	USBM Minerals Yearbook 1971, USGS (1999)	Standard Metals bankruptcy closes Sunnyside mine.
$5,645,698.00	Standard Metals Corp 1973 Annual Report, production and total value; commodity prices from USGS (1999)	Standard reopens Sunnyside mine.
$8,378,947.00	USBM Minerals Yearbook 1973, silver and base metal values calculated from commodity prices (USGS, 1999)	Government removes restrictions on gold price.
$11,924,712.00	USBM Minerals Yearbook 1974, silver and base metal values calculated from commodity prices (USGS, 1999)	
$10,842,267.00	USBM Minerals Yearbook 1975, silver and base metal values calculated from commodity prices (USGS, 1999)	
$10,601,928.06	Sunnyside mine production only (Hutchinson, 1988); values calculated from commodity prices USGS (1999)	Mayflower Mill increases capacity to 1000 short tons per day
$15,883,716.00	USBM Minerals Yearbook 1977, silver and base metal values calculated from commodity prices (USGS, 1999)	
$7,136,916.00	Sunnyside mine production from Hutchinson (1988); total value from Standard Metals 1982 report	Lake Emma floods Sunnyside mine.
$2,129,133.00	Sunnyside mine production from Hutchinson (1988); total value from Standard Metals 1982 report	
$17,904,380.00	Sunnyside mine production from Hutchinson (1988); total value from Standard Metals 1982 report	Sunnyside mine reopens.
$24,882,000.00	Production from Standard Metals 1984 Report, Sunnyside mine only. Total value from USBM Yearbook 1983	
$25,895,000.00	Producton from Standard Metals 1984 Report, Sunnyside mine only. Total value from USBM Yearbook 1984	
$21,019,112.00	Production from Standard Metals 1984 Annual Report; value from 1986 backruptcy disclosure	
$21,905,397.82	Production from Standard Metals 1984 Annual Report; values calculated from commodity prices (USGS, 1999)	
$2,813,704.96	Sunnyside mine production from Hutchinson (1988); values calculated from commodity prices (USGS, 1999)	Standard Metals bankruptcy closes Sunnyside mine.
$14,718,148.80	USBM Minerals Yearbook 1986 except zinc from Hutchinson (1988); commodity prices from USGS (1999)	Echo Bay Mines purchases, reopens Sunnyside mine.
$40,173,640.64	Base metal production from Hutchinson (1988), tonnage, gold, and silver from Echo Bay Mines 1987 Annual Report	
$31,282,882.56	Sunnyside Gold Corp. (written commun., 2002); commodity prices and value calculated from USGS (1999)	
$32,910,691.94	Sunnyside Gold Corp. (written commun., 2002); commodity prices and value calculated from USGS (1999)	
$28,716,460.52	Sunnyside Gold Corp. (written commun., 2002); commodity prices and value calculated from USGS (1999)	
$17,674,258.14	Sunnyside Gold Corp. (written commun., 2002); commodity prices and value calculated from USGS (1999)	Sunnyside mine closes August 15, 1991.
$529,838,329.44		

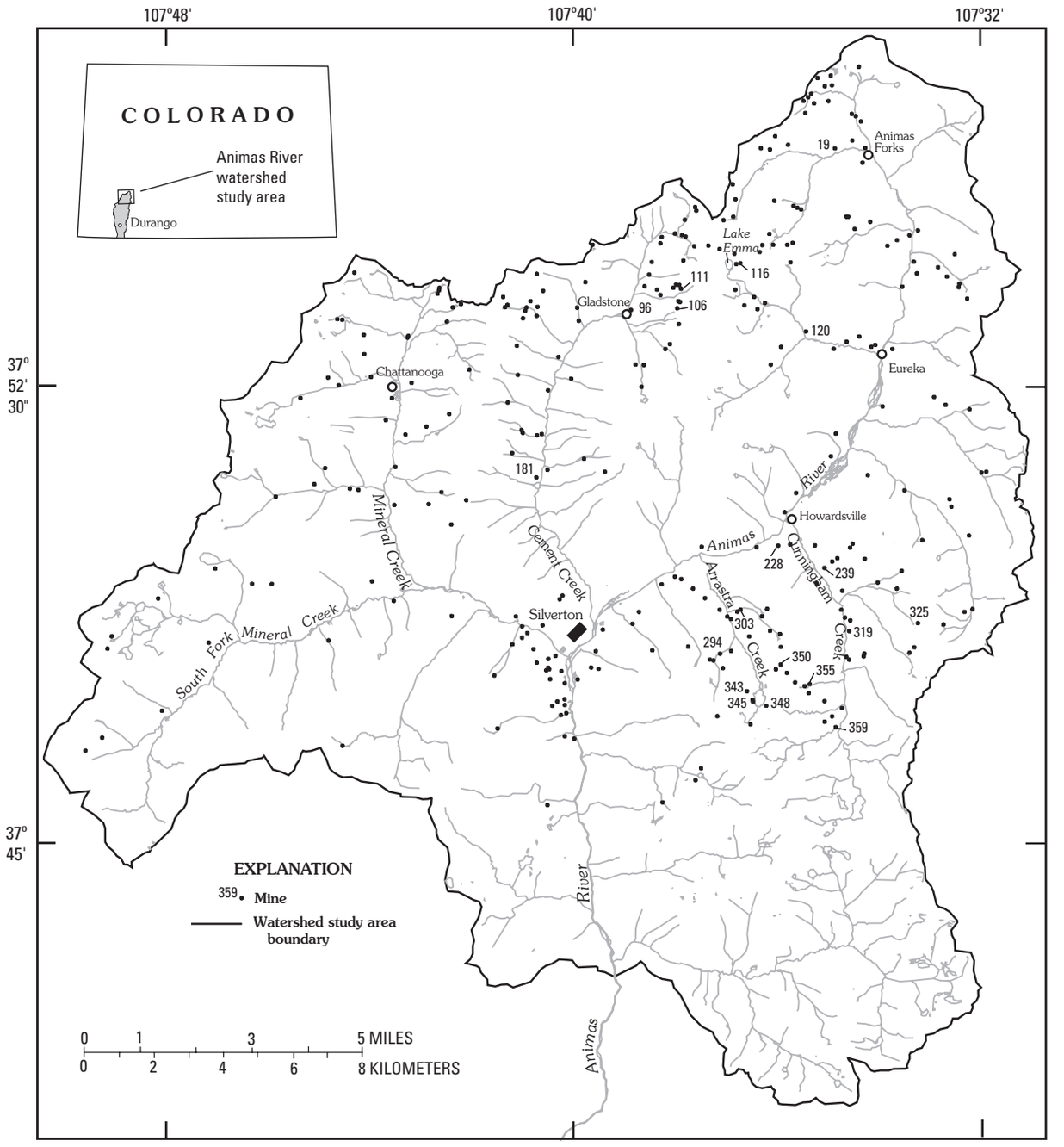


Figure 1. Locality map of mines, Animas River watershed study area (Church, Mast, and others, this volume, Chapter E5). Mine sites referred to in this chapter are: Frisco tunnel (site # 19), Gold King Mill level tunnel (site # 96), Lead Carbonate (mine # 106), Gold King (mine # 111), Sunnyside (mine # 116), Terry tunnel, Sunnyside (mine # 120), May Day (mine # 181), Little Nation (mine # 228), Old Hundred mine, mill level (site # 239), Unity tunnel of the Silver Lake (mine # 294), Little Giant (mine # 303), Pride of the West mine, # 1 level (mine # 319), Buffalo Boy (mine # 325), Silver Lake mine, # 1 level (mine # 343), Iowa (mine # 345), Royal Tiger (mine # 348), North Star (mine # 350, later a part of the Shenandoah-Dives mine, 1700 level), Shenandoah-Dives mine, 900 level (mine # 355), and Highland Mary mine, # 7 level (mine # 359).

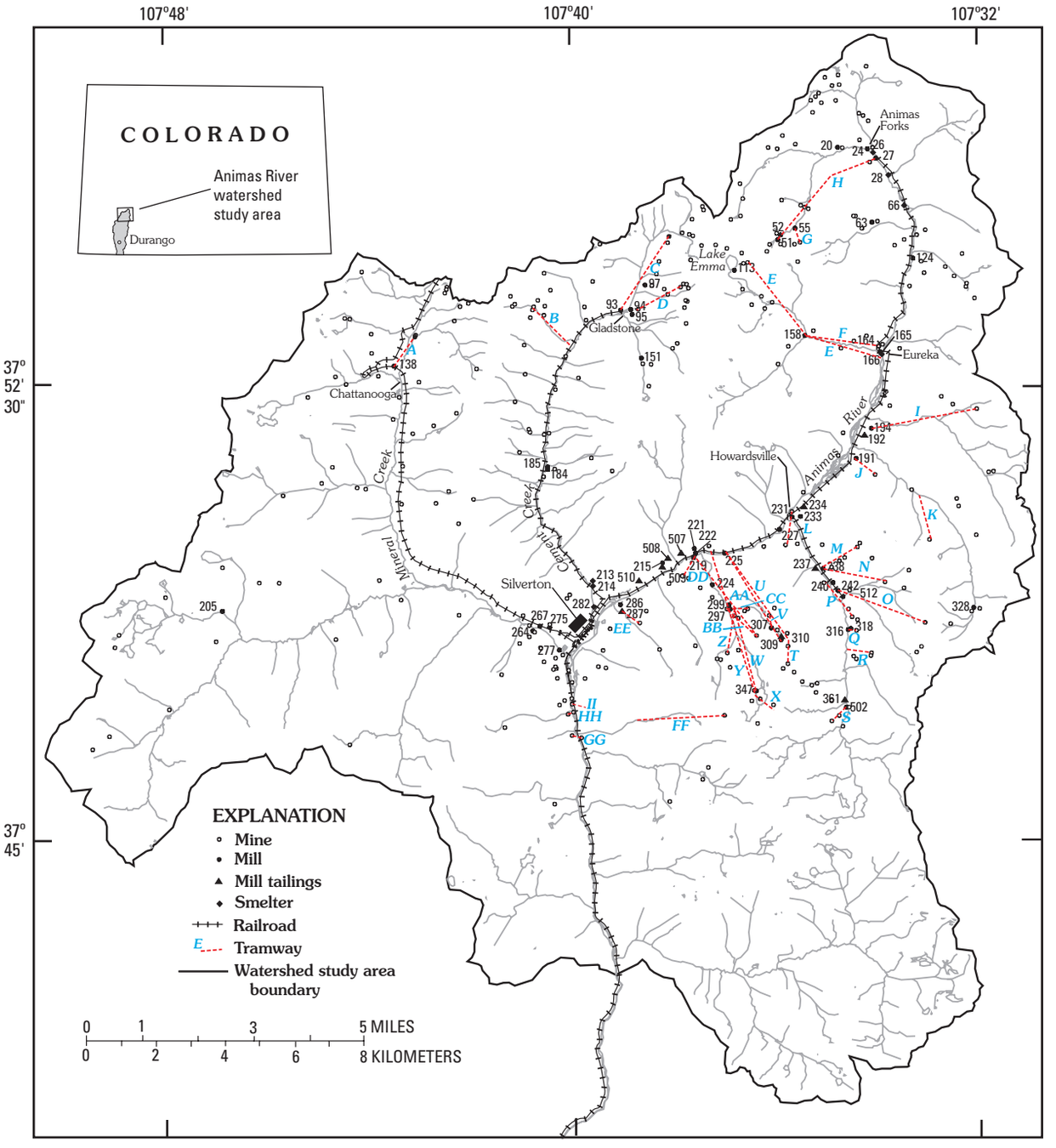


Figure 2. Locality map of mills, smelters, tramways, and railroads (mill and smelter localities from Church, Mast, and others, this volume; railroads from Sloan and Skowronski, 1975). Mills, their processing capacities, and dates of construction or expansion are summarized in table 2. Trams and their dates of construction are in table 3. Narrow gauge railroad segments and dates of their construction are in table 4. Large mill tailings present today are the Kittimack tailings (site # 192), Pride of the West Mill [# 4] tailings (permitted; site # 234), Old Hundred tailings (site # 237), Lackawanna tailings (site # 286, removed by the U.S. Bureau of Land Management in 2000 to the May Day mine site # 181, fig. 1), North Star tailings (site # 310), and Highland Mary tailings (site # 361).

Table 2. Mills and smelters, San Juan County.

[Localities shown in fig. 2; dates mill built or enlarged where approximate are indicated; size of mill capacity in italics where estimated; mercury used in gold recovery indicated by Y (yes) or N (no) if known, ? if uncertain; method of ore processing, C, concentrator; F, Flotation, S, Stamps; Lix, Lixivation; Rolls/pan, rolls crusher and pan amalgamation]

Name	Site No. (fig. 2)	Mill method (Stamp, Concentrator, or Flotation)	Date built or enlarged	Capacity (tons/day)	Amalgamation (used mercury for gold recovery)
Bagley Mill (aka Frisco)	20	C	1912	150	N
Big Giant Mill	307	C	c. 1896	20–40	Y
Boston & Silverton Mill (aka Yukon)	185	S, C	1890s	75	?
Columbus Mill	24	F	1940s	50	N
Contention Mill (aka Arpad, North Star [#2])	225	S,C	c. 1905	100	N
Green Mountain Mill (Osceola)	240	C	1904	300	N
Gold King Mill	94	S, C	c. 1897, 1899, 1903, 1904	65, 100, 250, 325	Y
Gold Prince Mill	27	S,C	1905–1906	500	Y
Hamlet Mill	191	C	c. 1905	50, 75	N
Hanson Mill (aka Sunnyside Extension Mill)	51	S, C	1896	50	N
Hercules Mill (aka Empire)	277	S, C	1889, 1899	50, 100, 140, 200	Y
Highland Mary Mill (aka Gold Tunnel M & M)	502	C, F	1902, 1940, 1944	150, 100	N
Ice Lake Mill	205	S, C	1890s	40	Y
Intersection Mill	328	S, C	1890s	30	Y
Iowa Mill	297	C	1890s, 1901	50, 100, 150, 200	Y
Kittimack Mill	194	C	c. 1908	100	N
Lackawanna Mill	287	C, F	1920s	*50*	N
Lead Carbonate Mill	95	F	1947	50	N
Little Giant Mill	299	Rolls/pan	1873	*5*	Y
Little Nation Mill	231	C, F	1923	50	N
Mastodon Mill	52	F	1952	50	?
Mayflower Mill (aka Shenandoah-Dives Mill)	221	F, C	1929, 1935, 1944, 1976	300, 600, 750, 1,200	Y
Mears-Wilfley Mill	222	C, F	1914	500	N
Mogul Mill	93	C	1900	75	N
Natalie/Occidental Mill	151	S, C	1899	75	N
North Star (Sultan) Mill	264	S, C	1883	70, 100	Y
North Star (Soloman) Mill [#1]	309	S	1882	40	?
Old Hundred Mill	238	S, C, F	1905, 1950	200, 65	Y
Pride of the West Mill [#1] (Schoelkopf)	318	S	1881	*20*	?
Pride of the West Mill [#2] (aka Howardsville Conc.)	227	S, F	1901	40	?
Pride of the West Mill [#3]	316	F	1928	65	N
Pride of the West Mill [#4] (aka Dixilyn, P&G)	233	F	1940, 1968, 1981	50, 90, 300	N
Red and Bonita Mill	97	S	1899	75	?
Silver Lake Mill #1	347	S, C	1893, 1899, 1901	100, 200, 250	N
Silver Lake Mill #2	219	C, F	1900, 1902, 1907, 1914	200, 300, 450	N
Silver Ledge Mill	138	C	1883, 1898, 1902	50, 125, 200	N

Table 2. Mills and smelters, San Juan County.—Continued

Name	Site No. (fig. 2)	Mill method (Stamp, Concentrator, or Flotation)	Date built or enlarged	Capacity (tons/day)	Amalgamation (used mercury for gold recovery)
Silver Wing Mill	124	S, C	1898	40, 100	N
Sound Democrat Mill	55	S, C	c. 1900	30	Y
Sunnyside Eureka Mill	164	F	1917, 1925	600, 750, 1,100	N
Sunnyside Mill #1 (Midway)	158	S, C	1889	40, 50	Y
Sunnyside Mill #2	165	S, C, F	1899, 1901, 1915	40, 50, 150, 200	Y
Sunnyside-Thompson Mill	113	S, C	1888	20	Y
Titusville Mill*		C	c. 1896	85	?
Treasure Mountain Mill	63	F	1941	25	N
Vertex Mill	242	F	1929	100	N
Victoria Mill	267	S, C	1890s	100	Y
Ward and Shepard Mill	224	S	1881	10–20	Y
William Crooke Mill	215	S, Lix, C	c. 1882	50	N
Yukon Mill	184	F, C	1977	10	N
San Juan Smelting Co.	26		1874		
Brown, Epley & Co. Smelter	28		1876		
Eclipse Smelter	66		1880		
Greene & Co. Smelter	214		1874		
Kendrick-Gelder Smelter (Ross)	213		1900		
Martha Rose Smelter	275		1882, 1894		
Rough & Ready Smelter	282		1875		
Winspear Smelter	166		1878		

*Locality uncertain, assumed to be at terminus of Titusville tram (FF, table 3, fig. 2).

Mining in Silverton followed the "boom and bust" pattern associated with the mining industry. International and national events such as war, economic depression, and government policies often triggered these cycles, which were quickly reflected in the price of metals and subsequent production. Ores in the district are typically polymetallic, containing gold, silver, lead, copper, zinc, cadmium, iron, and other trace metals. Mining evolved from small "high-grade" mines with limited processing, to larger mines producing lower grade ores, but at lower cost. This increasing output was processed in mills, which grew in size and efficiency. But unlike many other mining areas, which continued this progressive increase in size, large mines in San Juan County reached an upper limit of 700–1,000 short tons of ore produced per day around 1920. Annual production in the county was remarkably steady at 200,000–250,000 short tons per year when economic conditions were favorable to sustain profitable mining operations in the county (table 1 and fig. 3).

The sources of this production were varied, but a pattern developed that remained typical to the end of mine production in 1991: one or two "large" mines would account for the majority of production in any single year. Note that production records for individual mines are not generally available. After 1930, only two mines, the Shenandoah-Dives (1930–1953; mine # 355), which produced 4.099 million short tons of ore (Varnes, 1963) and Sunnyside (1962–1991, mine # 116 and # 96), which produced more than 7 million short tons of ore (Sunnyside Gold Corp., written commun., 2002) account for around 90 percent of all mine production for these years. Other earlier "large" mines include the Pride of the West (mine # 319—346,000 tons; Varnes, 1963), Silver Lake (mine # 343 and # 294—849,000 tons; Varnes, 1963), Iowa and Royal Tiger mines (mine # 345 and # 348—376,000 tons; Varnes, 1963), and the Gold King (mine # 111—665,000 tons; Taylor, 1988). Numerous small mines added to production during periods of high

Table 3. Aerial tramways built in San Juan County.

[Locations, code letters, fig. 2; approximate dates where uncertain]

Name	Built	Code
Silver Ledge tram	c. 1890	A
Henrietta tram	c. 1905	B
Mogul tram	1900	C
Gold King tram	1899	D
Sunnyside tram	c. 1889	E
Sunnyside tram (relocated)	1917	F
Sound Democrat tram	1900	G
Gold Prince tram	1905	H
Kittimack tram	c. 1907	I
Hamlet tram	c. 1903	J
Ridgeway tram	1946	K
Little Nation tram	c. 1928	L
Old Hundred tram	1904	M
Gary Owen tram	c. 1925	N
Buffalo Boy tram	c. 1926	O
Green Mountain tram	1904	P
Pride of the West (level # 3) tram	c. 1910	Q
Little Fanny tram	c. 1946	R
Highland Mary tram	1904, 1940	S
North Star tram	1898	T
Contention tram	c. 1900	U
Big Giant tram	c. 1910	V
Silver Lake #1 and #2 trams	c. 1899	W
Royal Tiger tram	c. 1890	X
Iowa tram	c. 1890	Y
Unity tram	c. 1905	Z
Shenandoah-Dives tram	1929	AA
Mayflower tram	c. 1915	BB
Little Giant tram	1872	CC
Aspen tram	c. 1906	DD
Lackawanna tram	c. 1928	EE
Titusville tram	c. 1900	FF
Royal Mining Co. tram	c. 1905	GG
Detroit tram	c. 1900	HH
Champion tram	c. 1900	II

metal prices or wars, only to close when prices dropped or Federal Government price supports were removed after the conflicts. The term “large mine” is relative to the historical period. In 1890, “large” was 100–200 short tons per day; by 1940, “large” had risen to 600–700 short tons per day.

Purpose and Scope

The purpose of this report is to identify the major historical mining, milling, and ore processing practices, technology, economics, and events that influenced mining production in San Juan County, Colo., and to place these historical practices in context with possible environmental effects in the Animas River watershed.

Period I—The Smelting Era 1871–1889

Mining Development and Practices

Lode mining began in 1871 with the discovery of the Little Giant (mine # 303, fig. 2 and table 2) in Arrastra Creek. Mining was performed by hand methods in small operations producing only a few tons of ore per day. Shafts, adits, and cuts were excavated directly into exposed or near-surface outcrops. Tunnels and shafts were short, typically not more than a few hundred feet. Only the higher grade ore was mined, usually the silver-lead ores. Lower grade ores and waste were typically left unmined when possible. Little mechanical processing or milling was done at the mine. The best ores were sacked and hauled off the mountains with mules as “crude ore” and eventually shipped to smelters as far away as Wales in the United Kingdom (fig. 4).

Ores were typically hand sorted, meaning the best ore chunks were hand selected and separately shipped to the smelters as “first class ore.” The sorting was done both underground in the stopes and at the surface in sorting houses (fig. 4). Often, a slightly lower grade ore was again hand sorted and shipped as “second class ore.” The hand “cobbing” technique upgraded lower grade ores when miners hammered off chunks of good ore mineral from the lower grade ore and waste rock. After the cobbed-off chunks were sacked, the mine waste was deposited on the surface dumps. To provide a work surface in the stopes, the void left from ore extraction was filled with mine waste and low-grade ores in a mining method called “cut-and-fill stoping” (Ransome, 1901). Owing to the difficulty and cost of breaking rock, mine development avoided tunneling through unmineralized, valueless “country” rock. Thus, much waste rock left both underground in stopes and on surface mine-waste dumps contained a significant amount of mineralized rock (fig. 5).

As the period progressed, mines became larger as outside capital financed new mines and expansion of existing mines. The Greene & Co. Smelter (site # 214, fig. 2), which could reduce the sulfide lead-silver ores to metallic bullion, opened in Silverton in 1875. This stimulated production by providing a local market for the ores, which avoided expensive and difficult transportation out of the basin either by mule train or by wagon. However, the smelter operated only intermittently and was dismantled and moved to Durango in 1880, where deposits of needed coal and limestone flux were located (Ransome, 1901, p. 20). The anticipated completion of the Denver & Rio Grande Railway’s San Juan Extension also influenced the smelter’s move. The railroad arrived in Durango in July 1881 and in Silverton in July 1882 (table 4). Mining production increased dramatically as reduced transportation costs for both ores and supplies stimulated development (Ransome, 1901). Ores were shipped by rail to the San Juan and New York Smelter in Durango for processing. In 1899, this facility became the American Smelting and Refining Co.

Table 4. Narrow gauge railroads built in San Juan County.

[Data from Sloan and Skowronski, 1975; locations shown in fig. 2; blank, date uncertain]

Name	From	To	Length (mi)	Started	Completed
Denver & Rio Grande Railway	Durango	Silverton	45.1	July 1881	July 1882
Silverton Railroad	Silverton	Red Mountain	11.5	July 1887	Sept. 1888
	Red Mountain	Ironton	6.0		Fall 1889
Silverton Northern Railroad	Silverton	Silver Lake Mill #2 (# 219)	2.2	Nov. 1895	Spring 1896
		Eureka	4.0		Summer 1896
		Animas Forks	3.9	Spring 1904	Nov. 1904
Green Mountain Branch	Howardsville	Green Mountain Mill (# 240)	1.6	Spring 1905	Fall 1905
Silverton, Gladstone, and Northerly Railroad	Silverton	Gladstone	7.1	Spring 1899	Sept. 1899

(ASARCO) Smelter in Durango, which was the regional smelter for lead-silver and quartz-gold ores and concentrates until it closed in 1930 (fig. 6). Rail connection to the smelters was an important component of the economic success of mining in Silverton well into the 1950s, when trucks finally replaced rail shipping.

As the mines expanded production, mining and ore-sorting practices continued as just described, but on a larger scale. More men were employed in additional working areas to achieve this higher production. Larger ore-sorting houses were built at the mines. By the end of the period, the larger mines were producing over 100 short tons of ore per day from tunnels as much as hundreds of feet long with multiple levels interconnected by internal and surface shafts.

The Federal Government supported mining development in several ways during this period. The General Mining Law of 1872 codified the ability to claim and later purchase government land for mining purposes. Purchase of government land by individuals and companies was a tenet of government policy throughout the late 19th and early 20th century. It was one of the primary ways the government raised revenues prior to income tax. In 1878, the Bland-Allison Act directly helped silver mining by requiring the Federal treasury to purchase about 24 million dollars worth of silver a year for minting coins for monetary purposes (Brown, 1984).

Milling Development and Practices

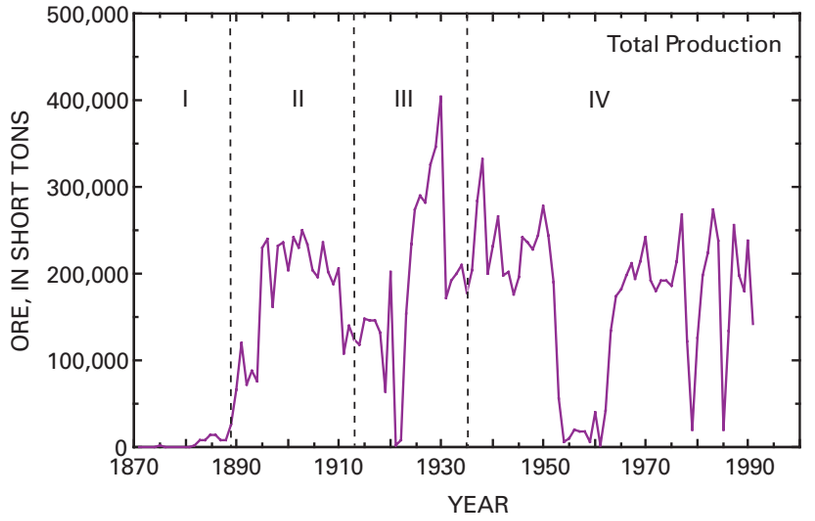
Most of the ores mined in the district were lead-silver ores (galena and tetrahedrite) that contained minor gold and were not very amenable to the mercury amalgamation processes used successfully in California and the Comstock District in Nevada. For this reason, direct smelting of crude ores of the various classes was the normal method of ore processing. San Juan County produced little “free milling” gold ore, though some gold was present in the Animas district ores (Varnes, 1963). According to published data, five stamp mills were built in the 1870s and nine were constructed in the 1880s (table 1). All were small, ranging in size from 10 to 70 tons per day capacity. Most included both amalgamation and concentration processes. Of the 14 stamp mills, only 4 are known to have survived into the 1890s; two of these were built in 1888 and 1889. The milling processes used during this time could not effectively treat the polymetallic ores of the county.

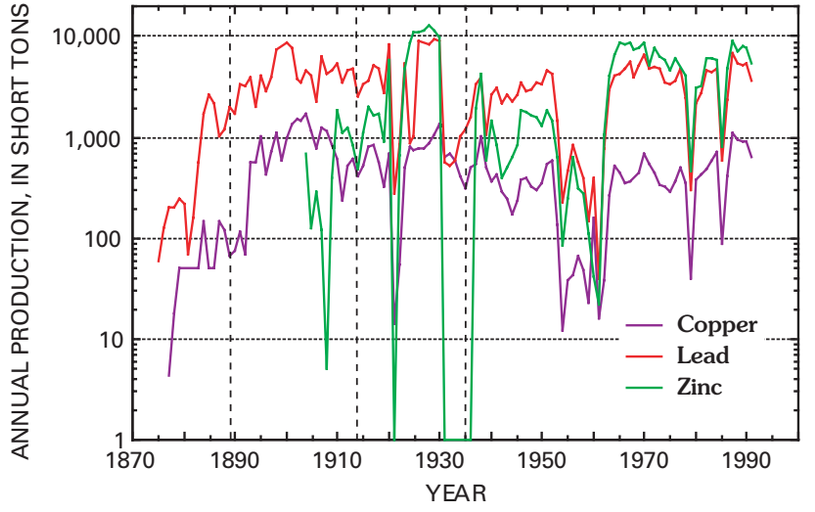
Environmental Aspects

Smelters in this and later periods could not treat ores containing more than 10 percent zinc due to metallurgical factors (Henderson, 1926). The smelters levied stiff charges against the mines for zinc contained in the shipped ore. Therefore, miners worked hard to leave the zinc in place in the mine, or sorted and cobbed the zinc off by hand. The zinc mineral, sphalerite, was disposed in waste dumps at the mine and as part of the waste ore used to fill the stopes. This “waste” still contained a relatively large amount of metal-bearing mineral. Thus, significant sulfide material including sphalerite was left where surface and underground water could potentially dissolve and mobilize metals, particularly the discarded zinc. Both copper and zinc contamination have been identified as limiting factors for aquatic life in several sections of the Animas River and tributaries (Besser and others, 2001).

The Greene & Co. Smelter (site # 214, fig. 2) and other pioneer smelters in the Silverton area operated for a short period prior to and during World War I. These smelters were tied to the mines by the local narrow gauge railroads (fig. 2 and table 4) and emitted acid- and metal-bearing flue dusts and gases from the oxidation of sulfur in the ores (fig. 7). These products were released directly into the environment. The stamp mills used the mercury amalgamation process to recover native or “free” gold. Industry practice at this time was to discharge mill tailings directly into a nearby creek. Some mercury may have been introduced into the environment by these mills (table 2).

Total tonnage mined in the period 1874–1889 is estimated at 93,527 short tons with most of this having been shipped to the smelters (table 1). Thus, only a small amount of this production was probably discharged as mill tailings into the Animas River watershed.


Total Production
I
II
III
IV
ORE, IN SHORT TONS
500,000
400,000
300,000
200,000
100,000
0
1870
1890
1910
1930
1950
1970
1990
YEAR


ANNUAL PRODUCTION, IN SHORT TONS
10,000
1,000
100
10
1
Copper
Lead
Zinc
1870
1890
1910
1930
1950
1970
1990
YEAR

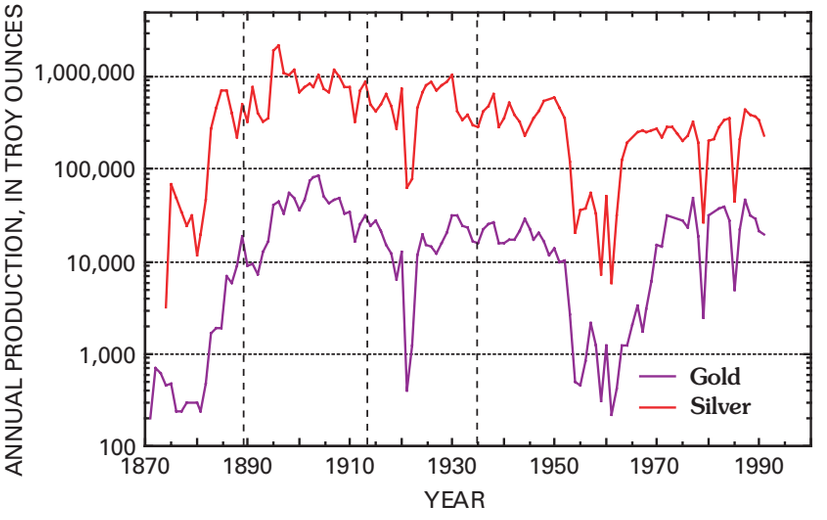

ANNUAL PRODUCTION, IN TROY OUNCES
1,000,000
100,000
10,000
1,000
100
Gold
Silver
1870
1890
1910
1930
1950
1970
1990
YEAR

Figure 3 (facing page). Historical production for San Juan County, 1871–1991 (table 1). Total ore production and annual production of copper, lead, and zinc are in short tons; gold and silver in troy ounces. Periods of production also shown.

Period II—The Gravity Milling Era 1890–1913

Mining Development and Practices

During this period, mining development greatly expanded due to Federal Government supports, stable to rising commodity prices, and improved technologies. In 1890, the Sherman Silver Purchase Act was passed by Congress as part of a compromise to gain the support of Senators in western mining States for import tariffs desired by Senators from eastern manufacturing States. This act required purchase of 54 million ounces per year of silver, more than twice what the Bland-Allison Act authorized. Colorado silver mining boomed as silver prices rose from $0.84 per ounce to as high as $1.50 (Brown, 1984). New mining technologies were developed in this period. First, the wire-rope aerial tramway revolutionized transportation of ore, machinery, and supplies to remote mine sites (fig. 8 and table 3). Then, compressed-air powered machine-drills increased productivity, resulting in increased production. Finally, the application of electricity to many mine and mill tasks increased efficiency and throughput to handle the increased mine output. The new tramways and mills were integrated into the narrow gauge railroad system during this period (tables 2 and 3). Three independent rail lines were built out of Silverton to serve the new milling facilities, which were located adjacent to the railroads (table 4). The railroads brought in coal and supplies to service the mines and shipped ore concentrate out of the basin to smelters (figs. 6, 9, and 10; Sloan and Skowronski, 1975).

In the large mines, tonnages exceeding 200 short tons per day became practical, and upward of 400 men could work year around at a remote high-altitude site such as Silver Lake (mine # 343) or Sunnyside (mine # 116). The larger mines had several thousand linear feet of drifts and tunnels. Ore sorting in surface houses continued to expand as increased mine production yielded lower grade ores. Most mines still used cut-and-fill stoping methods, or open “stull”

Figure 4. Sacking sorted crude ore for shipment to the smelter (Silverton Standard folio, 1904). Early mining was by hand methods. Ores were sorted and sacked for shipment to the smelters. Low-grade and sphalerite-containing waste was cast aside manually.

Figure 5. Miners working inside a cut-and-fill stope, Gold King (mine # 111; circa 1899, Silverton Standard folio, 1904). This rare view inside a stope was staged for promotional purposes, but the photo shows hand drilling on a stope hanging wall and ore being cobbed with a hammer while an engineer studies samples. Miners are working off a fill pile while timbers support mined-out area above.

(timber-supported) stopes. Milling became the predominant ore processing method as the tonnage increased and ore values dropped. Several classes of ore were mined and sorted for both direct smelting and milling, depending on the grade of the ore. During this period near-surface "bonanza ores" were mined out, and improved milling technology encouraged mining of larger portions of the veins, both of which resulted in lower average ore grades. Frederic L. Ransome (1901, p. 24) of the U.S. Geological Survey accurately predicted: "It is very probable that the future will see a great and permanent increase in the productive development of such large and persistent ore bodies of low average grade."

The development of the wire-rope aerial tramway was a unique feature of San Juan County mining (fig. 2), and most of the trams in the county were built during this period (table 3). These allowed large tonnages of ore to be transported down from high-altitude mine portals to mills along the river and the narrow gauge railroad system. Crude ore was shipped straight through to loading bins on the railroad, while milling-grade ores were off-loaded separately into the mill (fig. 10). These trams could be as long as 2 or 3 miles in length. Coal, supplies, men, and machinery all rode trams to and from the mines; ores were shipped down in buckets. By 1907 nineteen tramways totaling 119,850 linear feet were constructed (Silverton Miner, 1907). Both the Iowa (Y, fig. 2) and Sunnyside (E, F, fig. 2) trams were each nearly 3 miles in length.

An 1899 report by Edward G. Stoiber, owner of the Silver Lake (mine # 343), summarizes the dramatic changes made at the mine during this period of property consolidation and expansion (Chase, 1952, p. 114):

> At the time of the purchase of the property in 1887, probably not over 500 ft of work had been done on same, and there were but two claims in the group; today the underground workings may reach a total length of 35,000 ft, and the group embraces about 100 claims.***It is claimed for this property that it is a low grade concentrating proposition, with the premises of practically unlimited vein area to draw from.

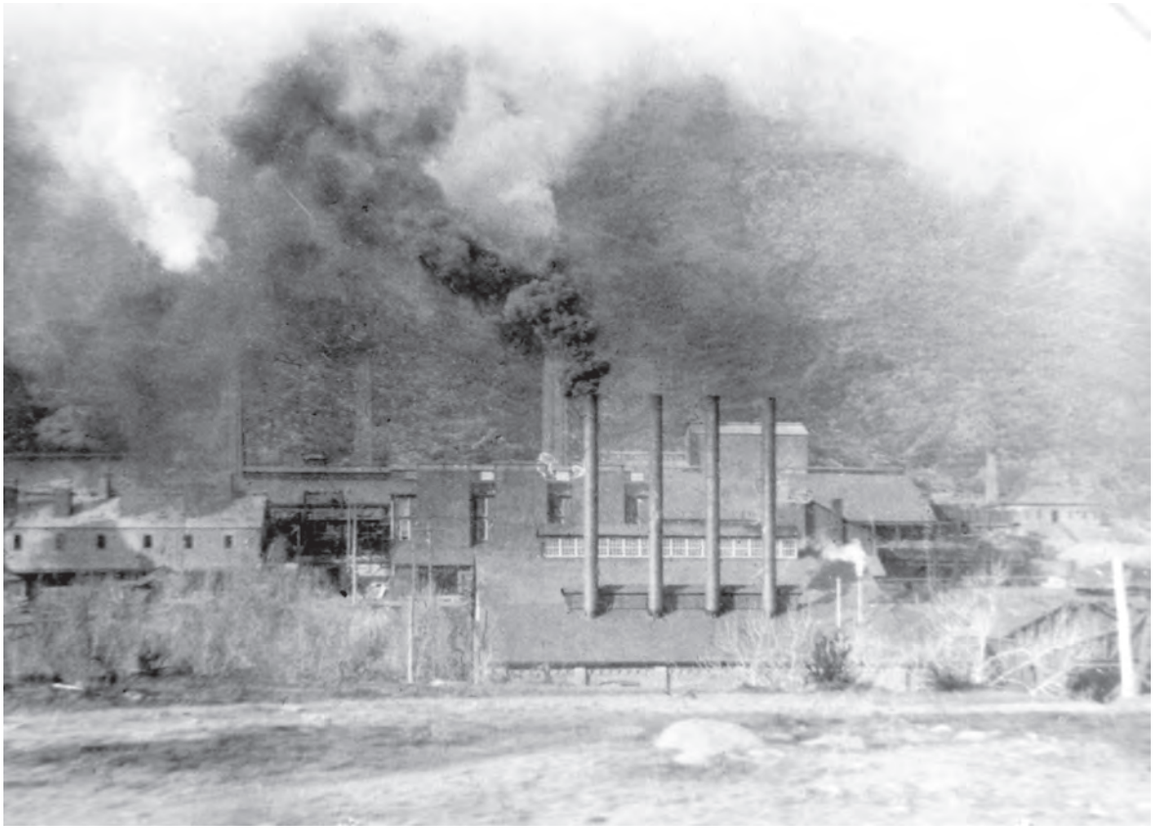


Figure 6. Durango Smelter along the Animas River, 1906 (C.A. Chase photo). Silverton lead-silver ores were shipped to the smelter in Durango for processing into metal. The process produced considerable air pollution.

Economic and political policies affected mining during this period. In the face of a mounting financial crisis caused in part by the Sherman Act, President Cleveland called a special session of Congress to repeal the act in 1893. This financial panic precipitated a national economic depression, which lasted until 1896 (Brown, 1984). Repeal of the Sherman Act caused the price of silver to fall from more than $1.00 per troy ounce, its typical value since the 1870s, to an average of $0.63 per ounce in 1893. Lead and copper prices also fell during the depression, though not as much, and they recovered faster. Silver prices languished throughout the period. Marginal mines were closed. Gold prices were supported by the Federal Government at $20.67 per ounce as part of the monetary Gold Standard, so that mines with significant gold content remained open and even expanded. After 1896, base-metal prices increased significantly as the U.S. economy expanded and many new mine and mill projects were built. In 1897, the Colorado Bureau of Mines reported that more than 160 mines were operating in San Juan County (Colorado Bureau of Mines, 1898). The Financial Panic of 1907 lowered metal prices again and greatly reduced the flow of investment capital needed for mine expansion. The beginning of World War I in 1914 led to a substantial increase in base-metal prices, resulting in the reopening of many mines and the expansion of others—notably the Sunnyside (mine # 116, fig 1).

Milling Development and Practices

As improved mining technology helped increase production, milling technology also improved to cope with larger tonnages of low-grade, metallurgically complex ores. Stamp mills utilized mechanically dropped heavy iron rod-like hammers to pulverize the ore (figs. 11 and 12). To extract the gold, concentrating machines called “tables” were used to separate the various minerals by gravity into “concentrates” containing lead-silver or lead-copper. If the ore contained significant gold, mercury-coated copper plates were located after the stamps and ahead of the tables to catch the gold particles (fig. 12). Various concentrating machines were developed and relied on differences in specific gravity to separate the mineral particles from worthless rock, hence the term “gravity milling.” By 1899, the Wilfley table was established as the leader in the field (Niebur, 1986).

Figure 7. Kendrick-Gelder (aka Ross) Smelter (site # 213, fig. 2) in Silverton and SG&N Railroad (circa 1907). Silverton had several short-lived smelters, connected to the mines by the narrow gauge railroad system. These small plants were uneconomic except during periods of high metal prices.

Mills, of which successful ones had been something of a rarity in Silverton, now were built at all but the smallest mines (for example, fig. 11). In 1899, the Silver Lake Mill # 1 (# 347, fig. 2) concentrator was built on the shore of Silver Lake at 12,125 ft elevation (table 2 and fig. 13) (Ransome, 1901). This mill was more than twice the size of the next largest in the county. The economic advantages of milling were significant. Low-grade ores could be concentrated into valuable high-grade concentrates that could be smelted more profitably than crude ore. Because smaller tonnages of material went to the smelter, both smelting and shipping costs were reduced and net revenue increased. However, zinc ores were still unmarketable during most of this period, because the mills could not efficiently separate it from the waste rock and local smelters could not process zinc ores. In 1897, twelve mills and two crude ore-purchasing stations called "samplers" were reported in operation. The largest mills were 200 short tons per day capacity, but most processed around 50 short tons per day. Total daily capacity of the crude ore samplers was 200 short tons per day and the mills 850 short tons per day in the county. Production was not continuous all year at all mills, however, in part because of severe weather at the high-elevation mine and mill sites. By 1901, additional mills increased combined active production to 1,470 short tons per day; annual production exceeded 200,000 short tons (table 1; Henderson, 1926). In 1897, six of the twelve mills included mercury amalgamation as part of the process. One mill used "lixivation," a sodium thiosulfate leaching process, to recover silver (Colorado Bureau of Mines, 1898).

The interrelationship of ore grades, tonnage produced, milling technology, and profitability is well summarized by the following excerpts from a February 12, 1913, report on the Silver Lake mine (mine # 343) by Lawrence R. Clapp, Superintendent.[3] The report was written for the mine's [now corporate] owners, American Smelting and Refining Company (ASARCO), who purchased the mine from E.G. Stoiber in 1901 and owned the smelter in Durango.

[3]Ore conditions at the Silver Lake mines, Silverton, Colo., in Shenandoah-Dives Collection, Center for Southwest Studies, Fort Lewis College, Durango, Colo., 15 p. (unpublished).

Figure 8. Iowa aerial tram (Y, fig. 2 and table 3) in Arrastra Creek (C.A. Chase Photo 1925). Aerial tramways provided the key link between high-altitude mines and the mills and railroads located along the river. The Iowa tram is nearly 3 miles long and climbed the steep cliff to Arrastra Basin in the background. The Silver Lake tram is out of sight in the trees to the left.

> The future of the Silver Lake Mines in my opinion, lies wholly in the solution of the problem of making this [low grade] material profitable and not in the search of better grade ore; the former company and Mr. Stoiber before them, both fought a losing battle in the attempt to keep their reserves of $9.00 or $10.00 [per ton] ore in advance of their [mill] consumption. In so doing they exposed a very large tonnage of lower grade material.*** To make $6.00 ore profitable, will require a total cost of $4.75 per ton and a mill extraction of at least 80%. Neither of these are beyond possibility. A $4.75 cost would mean a big tonnage, the avoidance of an expensive tram, an adequate modern equipment, and a high [milling] concentration ratio. [This is] considerably more than our present mill is capable of.

The solution recommended by Mr. Clapp was to try a new milling technique called "froth-flotation," which indeed was set to revolutionize mineral processing both locally and nationally.

Environmental Aspects

As mines and mills increased in size and scope, their effect on the environment also increased. Mining techniques were similar to those of prior periods, but were larger in scale owing to increased mechanization. Waste dumps from the sorting houses became large, some exceeding 50,000 short tons by the end of the period. Water drainage became more of an issue as longer tunnels intercepted ground water. When shaft mining was used, water infiltrating into the mines had to be pumped out. In the nearby Red Mountain mining district, acidic water was a major problem because it dissolved pumps and piping and finally contributed to the closure of the Yankee Girl and Guston mines (Ransome, 1901). In most San Juan County mines, such highly acidic water appears not to have been a major problem. However, water infiltrating the "filled"-type stopes and dumps probably became acidic, and it would have transported metals to the aquatic environment. By the end of the period, many mines were operated through long haulage tunnels, which were built at lower elevations to lower costs

Figure 9. Silverton Northern Railroad and the Sunnyside mine's first "zinc train" (1915). Sunnyside began producing a zinc concentrate in 1915, which was shipped to a smelter out of the area. This special narrow gauge train was used to transport the powdered concentrate in 25-ton capacity boxcars, about half the size of standard gauge cars.

Figure 10. Silver Lake Mill #2 (site # 219, fig. 2) and tram (W, fig. 2) along the Animas River and Silverton Northern Railroad (circa 1904). The mill was built in 1900 and burned in 1906. It was later rebuilt and closed in 1914. The Silver Lake Mill #2 integrated tramlines, ore processing, and railroads. Crude ore could travel straight into the rail loading bins at far left. Low-grade ores were dumped into the terminal at the top of the mill for concentration. Tailings discharged in a flume at the base of the mill building on the right and were piped into the Animas River.

Figure 11. Small mills, such as the Intersection Mill located at the head of Minnie Gulch (fig. 2), became common around the beginning of the 20th century. At right is a five-stamp Fraser & Chalmers #56 crusher at Intersection Mill (site # 328, fig. 2) built in 1909–1910. A second crusher, a five-stamp Allis Chalmers #77 (at left), was added about 1915 (U.S. Bureau of Mines, 1910, 1915). Stamps were powered by steam engine (lower right corner of photo). Concentrates were produced using a Wilfley table, the remains of which are in the depression in front of the stamps. Note mine-waste pile adjacent to mill (about 100 tons).

and to minimize damage and loss of life from frequent high-elevation avalanches. These haulage tunnels served to drain the ground water down to that level, leaving upper mine workings relatively dry. Some of these haulage tunnels such as Silver Lake's Unity tunnel (site # 294) and Sunnyside's Terry tunnel (site # 120) reached several thousand feet in length.

Increased milling during this period had a serious negative effect on surface-water quality. Mills produced a muddy slurry waste product called "tailings." These mill tailings were commonly discharged directly into a nearby stream for disposal (Smith, 1987, p. 117). Sometimes they were discharged haphazardly on the ground or riverbanks near the mill, and crude impoundments were occasionally constructed (fig. 14). Stamp-mill tailings contained both a coarse sand fraction and fine particles called "slimes." Because the ore particles were soft, they tended to slime, making efficient recovery using the Wilfley table difficult. Recovery using gravity milling methods was 40–60 percent efficient (Bird, 1999). Upon discharge of the tailings into a stream, the coarse sands tended to settle out closer to the mills, whereas the finer material would stay suspended in the stream for long distances, affecting water quality as far south as Durango, 45 miles downstream from Silverton (Durango Evening Herald, July 18, 1902). Gravity mills typically recovered as much as 80 percent of the metals in the ore, such as gold, silver, and lead. Zinc, iron pyrite, and a portion of the copper were not recoverable by gravity mills (Niebur, 1986, p. 134). Thus, significant amounts of metal were left in the mill tailings, and particularly in the very fine "slime" particles that could be widely distributed into the aquatic and riparian environment. The water quality was degraded sufficiently in Durango to require an entirely new reservoir and delivery system to be constructed on the Florida River for a public water supply, to avoid using water from the tailings-laden Animas River (Durango Democrat, August 1–15 and November 18, 1902).

Silverton's first large concentrating mill was located beside Silver Lake and deposited tailings directly into it (fig. 15). Ransome (1901, p. 145) commented, "The original beauty of this little sheet of water has been marred by mining operations, particularly by a partial filling with tailings

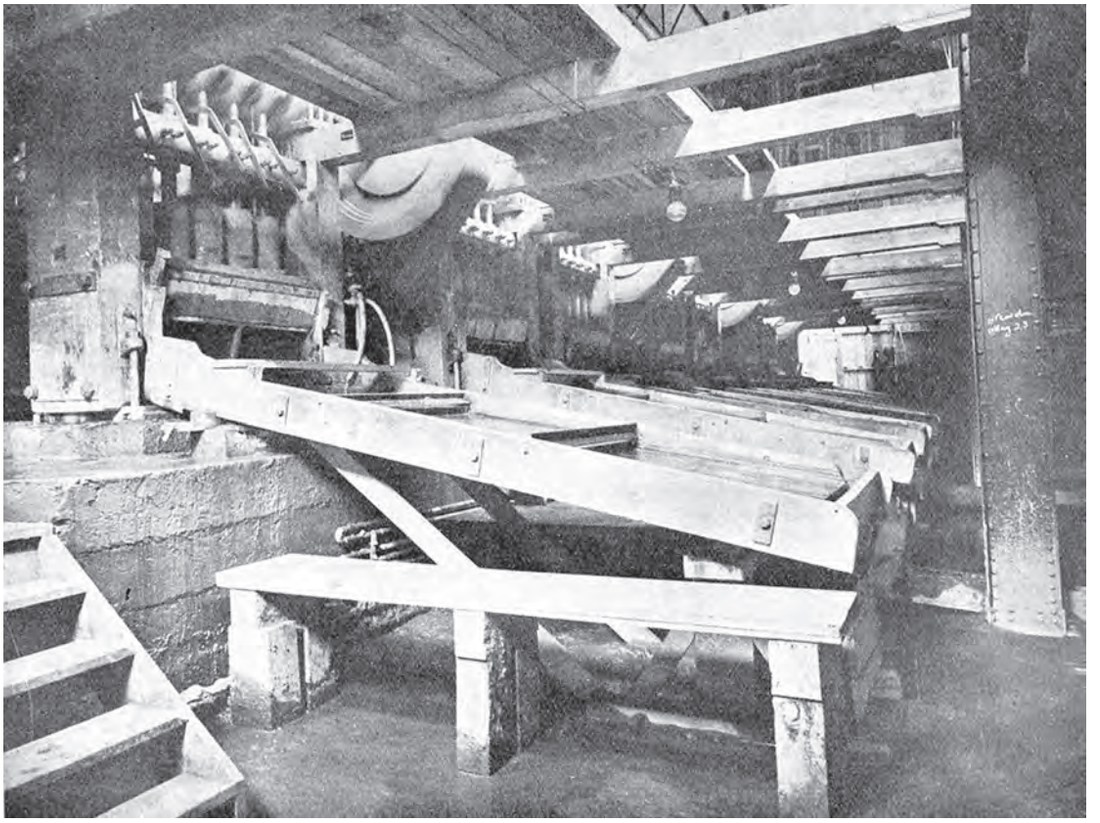


Figure 12. Stamps and mercury amalgamation plates, Old Hundred Mill (site # 238, fig. 2) (Silverton Miner, 1907). Inside the mills, heavy iron stamps pounded the ore to sand size, which washed over mercury-coated copper plates to catch the coarse gold and thence to concentrating tables.

from the Silver Lake Mill" (mill # 1, site # 347, fig. 2). About 500,000 short tons of mill tailings were reported to be in Silver Lake by 1903 (figs. 13 and 15; Niebur, 1986). Despite a long-held Silverton legend of a "pool of mercury" in the lake bottom, no mercury amalgamation was used at this mill (Ransome, 1901). Later improvements in milling technology resulted in about 400,000 tons of these tailings being pumped out of Silver Lake between 1914 and 1919 for reprocessing in a new mill built especially for this purpose by Arthur R. Wilfley (inventor of the concentrating table of that name) and Otto Mears (owner of the Silverton Northern Railroad) and located along the Animas River (site # 222, figs. 2 and 16). Although more metals were removed from the mill tailings, 500 short tons per day of these reprocessed tailing residues were then discharged directly into the Animas River near the mouth of Arrastra Creek (Niebur, 1986).

Chemical reagents were not used in the typical gravity concentration mill, although mercury-coated amalgamation plates were commonly used. Mercury was lost by physical attrition off the plates. Because of the high value of mercury, mill operators installed special mercury traps, such as the "Black Hills Trap," canvas tables, and other recovery devices prior to tailings discharge to minimize mercury losses (Adams, 1899). This may help explain why mercury contamination has not been generally detected in the watershed (Church and others, 1997). Sodium thiosulfate was used in one short-lived "lixivation" mill to dissolve certain silver minerals, this being the same chemical as photographic "hypo" developer solution.

Total ore tonnage produced during 1890–1913 is estimated at 4.3 million short tons. Based on typical milling practice of the time, a large majority of this tonnage would have been discharged as mill tailings directly into surface streams. Crude ore shipments decreased dramatically during this period as most mines now produced low-grade ores for milling. For example, during the period 1909–1913, for which data are available, only 29,314 short tons of crude ore was shipped, whereas 938,990 short tons, representing 96.97 percent of all tonnage produced, was milled (Henderson, 1926). These numbers show the importance milling had achieved compared to the prior period.

Figure 13. Silver Lake (mine # 343) and adjacent mines, mill, and mill tailings (Silverton Miner, 1907). The Silver Lake Mill # 1 (site # 347, fig. 2) at lower right was the first successful low-grade concentrator in the area. Tailings slowly filled the north end of the lake but were later removed. See also figures 15 and 16. The Iowa (mine # 345) is in center on right side of lake; Royal Tiger (mine # 348) is on left side of lake.

Period III—The Early Flotation Era 1914–1935

Mining Development and Practices

World War I in Europe caused the consumption of huge quantities of metals. The United States entered the war in 1917, whereupon an already brisk wartime economy boomed. Base-metal prices soared as the war continued to increase demand (Henderson, 1926). Improvements in both smelting and milling, coupled with wartime demand, made zinc ores a marketable commodity for the first time (Bird, 1986). Mines with zinc, such as the Sunnyside (mine # 116) expanded, whereas those without, such as the Silver Lake (mine # 343), closed.

The new froth-flotation milling process could do much of the separation formerly done by hand sorting and selective mining of ores and could recover zinc. Mining practices began a major shift to larger scale "bulk" mining methods and away from more selective lower tonnage methods. A new mining method called "shrinkage stoping" was developed. Here the entire vein was mined, instead of only the richest part (fig. 17). When the stope was completed, all the broken ore was removed from the mine, leaving a large void. In the "cut-and-fill" stope, the void was backfilled with low-grade ore or waste rock. With shrink stopes, no ore sorting was done and all mined rock was milled. Average ore grade decreased, but so did the cost per ton of mining and milling. This was to become the dominant underground mining method throughout the 20th century in San Juan County.

Other technological changes contributed to this increase in tonnage. Larger, more efficient compressed air drills replaced the early types. "Wet" drills, also known as Leyner drills, increased productivity by reducing dust and improving working conditions for the miners (fig. 17). Mines continued to increase in length, depth, and vertical extent. In 1916, Sunnyside (mine # 116) became the largest ore producer in the

Figure 14. Gold King Mill (site # 94, fig. 2) at Gladstone and SG&N Railroad (circa 1903). Tailings from the Gold King Mill can be seen crudely impounded by log dams along Cement Creek. The aerial tram (D, fig. 2) entered the building from the upper right; boxcars for concentrate shipment waited along the railroad sidings.

county. By 1917, its daily production increased to 500 short tons. In 1918, 600 short tons per day was reached and, by 1928, daily production exceeded 1,000 short tons per day (USBM, 1928). Wartime prices also saw many smaller mines open, and the old Kendrick-Gelder Smelter (# 213, fig. 2) was reopened to treat pyritic copper ores from the Red Mountain district (fig. 7; USBM, 1918).

The high metal prices caused by the war were unsustainable, and in 1921–1922, a sharp postwar recession hit the Nation. Mining activity in Silverton collapsed. In 1921, the county's total production was a mere 1,100 short tons, whereas in 1920 more than 200,000 short tons of ore had been produced (Henderson, 1926). Mining recovered in 1923 with the reopening of the Sunnyside (mine # 116), but the character of the mining industry had changed permanently. Many small and medium-sized mines closed, some permanently, along with some older large mines such as the Silver Lake (mine # 343) in 1921 and Gold King (mine # 111) in 1925. By the late 1920s, some new mines were opened as the national economy grew, notably the Shenandoah-Dives (mine # 355), Buffalo Boy (mine # 325), and Little Nation (mine # 228, fig. 1). But metal prices again collapsed with the onset of the Great Depression in 1930, and only two mines sustained any continuous production for the next 61 years. Small mines played a decidedly secondary role. The Sunnyside (mine # 116) closed in September 1930 leaving the 3-year-old Shenandoah-Dives (mine # 355) as the only major producer in the district for the next 23 years (Chase, 1952).

Milling Development and Practices

Ball mill grinding and froth flotation for concentrating ores revolutionized mining in the decade of 1910–1920 (Rickard, 1932). The impact of this new technology was dramatic. Instead of coarsely pulverizing ores with crude stamps, high capacity wet grinding with steel balls in a rotating drum ball mill created a more uniform and finer product. Early flotation used bubbles in an acidified pine-oil and water mixture to float off and separate the valuable mineral particles from the worthless quartz (fig. 18). More importantly for

Silverton, the process could separate zinc (sphalerite) from the lead and copper sulfide minerals, and worked well on the small-particle-sized "slimes" that were not amenable to gravity concentration. In addition, new smelting processes made the zinc concentrates produced by flotation marketable at last (Rickard, 1932).

The "remarkable success" of flotation on copper ores was noted in 1913 by Superintendent Clapp, who did his own laboratory experiments on Silver Lake ore (unpublished report in Shenandoah-Dives collection, Center for Southwest Studies, Fort Lewis College, Durango, Colo.). The first large-scale mills for lead-zinc ores were built at Butte, Mont., in 1914, using the patented Minerals Separation Syndicate process (Rickard, 1932; fig. 18). Stamp mills and Wilfley tables quickly became obsolete for primary milling of base-metal ores. The Silver Lake Mill # 2 (site # 219) and Gold King Mill (site # 94) in Silverton (fig. 2) added full-sized Minerals Separation flotation sections in 1914 with Sunnyside Mill # 2 (site # 165) following in 1915 (Henderson, 1926). Even the famed table inventor A.R. Wilfley installed flotation in his tailings reprocessing mill (site # 222, fig. 2) in 1916 (Niebur, 1986). The process worked so well that the Terry family, long-time owners of the Sunnyside (mine # 116), sold their controlling interest in the mine to the U.S. Smelting Refining and Mining Company. This large corporation had the financial resources to build a huge state-of-the-art 600 short ton per day flotation mill at Eureka in 1917–1918 (site # 164, figs. 2 and 19). The new mill recovered as much as 90 percent of the valuable minerals, including sphalerite as a separate zinc-rich concentrate. The mill tailings now had less metal in them, but were finer in size, and the tonnage produced increased to 1,000 short tons per day in the late 1920s. Wilfley tables still used in the new Sunnyside Flotation Mill at Eureka (site # 164) were relegated to the minor role of breaking down froth on flotation concentrates (Taggart, 1927). The new mill was the first large lead-zinc flotation mill in the State (Bunyak, 1998). Remaining gravity/stamp mills in the district became obsolete and when closed by the 1921 recession, never reopened. Most were burned to recover scrap iron during World War II.

Environmental Aspects

In the mines the trend continued toward larger and more extensive workings, with more potential impact on groundwater hydrology. Very long haulage tunnels such as the Gold King Mill level tunnel (later known as the American tunnel, site # 96) and the Frisco tunnel (site # 19) were nearly a mile

Figure 15. Silver Lake Mill # 1 (site # 347, fig. 2) discharging tailings into Silver Lake (Silverton Standard folio, 1904). The tailing flume from the mill is discharging tailings onto the sand pile now filling Silver Lake (see fig. 13). The large building is the miners' bunkhouse.

Figure 16. Silver Lake in 1978 showing that early tailings had been removed. Improved milling and pumping technology resulted in much of the Silver Lake tailings being removed leaving a circular "crater" where the sands once were piled (see fig. 13).

in length (fig. 1). Significant localized drainage of ground water from the mine workings now had considerable potential for discharge of acid or metals into the creeks that was not documented at the time. Improved milling had some indirect benefits during the period. Low-grade and zinc-bearing ores were no longer left in stopes or on mine-waste dumps where they could come in contact with the environment. Instead these ores were processed and much of the galena and sphalerite was removed. However, some of the galena, sphalerite, and most of the pyrite in the original ore were discharged into the environment as mill tailings.

Flotation milling adversely impacted the Animas River, compared to earlier stamp milling (Vincent and Elliott, this volume, Chapter E22). Ball-milled tailings were much finer than stamp mill tailings. Although the mill tailings contained less metal per ton, milled tonnage increased dramatically, yielding a net increase in the amount of tailings being deposited in the streams. In 1926, Sunnyside's Flotation Mill tailings (south of site # 164, fig. 2; Church, Fey, and Unruh, this volume, Chapter E12, fig. 4, locality B19; Vincent and Elliott, this volume) were reported to contain 0.015 oz/ton gold, 1.0 oz/ton silver, 0.6 percent lead, 0.08–0.13 percent copper, and 0.8–1.1 percent zinc (Taggart, 1927).

The finer tailings traveled farther, and their presence began to elicit serious, formal complaints from downstream water users. In the late 1920s, Durango ditch companies sued the Sunnyside mine's owner, U.S. Smelting Refining and Mining Company, over the pollution originating from the Sunnyside Flotation Mill at Eureka (site # 164, fig. 2 and fig. 19).[4] The main issue alleged was suspended material that clogged irrigation ditches rather than any concern about possible metal contamination. Whether the case was actually tried is unknown, but the company prepared a vigorous defense. It hired Durango assayer Albert P. Root to take weekly samples of the Animas River for clarity comparisons in Durango from March through September 1930, when the mine and mill closed. These samples were stored under seal for the next 2 years as legal wrangling continued. Root's field notes survive, and the Animas River was typically described as "gray and turbid" during normal and low-flow periods. During high flow, the tailings' gray color was obscured by natural sediment (A.P. Root, unpub. field

[4]1931–1932 correspondence of U.S. Smelting Refining and Mining Company with A.P. Root, Root and Norton Assayers; author's collection.

notes, 1930). Mining companies at the time typically argued that these sediments were not harmful to fish or agriculture, but the attitudes of the courts and the public were changing. The mining companies had successfully rebuffed similar complaints 25 years earlier, but now, legal action was being taken against them (Smith, 1987).

The oil flotation process used various chemical compounds, but the amounts released were not monitored at the time. In the early Minerals Separation Syndicate process, the mill water was acidified with dilute sulfuric acid and pine oil was added as the frothing reagent. The Mayflower Mill (site # 221, fig. 2) used this pine oil process for the first few years of operation (figs. 2, 18, and 20). Precisely what the Sunnyside Mill at Eureka (site # 164, fig. 2) used in the 1918–1925 period is unknown, but lead-zinc mill practice at the time used alkaline rather than acidic solutions. The 1926 mill circuit and reagents are described in detail in Taggart (1927). Reagents included small amounts of coal tar, creosote, naphthalene, pine oil, and potassium xanthate as the main frothing reagents. Large amounts of sodium carbonate (soda ash) were used to make the mill pulps and solutions alkaline. The xanthate chemicals, as an alcohol-like liquid, were patented in 1925 and became the basis of modern flotation processes. They completely supplanted oil flotation within a few years of their introduction (Rickard, 1932). Because no State or Federal regulations on chemical discharges existed, chemicals used in the mill water were likely discharged with the tailings.

In contrast to districts such as Telluride and Cripple Creek, there is no record of direct use of cyanide for recovery of gold in San Juan County, probably because of its chemical incompatibility with the zinc and copper sulfides associated with gold in the ores. Cyanide was used in small amounts as a pyrite depressant in flotation beginning in the 1930s.

Total tonnage produced from 1914 to 1935 was reported as 4.2 million short tons of ore with only 36,232 short tons reported as being shipped directly to the smelter. Nearly all production during this period was milled. Judging from tailings disposal practices of the time, most tailings were deposited into the Animas River and tributaries (Vincent and Elliott, this volume).

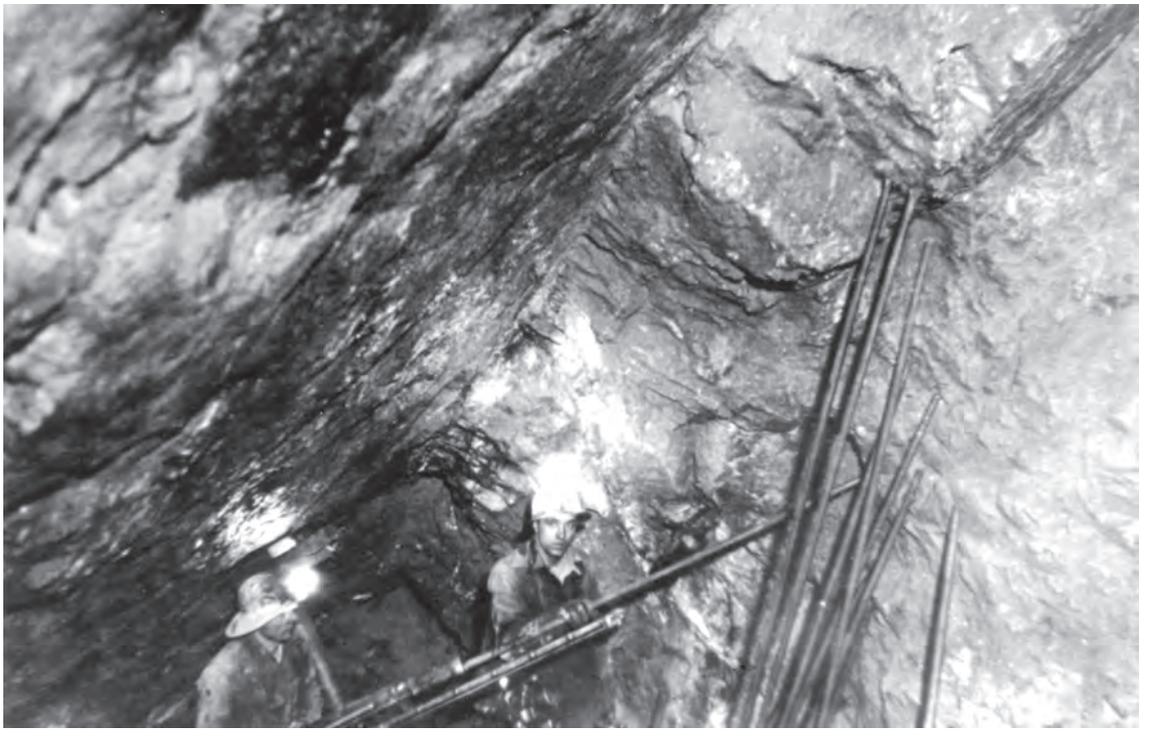


Figure 17. Shrink stope mining in Shenandoah-Dives (mine # 355, 1937; C.A. Chase photo). Air drills increased productivity and size of the mines. Here a Leyner type drill is working a flat-lying stope. In the shrinkage method, the miners stand on the ore pile which is later completely removed for processing, leaving a void. Vein exposed is about 3 ft thick.

Figure 18. Minerals Separation flotation cells, Mayflower Mill, 1930 (site # 221, fig. 2; C.A. Chase photo). The flotation process created froth, which floated the ore particles out of the redwood cells or tanks. The Minerals Separation Syndicate was the leading patent holder in the early years.

Period IV—The Modern Flotation Era 1936–1991

Mining Development and Practices

The Great Depression was a very difficult time for the base-metal mining industry. Declining industrial production saw the lowest nominal prices of the century for silver, lead, copper, and zinc. Gold was an exception: the government devalued the dollar in 1934 by raising the price of gold 75 percent from its long-time $20.67 per ounce level to $35.00 per ounce (USBM, 1934). This new price support sparked a renewed interest in gold exploration, but it had no significant effect on production in San Juan County, because of the scarcity of gold ore in the area. It did help to keep the Shenandoah-Dives (mine # 355), with low-grade gold ore, operating through the Depression. The Federal Government's new involvement in the mining business through New Deal programs generally helped mining, but at the expense of increased regulation (Smith, 1987).

The Shenandoah-Dives Mining Company survived the Depression by increasing tonnage mined to reduce per ton unit costs, and by improving the efficiency of the Mayflower Mill (site # 221, fig. 2 and fig. 20). Starting at 300 short tons per day in 1930, the Shenandoah-Dives (mine # 355, fig. 1) soon changed from cut-and-fill mining to large shrinkage stope mining methods and increased production to 600 short tons per day. Virtually every ton of rock broken underground was milled. As base-metal prices slowly recovered in the late 1930s, a few small high-grade lead-zinc mines were developed in the district, such as the Pride of the West (mine # 319), which, in 1940, built its own 50 (later 90) short tons per day capacity mill (site # 227, fig. 2) at Howardsville (Denver Equipment Company, 1947). The size and extent of the mines continued to increase. The Shenandoah-Dives (mine # 355) reached a vertical extent of more than 2,500 ft by 1941, and a horizontal extent exceeding 7,600 ft by 1948 (fig. 21; Chase, 1952).

The Sunnyside (mine # 116) reopened for 10 months in 1937–1938, due to a surge in metal prices, but closed due to sagging metal prices, high operating costs, and "excessive water which forced the***owners to abandon the work"

(Standard Metals Corp., 1961). World War II began to affect the mining industry. When the United States entered the war after Pearl Harbor, there was a severe shortage of zinc and other base metals. In 1942, the Federal Government closed all gold mines so that scarce mining labor and resources could be focused on base-metal production. At that time the Shenandoah-Dives (mine # 355), a nominal gold mine, was ordered closed by the War Production Board (WPB). Silverton mining leaders put political pressure on the WPB through Colorado's governor and congressional delegation. The WPB actually rewrote its national regulations to permit Shenandoah-Dives to meet new criteria and avoid the closure order (Chase and Kentro, 1942). The mine and Silverton were revived, which incidentally helped save the Durango to Silverton narrow gauge railroad for its future as a tourist line. The remaining equipment and track of the other small narrow gauge lines around Silverton were purchased by the U.S. Army for use in Alaska during construction of the Alaskan Highway (Sloan and Skowronski, 1975).

As flotation milling technology improved and wartime demand for metals increased, Shenandoah-Dives and other mines began to remine old underground stope fills and surface dumps left by previous mine operators. By 1952 Shenandoah-Dives Mining Company reported recovering 117,238 tons of dump from Dives Basin, 80,158 tons of pre-1925 underground stope fills, and 29,597 tons from "other sources" (fig. 22). Such "dump recovery" was widespread in the county during World War II and the Korean War. Government policy further stimulated mining and recovery of material from old mine-waste dumps when it began to pay bonus price subsidies called "premiums" for every pound of metal recovered. Begun in February 1942, the Government's Metals Reserve Company paid premiums for every pound produced above a quota based upon 1941 production. Lead and zinc premiums were 2.75 cents/pound, whereas copper received 5 cents/pound. In mid-1943, these premiums were increased to 6.50 cents/pound for lead, 8.25 cents/pound for zinc and 11.775 cents/pound for copper. Premiums were paid at varying levels through June 1947, when the plan expired (USBM, 1942, 1943, 1947).

Road building and mineral exploration were also subsidized by the U.S. Bureau of Mines through the Defense Minerals Exploration Act (DMEA) and later through the Office of Mineral Exploration (OME). The Reconstruction Finance Corporation (RFC) actively loaned money for mining

Figure 19. New Sunnyside Eureka Flotation Mill (site # 164, fig. 2), a large flotation mill built at Eureka, Colo. (circa 1925, SJCHS collection). The new 600 ton/day (later 1,000 ton/day) Sunnyside Eureka Mill dwarfs the original 150 ton/day concentrator (Sunnyside Mill # 2, site # 165, fig. 2) built in 1899, graphically showing the dramatic increase in size and scope of later milling operations.

Figure 20. Mayflower Mill (site # 221) and reclaimed tailings (sites # 507–510, fig. 2; 2002). Also known as the Shenandoah-Dives Mill, it operated for over 60 years (1930–1991). The aerial tram (AA, fig. 2) entered the plant at far right while tailings were stacked in tailings ponds on the left (# 507–510). These tailings were capped and seeded during 1990s reclamation work by Sunnyside Gold Corp. In 2001 the mill was designated a National Historic Landmark by the Secretary of the Interior.

projects, and the Metals Reserve Corporation bought metals and ores directly for Government strategic metals stockpiles. Some of these programs survived into the early 1960s (USBM, 1960).

With such favorable economic and Federal Government policies, operators reopened many dormant mines. Ore was shipped to Shenandoah-Dives' Mayflower Mill (site # 221, fig. 2) for custom processing, and when its capacity was reached, the ore was shipped by rail to the Golden Cycle Mill in Colorado Springs, Colo. Many of these reopened mines were small, often mining only a few short tons per day. Shenandoah-Dives (mine # 355) remained the main producer at 600 short tons per day; about 100 short tons per day of "custom ore" were being milled (Mayflower Mill, site # 221, fig. 2) in summer months for the small mines. The Pride of the West (mine # 319), Highland Mary (mine # 359), and Lead Carbonate (mine # 106) built or expanded their own small mills (sites # 233, # 502, and # 95 respectively, fig. 2) and increased production during the war. Production would have increased more during the war, except for the shortage of labor. Anecdotal evidence suggests that this labor shortage was the main reason the Sunnyside (mine # 116) never reopened during World War II, despite large zinc reserves.

The Shenandoah-Dives Mining Company continued steady development of its property (mine # 355) and the adjacent Silver Lake (mine # 343), which it leased, into the early 1950s. Metals prices increased in 1951 in response to the Korean War, but they declined after the 1952 election because of a perception that President Eisenhower would soon end the conflict. In 1953, the new Congress withdrew Korean War price supports for lead and zinc. Production at Shenandoah-Dives ceased on March 17, 1953, which also caused most of the remaining small mines dependent on the Mayflower Mill to close. A Government DMEA exploration grant kept the Shenandoah-Dives Mining Company going for a few more years, though without any production.[5] The company later became the Marcy-Shenandoah Corporation, which obtained key leases on the Gold King Mill level tunnel (site # 96) at Gladstone and the Sunnyside (mine # 116) in 1958.

In 1959 a new company, Standard Uranium Corporation, formed a joint venture with Marcy-Shenandoah Corporation to reopen the Sunnyside mine by building a new lower haulage

[5]Memorandum of C.A. Chase, June 29, 1953, in C.A. Chase Collection, San Juan County Historical Society Archives, Silverton, Colo.

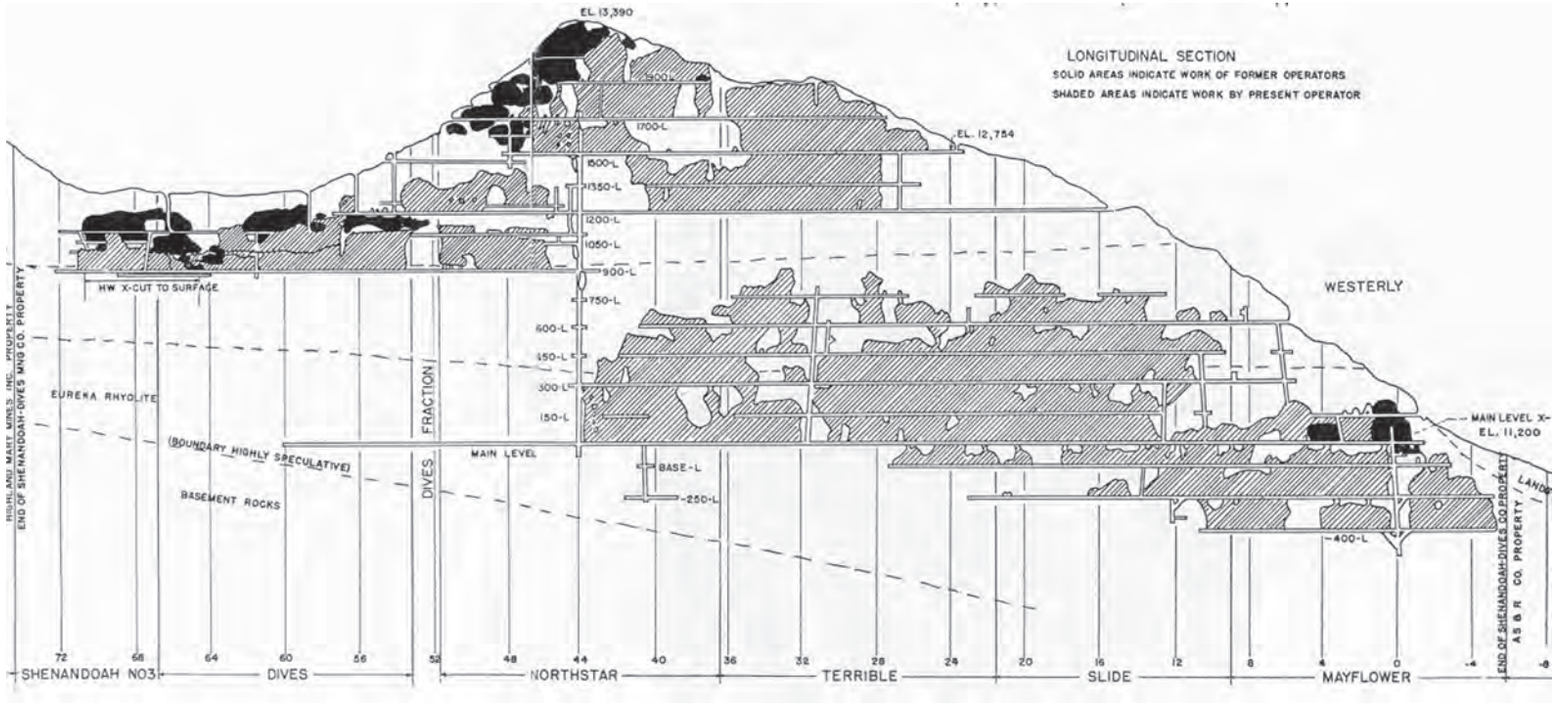


Figure 21. Cross section of Shenandoah-Dives mine in 1950 (Chase, 1952). This cross section view of the Shenandoah-Dives (mine # 355) shows 1880–1925 mined-out areas in black and 1926–1950 stoped areas in shaded gray diagonal lines. The figure graphically shows the difference in size and extent of the mined area removed during the latter "modern" period, when air drills and power equipment were used, relative to that achieved using earlier hand methods. Map shows mining over a vertical extent of 2,500 ft and horizontal extent of 7,600 ft.

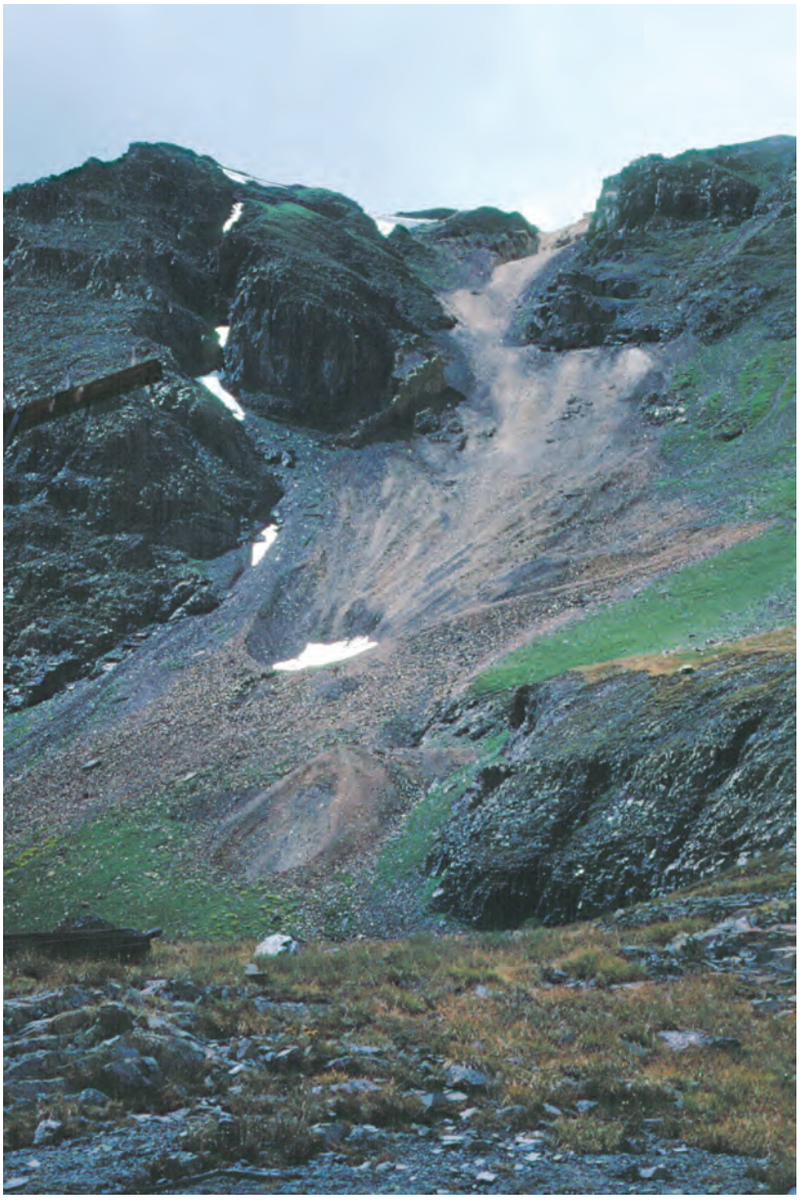


Figure 22. 1940s dump reclamation on Shenandoah-Dives vein, Dives Basin, photographed in 1978. Dumps left by early hand sorting operations were often reclaimed by later innovative methods. This is the North Star mine dump in Dives Basin (mine # 350, fig. 1), which was scraped into a shaft of the Shenandoah-Dives mine for transport through the tunnel and aerial tram system to the Mayflower Mill (site # 221, fig. 2) three miles away and 3,000 ft lower. Snow patch in center of photo is approximately 150 ft in length.

tunnel (mine # 96). In 1960, Standard Uranium Corporation changed its name to Standard Metals Corporation, bought out Marcy-Shenandoah Corporation's interest, and became sole owner of the former Shenandoah-Dives (mine # 355) and the Mayflower Mill (# 221, fig. 2). Work began to widen and extend the old Gold King Mill level tunnel (site # 96, prior to 1960) at Gladstone another mile under the Sunnyside mine workings. The goal was to avoid the costly hoisting and tramway operations of the former operators, whose main shaft was located beside Lake Emma at 12,300 ft (fig. 23). The renovated and extended haulage tunnel was renamed the American tunnel. The work is described in the 1960 Standard Metals Corporation Annual Report (p. 3):

> The [American] Tunnel was driven in order to provide an economical means for removal of ore as well as drainage. The original schedule for reaching the Washington vein was January 1961. This has been accomplished in spite of a water flow of 3,000 gallons per minute encountered from the 9,000 foot mark. *** Prior to driving the American Tunnel, the drainage of eight million gallons of water in the Sunnyside mine workings was *** a potential major problem. Fortunately the tunnel intersected a fault zone with fissures resulting in a gradual drainage of the old workings. The water level has been dropping an average of more than three ft per day in the old Washington Incline [shaft]. At this rate, when the raise is ready for the breakthrough the volume of water remaining in the upper level will be negligible.

The American tunnel (mine # 96) was successful at draining the workings, but the new mine drainage flowing into Cement Creek would later become a substantial problem when water-quality standards were enacted in the 1970s. Production from the Sunnyside (mine # 116) through the 11,000-ft long haulage tunnel (mine # 96) began in August 1962, and continued at 700 short tons per day, increasing to 1,000 short tons per day for a few years in the late 1970s. Unexpected gold discoveries in the early 1970s kept the Sunnyside (mine # 116) going long after other similar base-metal mines in Colorado had closed.

Other than Sunnyside (mine # 116), only a few small mines produced ore intermittently after 1953, usually in conjunction with the Pride of the West Mill (site # 233, fig. 2) in Howardsville. In 1967, a Texas oil company, the Dixilyn Corporation, began a large mineral exploration and development project at the Old Hundred (mine # 239). It found little ore, but constructed more than 15,000 linear feet of new tunnels and expanded the Pride of the West Mill [# 4] (site # 233, fig. 2) to 400 short tons per day capacity. Mill

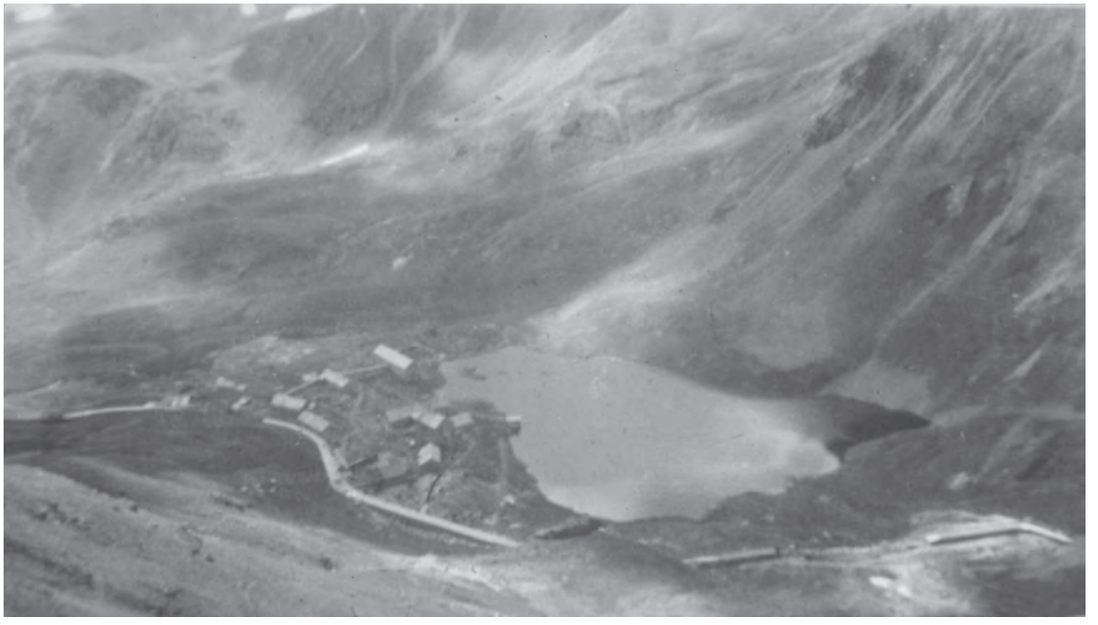


Figure 23. Lake Emma and Sunnyside mine from Hanson Peak (circa 1940; H.H. Mellus photo, SJCHS collection). The original Sunnyside mine (mine # 116, fig. 1) was located at 12,300 ft on the shore of Lake Emma, which was dammed to provide water to mills downstream. Men lived in the building complex; snow sheds connected them to the tunnels and shafts.

tailings are impounded in a permitted repository at the site (site # 234, fig. 2). High gold and silver prices in the late 1970s and early 1980s caused another increase in mineral exploration activity around Silverton. A few new access tunnels were built, but again, little ore was developed or produced. About 40,000 short tons of mostly waste dump material was processed at the Pride of the West Mill (site # 233, fig. 2) between 1970 and 1990, mainly during periods of high metal prices. Several old mines were explored, but gold and silver prices did not maintain a high level long enough to sustain large-scale new mine development. Sustained mining continued to be confined to the Sunnyside (mine # 116), which benefited from both high gold prices and high gold content in the ore. Sunnyside also recovered and milled mine-waste dumps from the original Sunnyside workings at Lake Emma in the late 1980s (figs. 1 and 2).

In the late 1970s, new surface reclamation laws in Colorado began to affect ongoing mining operations. In 1983, aggressive legal action under the Federal Superfund law against Newmont Mining's nearby Idarado mine in Telluride, Colo., coupled with declining gold and silver prices, caused all major United States and Canadian mining companies then exploring in San Juan County to soon terminate leases and exploration activities. After 1984, no major U.S. mining company initiated any new exploration activity in San Juan County. The continued exception was the Sunnyside (mine # 116), which developed into the State's largest gold producer in the 1970s. However, its operator, Standard Metals Corporation, went bankrupt in 1984, closing the mine. Its troubles began in 1978 with the flooding of the mine by Lake Emma. This precipitated a corporate takeover fight, and the ensuing debt load and subsequent fall in gold prices bankrupted the company. In November 1985 the mine and the Mayflower Mill were purchased by Echo Bay Mines and reopened as Sunnyside Gold Corporation in early 1986. By August 1991, the mine's higher grade gold ore reserves were exhausted, base-metal prices were falling, and the mine closed except for reclamation work, which continued for 12 more years. Low metal prices, coupled with increased expenses related to complex environmental regulations, resulted in a cessation of mining and exploration activity in the county after 1991, following a pattern similar to that of other mining districts in Colorado. Since 1991, no ore production has occurred in San Juan County, after 121 years of continuous mining production.

Milling Development and Practices

In the 1930s, the Mayflower Mill was the only milling operation in the upper Animas River basin. As a result of both downstream complaints and the personal philosophy of management, the first successful steps were taken to prevent water contamination caused by mill tailings. When the Mayflower Mill (site # 221, fig. 2) was built in 1929, Shenandoah-Dives' manager, Charles A. Chase, with the support of concerned stockholders, intended *not* to discharge mill tailings into the Animas River at all. Instead, special tanks and machinery were installed to settle the mill tailings and haul the sand back up the tramline, where it would be dumped as a surface pile, thereby keeping it out of the Animas River. Mill water would be filtered and recycled. Unfortunately the equipment did not work, and being in financial difficulty because of the Great Depression, the company discharged mill tailings into the Animas River as mills had before (Smith, 1987). In 1935, Chase received recommendations for a tailings impoundment built from its own sand that was being used in Butte, Mont. under operating conditions similar to those at Silverton. The technique relied on the fact "***that a single spigot will draw off sand in such a ratio to water as will permit the sand to build in a firm pile; and of course a series of such piles will merge into a continuous wall of sand" (fig. 24; Chase and Kentro, 1938, p. 19).

By 1936, nearly all Shenandoah-Dives mill tailings were being retained in sand-walled ponds (site # 507, fig. 2), keeping them out of the Animas River (fig. 25). The slimes and fine suspended material settled out in the pond formed behind the sand wall. As the water cleared, it was decanted out of the pond through wooden culverts (called decants) buried under the sand wall, and thence into the Animas River. When Sunnyside (mine # 116) briefly reopened their Eureka Mill in 1937–1938 (# 164, fig. 2), it too built settling ponds in the Animas River valley below Eureka (Church, Fey, and Unruh, this volume, fig. 4, locality B19; Vincent and Elliott, this volume). Variations of this method and improvements on it were used by all mills operating after 1935, until the end of milling in 1991 (site # 507–510, fig. 2).

Although this method of transport and emplacement of tailings was effective, the settling-pond system designed to contain the material was not perfect. The crudely constructed sand walls built on the hillside near the Mayflower Mill were plagued by springs, entrained ice, and slimes, and were therefore not structurally stable. The sand wall on tailings pond # 1 (site # 507, fig. 2) collapsed in 1947 (fig. 26) and again in 1974. The latter collapse released more than 100,000 short tons of tailings into Boulder Gulch and the Animas River and resulted in abandonment of the pond (site # 507, fig. 2; Bird, 1986). In 1947, the accident resulted in no legal actions against the company. The settling pond wall was promptly repaired, and the company even received a commendation for its pollution control efforts from the Colorado Fish and Game Department. By 1974, however, the story was different. Standard Metals Corp. was fined $40,000 (later reduced to $15,000) for contaminating the Animas River. Active water-quality monitoring of the mill tailings decant water became standard practice about 1977, with the advent of the National Pollution Discharge Elimination System (NPDES) permitting system.

Figure 24. Mill tailings spigots at tailings pond # 1, Mayflower Mill (site # 221, circa 1934; C.A. Chase photo). Wooden flumes were used to slurry tailings for disposal into tailings ponds (# 507, fig. 2) rather than into the river. Holes in the bottom of the flume let coarser sands flow down the planks into piles, which were shoveled together to create the pond wall while water settled behind the resulting dam.

From 1935 to 1991 milling technology gradually improved in efficiency but remained similar in method and operations. Metal recovery was often as high as 95 percent by the 1940s, and only incremental improvements were made into the 1970s. The one large change was the abandonment in the mid-1930s of the old oil flotation chemistry at the Mayflower Mill (site # 221, fig. 2), replaced by more efficient xanthate flotation reagents for the separation of a zinc concentrate. Tailings ponds also improved with the use of hydro-cyclone type classifiers replacing wooden launders, sluices, and spigots for dam construction. In its 1965 annual report, Standard Metals (1966, p. 7) noted, "Tailing disposal systems were improved in line with current stream and river pollution regulations and practices." This is an example of Colorado's efforts at water-quality regulations prior to national legislation.

During the period 1936–1991, a reported 9.5 million short tons of ore was mined and milled with all but an estimated 200,000 tons of mill tailings being impounded in settling ponds. Crude ore shipments for the period 1936–1957 amounted to only 8,148 tons.

Environmental Aspects

Changing public attitudes and government philosophy resulted in new legislation and legal proceedings in both the 1930s and 1970s. These changes forced mine operators to modify or improve practices to reduce environmental degradation caused by mining and milling (Smith, 1987). Required improvements tended to increase operating costs, though metals prices continued to decline in both nominal and real terms. The number of operating mines markedly decreased after 1953 as mining economics became less favorable. Underground mining practices continued much as in the past, but longer haulage tunnels at lower elevations increased mine drainage discharges, as at the Sunnyside (American tunnel, mine # 96), and Old Hundred (mine # 239).

Wartime demand and Federal Government policy in the 1940s and 1950s resulted in significant road building, processing of old mine-waste dumps, and reopening of old mines. Little regard was paid to the condition of the surface after such war-inspired activity. Most old stamp mills were burned and their scrap metal salvaged in support of the

Figure 25. Tailings pond # 1 sand wall (site # 507) at Mayflower Mill (1936; C.A. Chase photo). As tailings were deposited the sand walls became higher. Tall flumes (shown on left of sand wall) called "launders" now were needed to transport the sand and water.

war effort. Underground workings of the larger mines were expanded to tens of thousands of linear feet with multiple working levels. This resulted in ground water being drained from the vicinity of the mine workings and discharged out of the lowest haulage tunnel directly into the surface streams. Few large surface mine-waste dumps were created during the 1936–1991 period because most mineralized material was milled. The several new access tunnels built did generate large mine-waste dumps of mostly unmineralized "country" rock. Colorado passed one of the first comprehensive surface reclamation laws in 1976, which required surface disturbances to be reclaimed after mining was completed on both private and Federal lands.

Key legal actions in the 1930s finally pushed the mining industry to find solutions to the problem of turbid mill tailing discharges. In March 1935, the Colorado Supreme Court upheld a lower court ruling against the Chain-O-Mines Company in the town of Central City and ordered it to cease mill tailings discharges into adjacent Clear Creek (Smith, 1987). Legal action was never taken against Shenandoah-Dives Mining Co., who instead cooperated with downstream farmers and ditch companies to find a solution it could afford. Mill tailings settling ponds were begun in July 1935, and by June 1936 the majority of the mill tailings produced in the Animas River watershed were retained (site # 507, fig. 2). According to manager Chase, by August 1937 the system achieved "complete retention" of the mill tailings. "Decanted water is, for the most part above reproach as to clarity *** The Animas is reported a first-class fishing stream." Still, noting new grass growing on the sand wall he wrote, "we may yet demonstrate to the farmers that they are deprived of good soil building material" (Chase and Kentro, 1938, p. 21). Charles Chase was ahead of his time, but he still maintained the industry's long-held belief that the tailings themselves were benign or even beneficial.

When the Sunnyside (mine # 116) reopened in 1937, mill tailings pond dams were built with mechanical excavators on the flat river gravels south of Eureka (south of site # 164, fig. 2). After the mine was abandoned and the Sunnyside Mill at Eureka was scrapped in 1949, these tailings dams partly washed out and some of these tailings entered the Animas River (Vincent and Elliott, this volume). Remaining mill tailings were removed to the Mayflower tailings pond # 4 repository (site # 510, fig. 2) during reclamation activities in the 1990s.

Besides the occasional accident or error, decant water quality varied due to a number of factors. Wind and thunderstorms would sometimes stir up the shallow water in the settling pond, allowing slimes into the discharge. Close attention by operators was needed to keep the decanted water clear. Occasional complaints were registered with the State against

Figure 26. Failure of tailings pond # 1 sand wall dam (site # 507) at Mayflower Mill (1947; C.A. Chase photo). As sand walls became higher, structural instabilities also increased. Ice lenses in the wall were partly to blame for this 1947 collapse. The 1974 wall failure would be just out of this view to the left. Reclaimed tailings are shown in figure 20 to left of Mayflower Mill.

Shenandoah-Dives Mining Co. when conditions downstream deteriorated—even if the company was not to blame. Smith (1987, p. 131) noted, even though Charles Chase's

> enlightened attitude put to shame many of his contemporaries [in the mining industry] *** he discovered growing sentiment against mining's activities, and found his company in the role of the scapegoat, simply because Shenandoah-Dives represented the largest and most obvious local operation. *** Chase's problems [in Silverton] portended what would come on a larger scale.

Chemical and metallic constituents of decant water were not regulated until the late 1970s. Beginning in 1937, small amounts of cyanide (less than 10 ppm) were used in the mill water to depress iron in the flotation process (Taggart, 1945). Small amounts of cyanide were used until the end of milling in 1991, although in reduced amounts followed by treatment in the pond water, as discharge regulations became more stringent. Even at the time of the closure of the Mayflower Mill in 1991, the biotoxicity of various mill reagents was not well understood. Xanthate concentrations in mill water discharges were never regulated by State or Federal agencies during the period of operation of the Mayflower Mill, 1930–1991.

Potential ground-water contamination by mill tailings pond deposits was also not addressed by regulators or industry until the 1980s. Settling ponds built in prior years were not sealed and infiltration into ground water or near-surface water is known to have occurred below some ponds (Jim Herron, Bruce Stover, and Paul Krabacher, Unpublished Lower Animas River reclamation feasibility report, Upper Animas River Basin, Colorado Division of Minerals and Geology, 2000). This seepage process can result in ground water contamination by metals leached from the mill tailings. Though none of the older settling ponds were sealed to prevent contact with ground water, not all old tailings ponds resulted in surface or ground-water contamination. The 1940s tailings pond at the Highland Mary (site # 361, fig. 2) is an example. Some mill tailings material is chemically neutral or contains sufficient alkaline minerals, or the pH of water is sufficiently high, that any pyrite contained in the mill tailings will not be oxidized (Unpub. Reclamation feasibility report, CDMG, 2000).

One dramatic event did adversely affect the Animas River for a short time in 1978. Standard Metals Corp. was mining the Spur Vein, a high-grade gold vein in the Sunnyside (mine # 116) 85 ft below Lake Emma, located at 12,300 ft elevation in Sunnyside basin (fig. 23). About 6:00 p.m. on Sunday, June 4, 1978, Lake Emma broke through into the 2580 Stope on C level, flooding the mine on the only day of the week when no miners worked underground (fig. 27). The effect on the mine was cataclysmic, stripping timbers from the main shaft, crushing equipment, and filling tunnels with mud. At the Gladstone portal (mine # 96, fig. 1) an estimated 5 to 10 million gallons of water blew out the walls of the portal building under the pressure of a 1,700-ft head from the lake and covered everything with black mud (figs. 28 and 29). Sheriff Virgil Mason, on his way to the Gladstone portal, told reporters he saw "a wave that must have been eight to ten feet high rushing down the creek. At the portal it was like a UFO movie. Everything was black and timbers were shooting out like they were shot from a launcher" (Daily Sentinel, June 11, 1978). Alongside other townspeople, the author, who was employed by Standard Metals as an assayer at the time, watched Cement Creek flood. Main shaft timbers floated by in the roiling black water, which smelled strongly of diesel fuel and sulfides, but the tension of the close call with human tragedy outweighed any thoughts of the environmental effect of the event being witnessed.

Standard Metals Corp. explained the cause of the accident briefly in its Annual Report issued in May 1979:

> Studies of the breakthrough, made on behalf of the Company, have indicated that it was caused by a fault, filled with glacial till and other gangue material, which resulted in substantial amounts of water, mud and debris entering the mine, and blocking entrance through the tunnels.

Indeed, unknown to the miners and geologists, thousands of years before, glaciers had gouged a crack along the weak vein rock that was filled with permafrost sediments. Heat from the mine melted the frozen mud and Lake Emma drained into the stope (R.C. Dwelley, Cripple Creek, Colo., oral commun., 1985). One of the first mine geologists to examine the hole found clear glacial ice embedded in the fault (F.D. Taylor, Silverton, Colo., oral commun., 2003).

The Animas River turned black from the glacial mud and sediment well past Farmington, N. Mex., more than 70 mi downstream (fig. 30). (An analysis of the Lake Emma

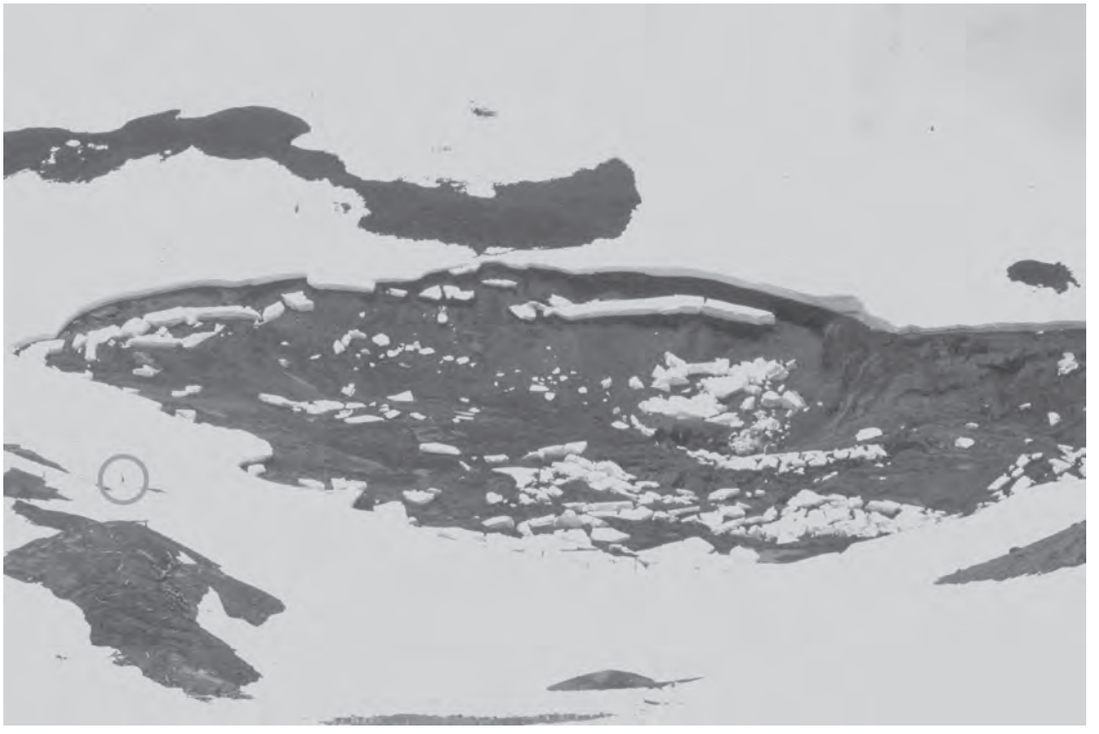


Figure 27. Lake Emma after collapse (photo taken June 11, 1978; note man (circled) in photo for scale). Lake Emma collapsed into the Sunnyside mine (mine # 116) after permafrost filling a fault on the Spur Vein failed from the heat in the mine. The resulting crater is about 300 ft wide, 800 ft long, and as much as 85 ft deep. Glacial mud and debris filled much of the mine. Standard Metals Corp. spent nearly 2 years cleaning and repairing the mine before it went back into production in January 1980.

Figure 28. American tunnel portal (mine # 96) June 5, 1978, the day after the Lake Emma flood. Lake Emma water and mud discharged at the American tunnel portal at Gladstone some 2,000 ft below and 2 miles away from Lake Emma. Black mud was deposited over the dumps and into Cement Creek. Portal buildings are on the site of the Gold King Mill (site # 94, fig. 2). Only one small house remains of the town of Gladstone circa 1903 (fig. 14). Photo taken 22 hours after the event.

sediment discharged is in table 1 of Church, Fey, and Unruh, this volume.) The towns of Durango and Aztec had to shut off intake of water at their pumping plants to prevent the polluted water from entering municipal water systems. Samples taken by health officials in Durango showed levels of 12.6 mg/L zinc and 4 mg/L lead in the water, and warnings were issued not to drink the water (Daily Sentinel, June 11, 1978). At the time of the event, most downstream users and the press thought this contamination was from mill tailings in Lake Emma. This was unlikely because the early Sunnyside mills (sites # 158, 165, fig. 2) were built considerably downstream of Lake Emma. The first Sunnyside Mill (site # 113) was built at or just below the outlet of Lake Emma, which was dammed to provide process water to the mill. Photographic evidence suggests the mill's tailings were probably discharged into Eureka Creek. Part of the B Level waste dump was deposited in the lake and sloughed in further due to the mine collapse. Natural metal content of the lake sediments as well as metals washed from the mine workings probably accounted for the metal loading. Large chunks of ore from the collapsed 2580 stope never made it past the Gladstone portal and were recovered and milled during the 2-year mine clean-up. Little ore was found in the Terry tunnel, the mine's upper entrance (# 120). Instead, these workings were filled with a black sticky mud, similar to that observed in the exposed lake bottom. Considerable mud-laden water also discharged from this portal, though in a less spectacular fashion, and blackened Eureka Gulch and the Animas River between Silverton and Eureka.

Standard Metals Corp. was not fined by any State or Federal agency, and the accident was determined to be an "act of God" in a Federal court action brought by the mine's insurance company, which was trying to avoid paying $9,000,000 in damage claims. Standard Metals Corporation won the suit and recovered $5.5 million dollars. The mine resumed production in January 1980 (Bird, 1986). Water drainage was significantly altered in Sunnyside basin, but was largely mitigated through reclamation efforts by later mine owner, Sunnyside Gold Corp.

Water drainage from long haulage tunnels, such as the American tunnel (site # 96, fig. 1), came under regulatory and environmental scrutiny when water discharges from mine tunnels became closely regulated in the 1970s. Sunnyside Gold Corp. has installed hydraulic seals in the principal access tunnels to eliminate this drainage. These seals are intended to provide a permanent solution to mining's 100-year battle with water and drainage problems, both operational and regulatory.

Figure 29. Erosion trench and muddy discharge at American tunnel portal, June 5, 1978, the day after Lake Emma flood. With 2,000 ft of head pressure, Lake Emma water exited the American tunnel (mine # 96) like a huge fire hose, blowing open the building wall and eroding the dump back about 15 ft, creating an erosion trench. The scene was described by witnesses as something out of a science fiction movie.

Figure 30. Crossing muddy waters of Cement Creek, June 5, 1978, the day after Lake Emma flood. The Lake Emma flood washed out bridges and blackened Cement Creek and the Animas River for a distance of 70 mi south into New Mexico, shutting down municipal water systems along the Animas River.

Conclusions

Historical mining and milling practices in San Juan County impacted the environment in various ways during the 121-year period of active mining. These practices in turn, were influenced by national and international economics, events, industrial policy, public perceptions, and technological trends in the mining industry. Knowledge of these historical practices can assist us in understanding current environmental issues in the Animas River watershed and in developing investigations of specific environmental problems that may be related to historical practices. Mining and milling practices, particularly prior to 1935, tended to release mining wastes directly into the aquatic and riparian environment. The magnitude of these releases was directly proportional to the level of production and number of operating mines and mills. After 1890, technological advances in both mining and milling fostered larger scale production averaging more than 200,000 short tons per year. The majority of this production was milled, and the resultant mill tailings were discharged directly into the watershed until the mid-1930s. Based on reported and estimated mine production during the period 1890–1935, an amount totaling 8.6 million short tons of mill tailings is estimated to have been deposited into the Animas River and various tributaries. This represents 47.5 percent of the total reported and estimated mine production of 18.1 million short tons produced during the 121-year period of production. These mill tailings as well as mine dumps both on the surface and underground

contain varying amounts of metals unrecoverable at the time of their production. Mill tailings entering the watershed often affected downstream water users. After tailings retention in settling ponds became standard practice in the mid-1930s, direct physical contamination of surface waters was nearly eliminated. Accidents and operator error did cause occasional tailings releases.

Mine workings expanded in length, depth, and vertical extent from the beginning of mining in 1871. As tunnels became longer and were constructed at lower elevations, mine drainage locally affected ground-water hydrology and resulted in point source discharges into the watershed. Earlier mining methods left mineralized rock underground in the stopes. Later mining methods tended to extract more of the mineralized material leaving larger voids and less mineralized waste. Fewer surface dumps were created at mine sites when improved flotation milling techniques allowed for nearly all mined material to be economically milled.

Federal Government policies actively encouraged mining until the early 1960s. During wartime direct and indirect financial incentives for increased production and exploration intensified mining activity. Remilling of dumps and stope fills during these and other periods of high prices removed some mined material from direct contact with ground water at the mine sites and transferred it to tailings repositories. Environmental regulations enacted in the 1970s required mine operators to perform surface reclamation and regulate quality of water discharges from both mines and mills. These regulations increased both current and future costs of mining, which, coupled with decreased metal prices, effectively ended San Juan County mining production in 1991 after 121 years.

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Appendix

Notes on the Table and Chart of Reported and Estimated Mine Production

Statistics on total annual mine production were compiled by the U.S. Geological Survey, U.S. Bureau of Mines, and State agencies from 1885 through the mid 1970s. Data from 1871 to 1900 are recorded in Henderson (1926) but as annual dollar value of ores produced, not tons. For purposes of constructing figure 3, the tonnage through 1889 is estimated by assuming an average value per short ton. For 1890–1900, actual average ore values per short ton for 1901 are used to back-calculate the tonnage from the dollar figures. For 1901–1923, production data cited are from Henderson (1926). For 1924–1977, production data are from the annual Mineral Resources of the United States, later called the Mineral Yearbooks of the U.S. Bureau of Mines. However, 1972 and 1976 are Sunnyside production only from company data. For 1978–1991, production data are for the Sunnyside only, based on data furnished by Sunnyside Gold Corporation and Standard Metals Corporation annual reports; the exception is 1986, which is from U.S. Bureau of Mines (USBM, 1986). An estimate of 20,000 short tons milled by three operators at the Pride of the West Mill [# 4] during 1979–1981 is not included in the totals, because supporting data are lacking. Metals prices were reported by U.S. Bureau of Mines through 1958, except that data from 1924–1931 are from the Colorado Yearbook (1932). Metals prices after 1958 are from U.S. Geological Survey (1999).

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Photographs in this report constitute an important source of historical information on past mining and milling practices. They come from a variety of published and unpublished archival sources in San Juan County, principally the Archive maintained by the San Juan County Historical Society in Silverton.

Charles A. Chase, General Manager of the Shenandoah-Dives mine, took numerous detailed photographs of that operation, copies of which were donated to the Society archives by his son, Charles H. Chase, of Tucson, Ariz., who was superintendent of the Mayflower Mill 1945–1948. The early halftone photographs come from special 1904 and 1907 illustrated editions of Silverton's pioneer newspapers, the Silverton Standard and Silverton Weekly Miner, author's collection. Color photos of the Lake Emma flood were taken by the author.

Photo credits:

Silverton Standard—Illustrated Folio 1904: Figures 4, 5, 10, 15.

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Charles A. Chase Collection, Courtesy of the San Juan County Historical Society: Figures 6, 8, 17, 18, 21, 24, 25, 26.

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San Juan County Historical Society (SJCHS) Collection, photographer unknown: Figure 19; Herbert H. Mellus Photo Fig. 23.

William R. Jones Photo: Figures 16, 20, 22, 27, 28, 29, 30.

David L. Fey Photo: Figure 11.

INVENTORY OF MILLS AND TAILINGS IN THE UPPER ANIMAS RIVER WATERSHED: LOCATIONS, PHOTOGRAPHS, AND INFLUENCE

by

J. Thomas Nash

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INTRODUCTION

Mill tailings are a potentially important source of acid and metals in watersheds because these materials are finely ground, are commonly permeable, minerals in them are reactive, and typically are placed in or near wetlands and (Plumlee, 1999). Because basic information on the status and location of mills and their tailings is sparse in published literature and nearly absent in electronic databases, an effort was made to locate them in the Animas River watershed. The information in this report is neither complete nor quantitative, but should be useful to persons concerned with the influence of historic mining on the Animas River watershed.

Some definitions are needed. A mill is a structure where ore is processed to concentrate minerals and metals of economic value. Included in the processing are numerous stages and appropriate equipment for grinding the ore and separating minerals or metals by physical or chemical methods. Physical methods generally are based on a physical property such as density or magnetic susceptibility, and in the study area typically included jig tables to recover heavy minerals like gold or galena. Chemical methods require that the ore minerals be dissolved, and this generally involves the use of cyanide. There also are chemical-physical processes that do not dissolve the minerals but utilize chemicals to do the work, including amalgamation (mercury is used to collect gold on its surface) and floatation (soapy reagents are used to pick up minerals according to special surface properties).

Tailings are here defined as the refuse after mill processing of *ground* ore (Thrush, 1968). The term ‘tailings’ is used by geologists and engineers in many other ways to connote the leavings or low-value materials from mining, but here is the key distinction is the ground condition: these materials are typically fine sand size, but can be coarser than beach sand in some early stamp mills, and can include finer material of clay size that some call ‘slimes’. The porosity of tailings is highly variable, depending on the ore mineralogy, processing, and placement of tailings. Some are highly permeably like clean beach sand, but others can be nearly impermeable because of clays, and not uncommonly the porosity is variable from layer to layer. Because most mills process the ground rock with water, the tailings leaving a mill are a viscous fluid like wet concrete in a cement mixer and can be poured, pumped through a pipe, or run through a sluice. It is much cheaper to process wet tailings downward, thus tailings are almost always topographically below the mill structure and in some places are carried in pipes or sluices for thousands of feet to an impound or ‘pond.’ The pond allows the tailings to settle and the water to be collected and commonly recycled. Impounded tailings are generally damp, compact, and quite cohesive. The cohesiveness of old tailings is a significant issue because they tend to appear to be strong, but in practice are susceptible to wind and

stream erosion or even catastrophic failure by liquifaction (when the 'solids' become a viscous liquid and flow like pancake batter).

Tailings tend to be placed on mill patents (private property with use justified for this purpose and larger in size than a mine patent), but in places tailings may be placed on public lands adjacent to the mill patent. The land status of mills and patents in the study area is not well known to the author, and the likelihood of their being on private property has restricted the kinds of observations and sampling that could be done. Most of the sites described here were observed from a distance on public thoroughfares. This restriction limited my ability to identify and characterize mill tailings, which can be difficult to recognize through willows and other riparian vegetation. Locations given in Table 1 are not highly precise as they were measured by standard GPS, extrapolated to the estimated site that could not be visited, and for some localities measured from 1:24,000 scale topographic maps. Chemistry and reactivity of these tailings is discussed elsewhere (Nash, 1999).

Smelters can be sources of contamination, especially from thick and noxious fumes (Nash and others, 1996), but the slag at three smelter sites in this area probably is not a significant problem. Leach tests on slag from this area suggest that very little is soluble (Nash, 1999). However, these and other slags contain several percent lead, copper, zinc, and other base metals which can be mobilized by gastric juices if the slag is ingested. Thus, the slag at the three sites appears to pose little threat to water, but should not be handled or eaten by humans or wildlife.

BRIEF INTRODUCTION TO MILLING IN THE AREA

Changes in mining and milling technology over the years have had important influences on the materials left behind in the mines or placed on dumps and tailings piles. In this region at least four stages of technology can be described:

1). Early stage (1875-1890) small-volume mining of high grade ores: because the associated milling and transportation infrastructure at this time was poorly developed, the ores often were hand sorted to create extremely rich material for direct shipping to smelters. Local smelters were built by several entrepreneurs to treat specific kinds of local ores from the Red Mountain district pipe mines or the more typical vein deposits, but the high lead content defied the crude technology of the time and all failed with little production. Hand sorted ores were carried by mules, or wagons, on crude roads and, after 1882, by trains to efficient smelters in Durango, Denver, and Pueblo. Many of the mills in this era utilized water power. This stage of mining has left a relatively low impact on the environment today because most of the milling and smelting was done elsewhere and not much mineralized waste rock was brought out onto dumps. The mills that operated in this early stage, as in Little Giant Basin and Arrastra Creek, were small stamp mills that were not very efficient at removing much other than gold, and the tailings were discarded in any convenient manner, often directly into streams. Very little remains near these mill sites today. In about 1890 methods were changing, but the price of silver was dropping and this hurt efforts to create better infrastructure.

2). Middle stage (1890 to about 1918), medium-volume mining with larger stamp mills: the mines that survived the silver crash of the mid-1890's or reopened later tended

to be larger and deeper, and often utilized trams to carry ore to protected millsites below treeline. The chief incentive was to locate mills at sites distant from avalanches to minimize risk of injury and damages. Mills were enlarged to 150 and even 350 tons per day capacity (Ransome, 1901; Henderson, 1926); the larger mill throughput obviously created more tailings and there often was little space for the tailings. Electric power was available at some sites, but many mines utilized steam to power their equipment. The mills of this era tended to be down in the main valleys, and most were close to the railroad that ran up the Upper Animas River. Most of the tailings from this period can not be found near the mills and it must be presumed that either they were piped into the creeks, or that the impounds were inadequate to survive floods such as the ones that occurred in 1911 and 1928 (Follansbee and Sawyer, 1948).

3). Late-middle stage (1918 to 1935), flotation mills introduced: infrastructure did not change much, but new technology called 'selective floatation' permitted mills to concentrate sphalerite for profit (earlier zinc drew a penalty), and also other sulfide minerals such as galena and chalcopyrite in separate fractions for higher value when shipped to smelters for refining. This new technology permitted the mining of 'low grade' ores of the type in the Sunnyside mine (Burbank and Luedke, 1968; 1969), and the rate of mining increased accordingly. Use of electricity was now the norm for increasingly large-scale mining. The change in style was first made at the Sunnyside mine and the associated new mill built at Eureka in 1917. In this stage mine tunnels reached many miles in length (some crossing under natural drainage divides), numerous tramways carried ores to centralized mills, and large mine dumps and mill tailings piles were created.

4). Modern regulated stage (1935-1990), controls on tailings: tailings technology changed in 1935 when regulations required that mill tailings be confined to tailings ponds rather than allowed to go into surface streams. An Executive order imposed this regulation to improve the quality of water in streams. The Shenandoah-Dives (Mayflower) mill was a leader in the development of methods to collect tailings, and to separate and recirculate mill water from tailings ponds back to the mills. This is explained well on displays at the tourist stop southeast of the Mayflower mill, created by the Sunnyside Mining Corp. in about 1995. A smaller number of mills operated in this period, the largest by far was the Mayflower mill that processed ore from mines run by the company (first the Shenandoah-Dives complex to the east, then the Sunnyside mine complex to the west), as well as from numerous smaller mining operations on a 'custom' basis. The tailings from some of the mills at this stage created very large, multi-million ton impounds such as at the Mayflower mill and at the Idarado mill in the Red Mountain District. These have been physically stable, with no evidence of significant failure in the Silverton area, but there have been concerns over chemical processes operating in the tailings to leach and mobilize metals into groundwater, which have been addressed by reclamation work in the 1990's. I lack information on the age of many of these impounds and the behavior of the tailings after placement because all are on private property and little is recorded in the literature.

INVENTORY OF MILLS AND TAILINGS

An inventory of mills, or mill sites, and associated tailings because the published literature and electronic databases have incomplete records. Electronic databases, such as those maintained by the USGS and by the former US Bureau of Mines (MAS/MILS) contain reports on less than ten percent of the mills and even less information on tailings.

Tailings are considered to be the important environmental feature because the materials most typically were placed in or close to streams and wetlands. Locating mills in the field often is a first step toward identifying their tailings, or lack thereof. Some of the mills were described in reports (Ransome, 1901; Henderson, 1926; King and Allsman, 1950), most of which I could confirm in the field. A few mills could be identified on topographic maps, and then checked in the field. Some tailings impounds are large enough to be shown on topographic or geologic maps, a great help, but not always reliable because many maps use the same label for mine dumps and placer mine spoil. Information for 51 mill and 23 tailing sites, and 3 smelter sites is given in table 1, and the locations are shown on Figure 2. The number of mills may seem high for such a small area, but really is a minimum estimated because I surely have missed some sites that were burned beyond recognition or which were rebuilt. The number of tailings sites that I list is an even lower estimate of the number originally present because many of the older mills have no visible preserved tailings to report. The volume of tailings that were placed directly into streams or eroded during storm events is difficult to quantify but is one of the most important implications of this study.

PHOTO TOUR OF MILLS AND TAILINGS

Color photos, in digital format, are included to help understand the mills and tailings and the wide disparity in their size and present condition. Most of the structures have collapsed over the years, and many are burned or rotted beyond restoration. Some may question the identification of structures as mills, and I would agree that some could be another variety of mining-related building. However, for more than 90 percent of mills, the multiple-level design (to facilitate gravity feed of materials) is diagnostic. The 75 photos are explained briefly and the user can 'click' on buttons to view the picture using Adobe Acrobat Reader, which is widely distributed as free software.

DISCUSSION OF TAILINGS AND THEIR SIGNIFICANCE

Tailings are a significant legacy of mining. The volume of fine sands produced during milling is proportional to the amount of ore produced, and typically much more abundant than the ore sent away to be refined: from a ton of ore mined, tails commonly are more than 80 percent, to as much as 99 percent, or more than 1,600 pounds per ton.

The total amount of tailings created in the watershed in 125 years of mining is on the order of 16-18 million tons if one extrapolates from the figures for 1873 to 1964 (Burbank and Luedke, 1964). Of this about 12 million tons is reasonably accounted for, mostly in the Mayflower mill impounds (the Sunnyside Mining Co. display near the Mayflower mill states that this mill produced 10 million tons of tailings, most of which appear to be in place). We can make some estimates for time periods:

a). early years: production from 1873-1890 was roughly 150,000 to 190,000 short tons (Henderson, 1926); possibly 10 percent of this is in place near those old mills.

b). middle years: production from 1890-1918 was about 2.5 million short tons; possibly 10 to 20% of these tailings are in place.

c). late-middle years: production from 1918 to 1935 was about 1.5 million short tons; possibly 20 % of these tailings are in place;

d). Modern regulated era: production after the 1935 order was about 10 to 12 million tons; most of these tailings are in place.

These estimates are not precise but are sufficient to suggest that about 3 to 5 million tons of tailings are not accounted for—washed down the minor and major streams. This is qualitatively supported by studies of stream alluvium, and especially sandbar and overbank deposits that visibly display layers of tailings. Detailed studies of alluvium stratigraphy (Vincent and others, 1999) and stream-sediment geochemistry (Church and others, 1997) provide more facts. The scope of this problem is large and quantification is difficult.

This study documents what many specialists know, but is inadequately reported in the literature:

- Tailings typically are placed within 200 yards of streams, and often are in floodplains.

- Some impounds were breached during severe storms, but the evidence is mostly downstream in overbank deposits. In contrast, in other areas such as Nevada, one can see partial remains of breached impounds and track the fluvial tailings down arroyos for 2 to 10 miles.

- The majority of mills were in the Upper Animas River watershed, and these probably produced 80 percent of the tailings by tonnage. Mills in the Mineral Creek watershed had the smallest amount of tailings, possibly about 5 percent of the total. Cement Creek watershed had several large mills, and possibly 10-15 percent of total tailings tonnage.

- The tailings that have been lost to stream drainages are effectively part of the geochemical baseline for the area, similar to clasts of mineralized rocks. The tailings on sandbars, overbank deposits, or mixed in with bed sediments, are very difficult to remove because restoration activities would damage habitat and these activities are very expensive.

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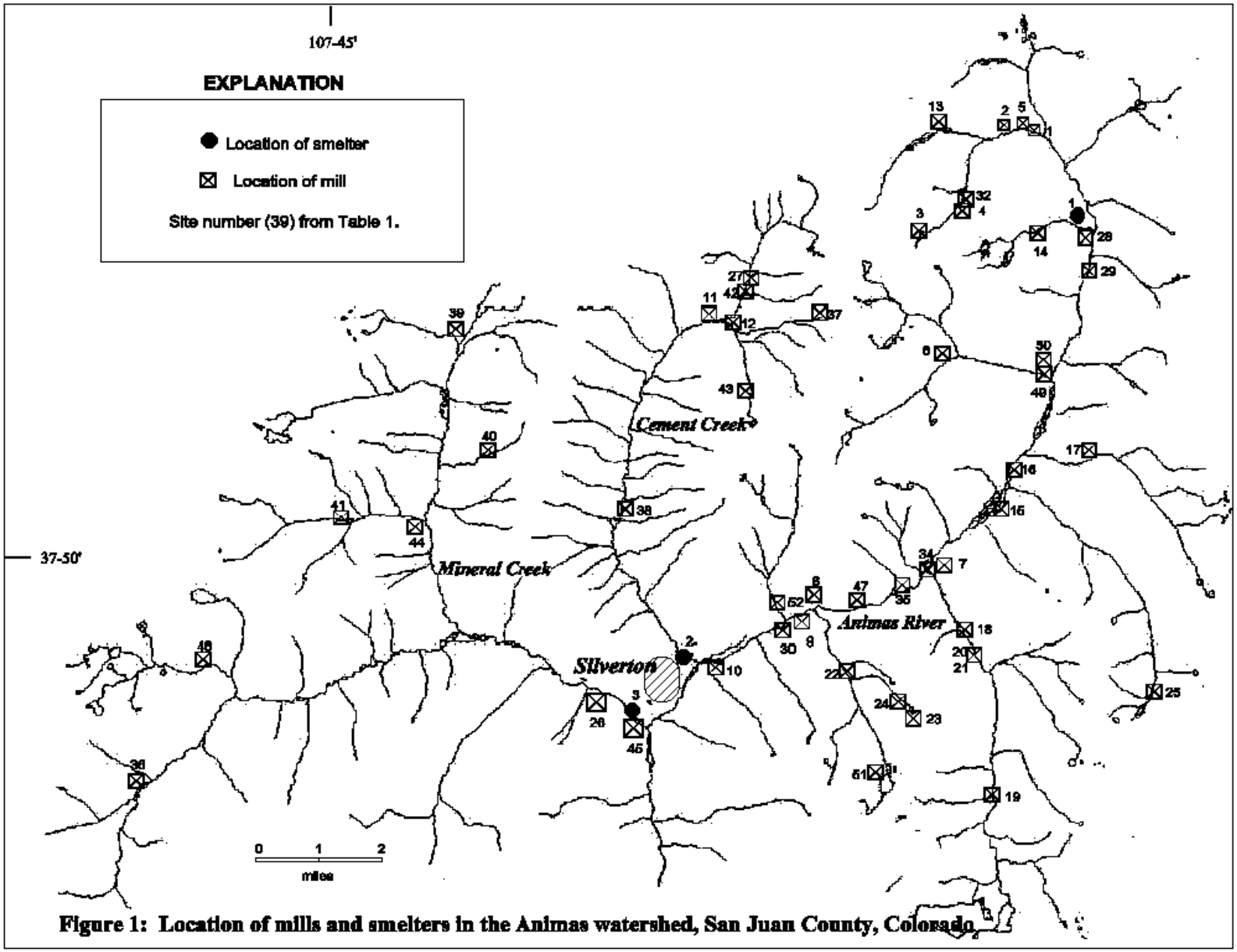

Figure 1: Location of mills and smelters in the Animas watershed, San Juan County, Colorado.

Table 1: Location and description of mills and tailings in Upper Animas River watershed, Colorado

Site-ID	Map	Name	Ndd	Wdd	MILL	TAILS	COMMENTS
SMELTERS							
NAG170	1	Eclipse smelter	37.9178	107.5592	Y	S	ECLIPSE SMELTER C. 1880, SMALL VOL OF SLAG NEXT TO ANIMAS R
NAG171	2	Greene(?) smelter	37.8200	107.6628	Y	S	SMELTER CEMENT CRK MOUTH; MOD VOL SLAG C. 1890
NAG299	3	Walshe/S. Silverton	37.8078	107.6750	Y?	S	SILVERTON SMELTER, 1 MI WEST; FAIRLY LARGE
MILLS							
NAM103	1	Gold Prince	37.9300	107.5689	Y	N	BIG MILL, TRAMMED ORE FROM GOLD PRINCE; NO TAILS EVIDENT, 30 JIG TABLES
NAM104	2	Bagley	37.9325	107.5783	Y	SM	WOOD MILL, BAGLEY, SMALL TAILS to east
NAM105	3	Mastodon	37.9100	107.5992	Y	SM	SM STAMP MILL, STONE FOUNDATION, TAILS IN CREEK
NAM107	4	Hanson	37.9117	107.5944	Y	SM	SM STAMP MILL, SM TAILS, restored, excellent condition
NAM109	5	Columbus	37.9322	107.5708	Y	NX	SM STAMP MILL EARLY ANIMAS FKS
NAM111	6	Eureka Gulch (Sunnyside)	37.8831	107.5919	Y	NX	MD MILL EUREKA GULCH, SUNNYSIDE EARLY; NO TAILS FOUND
NAM112	7	Pride of the West Mill	37.8394	107.5917	Y	MD	PRIDE OF WEST MILL, HOWRDSVILLE; MED TAILS CONTAINED
NAM113	8	Mayflower mill	37.8283	107.6292	Y	LG	MAYFLOWER BIG MILL HUGE TAILS IMPOUND INTACT
NAM114	9	Silver Lake mill	37.8278	107.6272	Y	NX	BIG CEMENT FOUNDATION,EAST OF MAYFLOWER MILL; NO TAILS
NAM115	10	Lackawanna mill	37.8144	107.6522	Y	SM	LACKAWANNA MILL AND TAILS BELOW
NAM116	11	Mogul-Gold king	37.8908	107.6525	Y	NX	GLADSTONE BIG CEMENT MILL; NO TAILS
NAM117	12	Lead Carbonate New	37.8917	107.6500	Y	N	LEAD CARBONATE MILL PER TOPO; TAILS GONE?
NAM121	13	Vermillion	37.9339	107.5978	Y	SX	CONCRETE REMAINS BELOW DUMP, TAILS S OF ROAD
NAM164	14	Treasure Mtn	37.9142	107.5694	Y	NX	TREASURE MTN MINE AND MILL; COULD FIND NO TAILS IN PICAYUNE GULCH
NAM229	15	Hamlet mill	37.8519	107.5747	Y	NX	CONCRETE AND WOOD, 1 MI N OF HOWDSVL; NO TAILS
NAM230	6	Kitti-Mac mill new	37.8606	107.5706	Y	MD	KITTI-MAC TRAM MILL; TAILS TO SW NAT 101
NAM234	17	Kitti-Mac mill old	37.8622	107.5533	Y	NX	EARLIER KIT-MAC MILL IN MINNIE GULCH; NO TAILS
NAM252	18	Old Hundred	37.8222	107.5861	Y	NX	OLD HUNDRED MILL; TAILS SMALL AS OBSERVABLE
NAM257	19	Highland Mary	37.7878	107.5778	Y	MD	HIGHLAND MARY MILL, STONE FOUNDATION ONLY
NAM268	20	Buffalo Boy(?)	37.8181	107.5819	Y	NX	CONCRETE STRUCTURE ACROSS RD FROM TRAM BUILDING
NAM269	21	Buffalo Boy	37.8197	107.5825	Y	NX	STONE FOUNDATION, BEAMSN STEEL, W OF BUFFALO BOY MINE/TRAM
NAM279	22	Iowa Mill	37.8125	107.6169	Y	NX	CRUDE FOUNDATION, METAL PARTS; TAILS START 100 M TO WEST
NAM291	23	Little Giant, old	37.8042	107.5986	Y	SM	CRUDE FOUNDATION, GRIND WHEELS, TAILS; OLD STAMP MILL
NAM292	24	Little Giant	37.8086	107.6022	Y	SM	LITTLE GIANT STAMP MILL, EXC. PRESERV., STAMPS GONE, SM VOL TAILS BELOW
NAM299	25	Minnie Gulch	37.8133	107.5361	Y	NX	10 STAMP MILL IN GREAT SHAPE; NO TAILS--GONE IN MINNIE CREEK?
NAM302	26	Northstar	37.8069	107.6797	Y	NX	NORTHSTAR MILL, SOME TAILS POSSIBLY ALONG MINERAL CREEK
NAM330	27	Red and Bonita	37.8978	107.6447	Y	NX	RED AND BONITA MILL, VERY FEW TAILS on fericrete terrace
NAM354	28	Burns/Narrows mill	37.9106	107.5561	Y	N	SMALL STONE FOUNDATION, UPPER ANIMAS, ZERO TAILS
NAM356	29	Silver Wing	37.9033	107.5553	Y	N	SILVER WING MILL, ZERO TAILS
NAM363	30	Aspen mill?	37.8244	107.6328	Y	N	MINIMUM REMAINS, FOUNDATION, SMALL MILL ONE LEVEL? NO TAILS
NAM377	32	Sound Democrat?	37.9125	107.5954	Y?	NX	FOUNDATION AND BOARDS NORTH OF M107, JIG TABLE

NAM388	34	Howardsville Mill	37.8372	107.5444	Y	NX	OLDER MILL, NEW RED ROOF, TRAM TO SE; SMALL TAILS
NAM389	35	S Howardsville	37.8339	107.6006	Y	NX	MINIMUM FOUNDATION, TWO? LEVELS, SOME TAILS
NAM399	36	Bandora	37.7869	107.8006	Y	NX	BANDORA MILL, SM CONCRETE FOUNDATION, NO STEEL, NO TAILS
NAM409	37	Lead Carbonate old	37.8908	107.9664	Y?	SX	OLD LEAD CARBONATE MILL, AT MINE, SMALL TAILS NEARBY
NAM414	38	Yukon mill	37.8494	107.6764	Y?	N	BLUE METAL BUILDING, ON SITE OF OLD MILL?
NAM424	39	Silver Ledge	37.8758	107.7264	Y?	N	MINIMUM REMAINS NEXT TO ORE BIN, CHATTANOOGA
NAM509	40	Brooklyn	37.8603	107.7139	Y	SM	SMALL HANDMADE MILL, 70'S? BROOKLYN
NAM524	41	Ruby Trust	37.8447	107.7519	Y	SM	OLD STAMP MILL WITH JIGG TABLES
NAM529	42	Gold King old	37.8969	107.6447	Y	SM	STONE FOUNDATION, TRAM TO EAST, HIGH SULFIDE TAILS ON SLOPE
NAM552	43	Big Colorado	37.8769	107.6464	Y	SX	MILL BOARDS AND STEEL JUNK BELOW ADIT
NAM600	44	Burro Bridge	37.8511	107.7264	?	SX	BURNED BEAMS FOR STAMP, SOME TAILS AND ORE
NAM602	45	Lodore	37.8017	107.6725	Y	MX	LODORE MILL; SMALL TAILS REMAIN
NAM609	46	Ice Lake	37.8117	107.7822	Y	SX	WOODEN BEAM STANDING, 20 STAMPS, QUITE GOOD CONDITION
NAM618	47	Big Giant mill?	37.8294	107.6161	Y	SX	CONCRETE FOUNDATION, STEEL STUFF, AT END OF TRAM TO BIG GIANT MINE
NAM619	48	May not be a mill	37.8269	107.6278	Y	SX	WOOD FLOOR AND BEAMS, AUGER FOR TAILS, SOME TAILS
NAM624	49	Eureka old	37.8803	107.5678	Y	MX	OLD EUREKA MILL, STONE AND WOOD, 50 STAMP?
NAM625	50	Eureka new	37.8808	107.7178	Y	LX	NEW EUREKA MILL, CONCRETE, BURNED, 8-10 LEVELS
NAM641	51	Silver Lake old	37.7916	107.6212	Y	M	LARGE MILL AND TAILS SW OF SILVER LAKE
NAM960	52	Crooke mill	37.8280	107.6350	Y	S?	SITE AS SHOWN BY RANSOME (1901), COVERED BY MAYFLOWER TAILS?

TAILINGS

NAT101	Kitti-Mack new	37.8536	107.5708	Y	MD	OCHER TAILS FROM KITTI-MAC MILL 200 M TO NE
NAT102	Fluvial tails	37.8728	107.5661	Y	LGX	HUGE TAILS IN ANIMAS FROM EUREKA MILL TO NW
NAT113	Mayflower tails	37.8272	107.6484	Y	LG	THREE IMPOUNDS, RECLAIMED, 10 MILLION TONS
NAT127	Hanson? Demo?	37.9175	107.5900	Y	SM	SMALL TAILS IN PLACER GULCH, FROM ?? MILL
NAT234	Kitti-Mac mill old	37.8622	107.5533	Y	NX	SMALL POCKET OF TAILS IN MILL
NAT258	Highland Mary	37.7886	107.5789	Y	MD	HIGHLAND MARY OCHER TAILS; STABLE IMPOUND IS A SURPRISE
NAT270	Old Hundred	37.8244	107.5864	Y	NX	OCHER TAILS FROM OLD HUNDRED MILL; NOT MUCH VOULME HERE
NAT278	Iowa mill, fluvial	37.8156	107.6181	Y?	NX	OCHER TAILS IN ARRASTRA CRK BELOW MAYFLOW MINE
NAT287	Little Giant, old	37.8061	107.5992	Y	SM	CRUDE HEAP LEACH ON TAILS FROM NAM291 STAMP MILL
NAT290	Little Giant, old	37.8050	107.5992	Y	SM	COURSE TAN TAILS IN CREEK BELOW NAM291 STAMP MILL; HI CC-QTZ-GN-CP
NAT292	Little Giant	37.8086	107.6031	Y	SM	SMALL TAILS FROM LITTLE GIANT MILL M292
NAT378	Vermillion	37.9325	107.5961	Y	SM	YEL-OCHER TAILS,CSE, CRUDE IMPOUND
NAT389	Howardsville S	37.8339	107.6006	Y	NX	RUSTY TAILS AT MILL NAM389, MOST IN ANIMAS?
NAT509	Brooklyn	37.8581	107.7111	Y	SM	POND AT BROOKLYN MINE; TAILS STABLE
NAT524	Ruby Trust	37.8442	107.7519	Y	SX	TAILS AT MILL, SLURRY DOWN HILLSIDE?
NAT528	Red and Bonita	37.8978	107.6450	Y	SM	TAN TAILS FROM R&B MILL M330
NAT529	Gold King old	37.8969	107.6450	Y	SM	GRAY HI PYRITE TAILS
NAT600	Burro Bridge	37.8511	107.7264	?	SX	BURRO MILL TAILS IN FOUNDATION, MOST GONE
NAT602	Lodore	37.8022	107.6728	Y	MX	LODORE MILL TAILS BY MINERAL CREEK
NAT609	Ice Lake	37.8119	107.7817	Y	SX	ICE LAKE STAMP MILL TAILS, VARIABLE TAN TO OCHER

NAT622	Lackawanna	37.8147	107.6525	Y	M	LACKAWANNA MILL OCHER TAILS
NAT628	Fluvial tails	37.9208	107.5597	?	?	FLUVIAL TAILS, ONE MI S OF ANIMAS FORKS
NAT706	Bagley	37.9328	107.5789	Y	MX	BAGLEY MILL TAILS, RUSTY OCHER, SMALL IMPOUND, OTHERS LOST?

Abbreviations: Mill: Y, yes, mill probable; N, no, can not find; ? Questionable;
Tailings Size: LG, large; M, medium, S, small; X, tailings lost.

INVENTORY OF MILLS AND TAILINGS IN THE UPPER ANIMAS RIVER WATERSHED: LOCATIONS, PHOTOGRAPHS, AND INFLUENCE

J. Thomas Nash
U.S. Geological Survey

Photo Tour of Mill Sites and Tailings

Photos of mills and tailings are arranged by watershed, and listed in alphabetic sequence by site name. Click on the raised rectangle to view the photo.

[Explanations: 1) Site names used here are informal and may be incorrect; some are taken from nearby geographic features. 2). Sites are coded, such as NAM104, and refer to Nash field observations which are summarized in table 1 of text; in these codes N means Nash observation; A, Animas project area; M, mill; T, tailings. 3) the second number is the digital photo code, a unique number assigned to each digital file by the camera or when scanned, with SPM or SPT, etc. added to denote mill or tailings in the Silverton area.]

UPPER ANIMAS RIVER WATERSHED

Aspen (?) mill: The faint remains shown here may be those of a mill, located in the canyon of the Animas River, about a half mile east of the Mayflower mill; it is on the old road to the Aspen mine. No tailings are evident. [NAM363, SPM423]

Bagley mill: this well preserved structure in California Gulch is at the portal of a tunnel that head northwest under Houghton Mountain to mine large veins [NAM104; SPM312]

Bagley mill tailings: this small impound of ocher tailings is a few hundred feet east of the mill, and other tailings likely were lost downslope into California Gulch creek [NAT104; SPT229]

Big Giant mill: this site on the old railroad and close to the Animas River, is at the end of a tram from the Big Giant mine. A rough foundation and some metal are all that are visible, and no tailings could be identified. Alternatively, this site could have been used to load ore on rail cars. [NAM621, SPM425]

Buffalo Boy mill: this stone foundation in Cunningham Gulch appears to be the mill that processed ore carried by the tram to the Buffalo Boy mine to the northeast. No tailings are evident. [NAM269; SPM164]

Burns mill: this obscure structure in the narrows of the Upper Animas, about 2 miles south of Animas Forks is given the name Burns for the gulch to the east of it. The structure contains several strong stands for heavy equipment and has the general appearance of a small mill. No traces of tailings were found. [NAM354, SPM203]

Columbus mill: this small mill served the Columbus mine just above it; a few tons of tailings are preserved on the south side of California Gulch creek about 200 yards away. [NAM715; SPM225]

Eclipse smelter: this early smelter is near Animas River, about 2 miles south of Animas Forks; about a ton of slag remains [NAG170; SPG205]

Eureka gulch mill: this mill processed ore trammed from the Sunnyside mine through about 1910; only traces of tailings can be found [NAM111; SPM267]

Gold Prince mill: this very large mill at Animas Forks was designed to process ore trammed several miles from the Gold Prince mine; equipment such as jig tables can be found, but not even a trace of tailings could be identified, probably because the mill did not process much if any ore and was dismantled a few years later, in 1915 [NAM103; SPM224]

Hamlet mill: this small stamp mill processed ore carried by tram and tunnel from the Hamlet mine to the southeast; the mill is about 300 yards south of Maggie Gulch (Middleton), just east of the road to Animas Forks. No tailings could be identified in the meadow and floodplain to the west. [NAM600, SPM245]

Hanson or Sound Democrat: this stamp mill in Placer Gulch has been restored and shows very well the layout of stamps that ground ore and jig tables that were used to concentrate gold and other ore minerals. I believe some reports use the name Hanson for this site, but others call it Sound Democrat. A small area of tailings is to the north, but most tailings probably went down the creek. [NAM121; SPM238]

Hanson mill tailings: this small area of tailings adjacent to Placer Gulch is about 200 yards north of the Hanson mill and probably are only part of the tailings produced by that stamp mill. [NAT121; SP4D15]

Highland Mary mill: this mill at the east end of Cunningham Gulch has burned and very little remains of the plant that operated in the 1950's. A medium-sized impound of tailings is to the west. [NAM257; SPM165]

Highland Mary tailings: these light-colored tailings are quite stable, but close to Cunningham Gulch creek. These tailings are unique in the study area for their content of calcite and because of this pose only minor problems to the creek. [NAT258; SPT167]

Howardsville mill: This mill, recently refurbished with the red metal roof, processed ore trammed from the southeast. This mill and its tailings are southwest of the larger tailings impound for the Pride of the West mill at Howardsville. [NAM388; SPM270]

Howardsville south mill: not much is left of this structure but some bricks, concrete foundations on one or two levels, and a few tons of tailings. This site is on the west side of the Animas River, next to the old railroad, about a half mile south of Howardsville. [NAM389; SPM157]

Iowa mill site ruins: apparently a pre-1900 mill with stone foundation, may be called Iowa mill, served by tram [NAM888; SPM441]

Iowa mill tailings in stream: fluvial tailings trapped in willows about ¼ mile west of mill [NAT278;SPT444]

Kitti-Mack mill tailings: these yellowish tailings are prominent between the road to Animas Forks and the river; this is the largest impound of un-reclaimed tailings in the area. [NAT101, SPT 248]

Kitti-Mack mill: the tumbled remains of this mill are prominent just east of the Animas road, about 300 yards north of Maggie Gulch (Middleton); ore was trammed from the mine several miles to the northeast [NAM101; SPM251]

Lackawanna mill and tailings: this mill and tailings are adjacent to the Animas River on the northeastern edge of Silverton; The mill is on a mill patent but the tailings are on BLM lands and are a prime concern because they are in the floodplain of the Animas River. [NAM115; SPMMT356]

Little Giant mill: this stamp mill is west of Little Giant Lake and served several mines in that basin by short trams. Longer trams later carried ores to a newer mill on the Animas River and railroad. A small amount of tailings remain in the canyon bottom. [NAM292; SSP37]

Little Giant original mill, Little Giant basin: this rough stone foundation seems to be from a very early stamp mill; a few pieces of heavy steel equipment used for grinding ore remains at the site, and tailings can be found in the stream at the inlet to Little Giant Lake. [NAM270, SPM429]

Little Giant mill tailings: the stamp mill tailings are below the mill in the creek that flows into Little Giant lake. The tailings were reprocessed in recent years. [NAT270; SPT436]

Little Giant mill tailings, reprocessed: the stamp mill tailings were placed on a plastic sheet and efforts were made to leach silver and gold from them. Note the proximity to the alpine lake. [NAT270; SPT431]

Mastodon mill near Gold Prince mine: this stamp mill may be the one called ‘Mastodon’ in the literature and could have processed ore from either the nearby Gold Prince or Silver Queen mines; tailings were placed in the headwaters of Placer Gulch creek—many could have been lost, and those remaining have been reclaimed [NAM376; SPM236]

Mayflower mill: this is the largest mill in the area, and also the one that operated most recently and consistently from the 1935 through 1991. It originally worked ore trammed down from the Shenandoah-Dives mine about three miles to the east, and for many years worked on ore hauled by truck from the Sunnyside mine at Gladstone. The tailings were among the first to be impounded in the 1930’s in engineered ponds that minimized input of solids into the Animas River and recycled water back to the mill. More than 10 million tons of tailings were stacked on a series of three ponds, which were reclaimed in 1997. [NAM113;SPM156]

Minnie Gulch stamp mill: this ten stamp mill at the southern end of Minnie Gulch is remarkable for its remote location and preserved heavy equipment, but little remains of the building. No traces of tailings could be found. [NAM299, SSP38]

New Eureka mill: this large concrete mill was built in 1915, adjacent to the smaller mill at Eureka, to serve the Sunnyside mine. New selective floatation equipment in this mill allowed economic recovery of zinc (sphalerite) from 'low grade' ores. Tailings from this mill were placed in the floodplain of the Animas River, and major storms in 1928 and other years eroded the tailings and carried them for tens of miles downstream. [NAM625; SPM195]

Old Eureka mill: the original mill at Eureka may have utilized water power. It was replaced by a larger mill in 1915. Tailings were placed on the Animas River floodplain, or run into the river, before there were any regulations against this practice. [NAM624, SPM197]

Old Hundred mill: the concrete foundation below the haulage level appears to be from the mill; a few tons of tailings are below the mill, adjacent to Maggie Creek, and the remains of a wooden trough or sluice angles gently down to the east of the mill and a small amount of tailings were found in willows adjacent to the creek near the projected end of the sluice. [NAM252, SPM473]

Old Kitti-Mack mill: the stone foundation with several levels clearly was an early mill as it is situated in a place that would provide water power; a few hundred pounds of tailings remain in the foundation, but no others could be located. A tram cable may have connected with the mines to the east, including the Kitti-Mac. [NAM234, SPM254]

Pride of the West mill: this fairly modern mill operated after World War II. The tailings are west of the Animas Fork Road. [NAM112;SPM162]

Pride of the West tailings: the large impound formerly extended across the Animas River. These tailings are on the west side of the Animas River. [SPT275]

Silver Lake mill on Silver Lake: this large mine and mill complex at the southwest corner of Silver Lake produced a large volume of dump waste and mill tailings that were poured out between the mill buildings and into the lake. Much of the milling equipment, such as stamps, jig tables, and amalgamation rollers can be seen. This mill operated from about 1890 to 1900. [NAM641; SPT10]

Silver Lake mill: this very large mill on the Animas, and on the railroad, processed ore trammed from Silver Lake. It was built in 1899. No tailings are evident. [NAM114, SPM447]

Silver Ledge mill: A mill for the Silver Ledge mine is reported in several publications and operated from about 1900 to 1920. The traces shown here may be for that mill, and no other site is likely. No tailings could be found. Another mill in this vicinity is reported in literature to have operated in the 1890's, but could not be located on the field. [NAM424; SPM474]

Silver Wing mine and mill: this mine and mill complex was designed to produce ore from the Tom Moore mine area to the east in Burns Gulch by way of a deep tunnel. The stone foundation of a mill is below the dumps, and no tailings could be located. If the mill was a significant producer, the

tailings went into Animas River, but the mill may have been one of the numerous speculative ventures in the region that never reached their target. The mill and tunnel existed in 1899 but the ore target had not been reached (Ransome, 1901). [NAM356; SPM313]

Treasure Mountain mill: this fairly modern (1940's?) mill was part of a mining venture that appears to have failed to reach its target deep under Treasure Mountain. The mine may also go by the names Picayune Gulch and Sandiago. The mine dump is fairly large (but lean of ore) and no trace of tailings could be found. [NAM164; SPM305]

Vermilion mill: only a small amount of concrete remains of a mill adjacent to the Vermilion tunnel and its waste dump. A few tons of tailings are on the slope below the mill (between the California Gulch Road and the creek). This mill probably was not a big producer. [NAM378, SPM233]

CEMENT CREEK WATERSHED

Big Colorado mine and mill: the mining complex on the South Fork of Cement Creek had a stamp mill close to the main tunnel. Timbers and assorted steel equipment lie in the ruins. Only traces of tailings could be identified. [NAM552; SPM14]

Gladstone mill (Mogul, Gold King): this large cement foundation at Gladstone was connected by trams that went north to the Mogul mine and southwest up Prospect Gulch, and also served the Gold King by a tram to the east. No tailings could be identified, but could be present in the wetlands to the east (and possibly reclaimed in recent years). This mill did not service the Sunnyside mine, although the American Tunnel to the Sunnyside was later constructed a short distance to the northeast. [NAM116; SPM301]

Gold King mill: this site is to the right of the Red and Bonita mine and mill, at the edge of the trees. It appears to be an early stamp mill which processed ore trammed down from the Gold King mine to the east. Tram cables, some metal parts, and traces of tailings can be identified. Later, the Gold King ore was trammed to the large mill at Gladstone. [NAM529; SPM299]

Greene smelter: the site of this smelter, a fairly productive one in the 1890's, reveals no remains of the structure, but a substantial amount of slag is spread across several acres, much of it crushed to sand size for some unknown application.[NAG177, SPG150]

Lead Carbonate new mill: a new mill for the Lead Carbonate mine was built at Gladstone in the 1940s. Tailings could not be identified, but could be in the valley (wetlands) to the south, and may have been reclaimed in the mid-90's. [NAM117; no photo available]

Lead Carbonate original mill: this mill at the mine site was beset by avalanche problems and apparently did not operate for many years. A few tons of tailings are in the valley to the southwest. [NAM409; no photo available]

Red and Bonita mine, mill and ferricrete: a few charred beams, some steel pieces, and a few tons of tailings are the scant remains of a mill below the Red and Bonita mine. Another mill, possibly

earlier, was a few hundred feet to the southeast (right in picture), but it seems to have worked ore from the Gold King mine as tram cables on the ground head east from that mill site. [NAM330, SPM299]

Yukon mill tailings pond: this series of two ponds collected tailings from the Yukon mill, and also serves as a settling pond for runoff. It collects and contributes to acidic, metal-rich drainage. [NAT414, SPT418]

Yukon mill: the Yukon mine was a bold mining venture with a tunnel deep under Storm Peak, and active enough to produce a large volume of mine waste after WWII. The mill is a fairy modern one, but the small amount of tailings retained to the west suggest that the mill was not a big producer. [NAM414; SPM422]

MINERAL CREEK WATERSHED

Bandora mill: this concrete foundation has the multiple levels typical of a mill; only traces of tailings were found, suggesting that this 1940's era mill did not operate much if at all [NAM401; SPM458]

Burrow bridge mill: these burned beams, some sulfide ore, and traces of tailings are all that remains of this probable mill site downstream from the present Burro Bridge; these vertical beams are of the style used to support stamps in pre-1900 stamp mills [NAM603; SPM352]

Brooklyn mill: this small mill appears to have operated in the 1960's and pumped its tailings to small impounds on the east side of Browns Gulch [NAM509; SPM190]

Brookyn mill tailings: these small ponds contain tailings that were pumped across the creek in a plastic pipe. Water in the ponds is mostly runoff and not highly degraded, but the pore water in tailings is acidic and rich in metals (Nash, 1999B). [NAT621; SPT189]

Ice Lake stamp mill: this picturesque mill is a popular stop for hikers on the trail to Ice Lake. The mill probably used water power. A trace of tailings can be found, but most seem to have been washed down the stream. [M609, SPM13]

Lodore mill: the remains of this mill can be seen just south of Silverton, on the south side of Mineral Creek and adjacent to the Lodore mine; a small area of tailings remain on the bank of Mineral Creek . [NAM602;SPM315]

North Star mill: visible from US550 southwest of Silverton, this mill on Mineral Creek processed ores from the large North Star mine. No tailings are visible adjacent to the mill. [NAM302; SPM322]

Ruby Trust mill: these collapsed beams and pieces of steel are from a stamp mill for the Ruby Trust mine, a short distance to the west of the lowest mine level. Two jig tables can be discerned in the ruins, traces of tailings are in the ruins, but no tailings remain below the mill and one must presume that they have been carried down the Middle Fork of Mineral Creek. NAM524; SPM181]

Walshe Smelter: this smelter southwest of Silverton was built in 1894 and ran for about three years. No remains of the structure remain, but slag is abundant (much is finely ground). [NAG299; SPG318]

MISCELLANEOUS FEATURES REALTED TO MILLING:

Grinding devices of several types were used to make the sand-size material for processing in the mills. This set of grinders is in the rehabilitated Hanson mill in Placer Gulch [NAM107; SPM239]

Jig tables were used to concentrate gold and other heavy ore minerals. These table are in the Hanson mill, Placer Gulch. [NAM107; SPM240]

A variety of metal devices is found in some old mills, such as the Silver Lake mill at Silver Lake. The cylindrical devices probably were used in the amalgamation process to recover gold. [NAM 641; SPM11]

Wooden tram tower: towers like this were used to support the long cables (wire rope) used to carry ore down from mines above treeline. This one is part of the tram from the Big Giant mine. [SPM428]

Steel tram tower: the later trams were refined and high above the ground. This is part of the tram from the Shenandoah-Dives mine to the Mayflower mill. [SPM446]

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HOWARDSVILLE QUADRANGLE

COLORADO

7.5 MINUTE SERIES (TOPOGRAPHIC)

SE/4 SILVERTON 15 QUADRANGLE

4459 I NW (IRONTON)

4459 IV NW (REDCLOUD PEAK)

4459 I SW (SILVERTON)

4459 IV SW (POLE CREEK MOUNTAIN)

(SNOWDEN PEAK) 4459 II NW

(STORM KING PEAK) 4459 II NE

4459 III NW (RIO GRANDE PYRAMID)

Mapped, edited, and published by the Geological Survey

Control by USGS

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1951. Field check 1955

Polyconic projection. 1927 North American datum
10,000-foot grid based on Colorado coordinate system, south zone

Land lines are omitted in T. 40 N., T. 41 N., and T. 42 N.-R. 6 W. and R. 7 W. because of insufficient data

All mining features on this map are inactive unless otherwise indicated

Unchecked elevations are shown in brown

1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24000

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION
Light-duty ——— Unimproved dirt - - - - - -
State Route

COLORADO
QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

HOWARDSVILLE, COLO.
SE/4 SILVERTON 15 QUADRANGLE
N3745—W10730/7.5
1955
AMS 4459 I SE—SERIES V877

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MAP ROOM

USGS-00078
p. 1 of 1

DMEA Form 9
Rev. 6/57

UNITED STATES
DEPARTMENT OF THE INTERIOR
Defense Minerals Exploration Administration

OFFICIAL DOCKET FILE Idm-E NO._____ DMEA NO. 4549

Application
- [ ] Denied
- [x] Withdrawn

Contract
- [ ] Terminated - Not Certified
- [ ] Terminated - Certified
- [ ] Cancelled
- [ ] Royalty Agreement

The records contained in this file are marked (x) and arranged in this order:

Folder No. 1:

Left Side

- [ ] Royalty Audits
- [ ] Certification of Discovery
- [ ] Closing Letter
- [ ] Cost Audits
- [ ] Termination Notice or Agreement
- [ ] Recision Notice
- [ ] Assignment of Contract
- [ ] Contract Amendments
- [ ] Contract with all exhibits and annexes
- [ ] Owner's Consent to Lien and Subordination Agreement
- [x] Application and attachments

Right Side

- [ ] Project summary (final)
- [ ] Work Completed analysis (final)

All other material filed in chronological order including the following reports if checked:

- [ ] Field Team Semi-Annual Report for Certified Project
- [ ] Final Field Team Report (Tab)
- [ ] Operator's Final Report (Tab)
- [ ] Interim Field Team Reports
- [ ] Operator's monthly reports and all attachments
- [x] On-site Exam Report (Tab) 10-8-57
- [ ] Settlement Sheets
- [ ] Drill Logs

Additional Folders:

Left Side

Folders No._____: Reports
- [ ] Analysis of Semi-Annual Inspection Reports
- [ ] Project Summary (Interim) by DMEA Engineers

Right Side

- [ ] Field Team Semi-Annual Report for Certified Project
- [ ] Field Team Interim Reports
- [ ] Operator's Monthly Reports with transmittal, narrative and maps.

Folders No._____: Maps (Use pocket folder or envelope)

Folders No._____: Settlement Sheets

Folders No._____: Drill Logs

Folders No._____: Royalty material

17963

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

DMEA
DEPARTMENT OF THE INTERIOR
NOV 19 1956
REGION III
DENVER, COLORADO

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

Not to be filled in by applicant

Docket No. 4549.
Metal or Mineral La. Zinc-Copper
Date Received 11-23-56
Estimated Cost $50,381.22
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Walter W. Bentley, d.b.a. Kittimac Mining Company
P.O. Box 541, Silverton, Colorado
(see attached sheets for detailed answers to Form MF-103)

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract

RECEIVED NOV 23 1956 DMEA

(*b*) State any mine name by which the property is known.

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property.

(*e*) If you own the land, describe any liens or encumbrances on it

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice.

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

16—66551-1

5. *The exploration project.*—(*a*) State the mineral or minerals for which you wish to explore _____

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc.

(*c*) The work will start within _____ days and be completed within _____ months from the date of an exploration project contract.

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations.

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)?

(*b*) How do you propose to furnish your share of the costs?

☒ Money ☐ Use of equipment owned by you ☐ Other

Explain in detail on acompanying paper.

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated Nov. 17, 1956

Walter W. Beardsley
(Applicant)

d.b.a. By: Kittimac Mining Co

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U.S. GOVERNMENT PRINTING OFFICE 16—86551-1

Walter W. Bentley
Silverton, Colorado.

I - Name of applicant:-

(a) Walter W. Bentley, d.b.a. Kittimac Mining Co.
P.O. Box 541, Silverton, Colorado.

(d) If a partnership, add names of all partners:-

O. W. Bentley and Associates, c/o Crown-Willamette Paper Co.
Portland, Oregon.
Negotiations are still pending as to other partners who wish to acquire interests. When any partners are accepted, they will be added to this application by letter amendment.

II -

III - Applicant's property rights

(a) The Kittimac group consists of 84 claims of 10 acres each, two mill sites, and a 76 acre portion of the John H. French placer claim, together with certain water rights, situated in the Eureka Mining District, San Juan County, Colorado.
These are all unpatented claims with the exception of the Forest Queen #6 to #10 inclusive, U. S. Survey #18843, and the portion of John H. French Placer, U. S. Survey #46.
The names and other data are set forth in the attached agreement, marked Exhibit I.

(b) The mine has always been known as the Kittimac.

(c) The applicant has a five year lease with option to purchase, as set forth in the agreement attached, marked Exhibit I.

(e) There are no liens or encumbrances other than those related to the original receivership, as recited in the agreement.

(f) The book and page numbers of recorded locations are set forth in Exhibit I.

(g) The claims of the Kittimac group were located prior to 1901, and the records of the General Land Office show that the most important claims were surveyed for patent and the survey number 14544, was filed in February, 1901 on the group outlined in red on Figure 1.

There are reported to be 9 veins outcropping on this group, and the Caliber vein is reported to have been the original objective of the early work, because of a high

gold content in the outcrop of this vein. There is a report that C. R. Wilfley of the U.S.B.M. cut a sample from this outcrop which ran 1.0 oz. gold and 40.0 oz. silver, but a search of the old files has failed to produce any record to confirm this. The old workings on the Caliber vein consisting of trenches and short tunnels, are now sloughed full of surface debris and are inaccessible.

The old work consists of two tunnels on the Little Joe vein, the upper of which is caved at the portal. The lower tunnel on the Little Joe vein is now retimbered and cleaned up, and was the working level throughout the history of mine. A boarding house, compressor house, and ore house containing bins, crushers, and tramway terminal were constructed at this portal. A 16,000 foot aerial tramway connected this portal with a mill on the edge of the Animas Valley adjacent to the tracks of the Silverton Northern Railway.

After driving approximately 1000 feet on the Little Joe vein toward the Caliber vein, a short cross cut was driven to the left which disclosed a second vein in which very good ore was encountered. Drifts were driven both ways, and at about 150 feet westerly a third vein was found, which was also drifted on in both directions from this point. There was some production from all three veins.

According to Mr. William A. Hay, the local attorney since 1906, who was well acquainted with all the mines and mine operators of the district at the time, the managers of the Kittimac were extravagant and inexperienced, and consequently found themselves in financial difficulties. In about 1916, bonds were floated to raise funds for their operations, and in 1917, full payments not having been made on the bonds, the bondholders had a receiver appointed, and the mine was closed. During World War II the Little Joe tunnel was cleaned out and the then lessee applied for an R.F.C. loan. In connection with this request, the U. S. Bureau of Mines field engineers cut trench samples under the track marked U.S.B.M. #1 to #15, as shown on Fig. 3. In 1946, the American Smelting and Refining Co. became interested in the property, and sent their engineers to examine it. These engineers made the maps attached, Fig. 2, 3 and 4, and cut trench samples under the track, shown on Fig. 3 as A.S.R. #35 to #56, also #60 in the back of the old stope, #48 from a stope pillar, and #41 on the Little Joe vein. Litigation was started against A.S.R.Co. by claim-jumpers, and they dropped the project, for that or other reasons.

During 1948 and 1949, the U. S. Bureau of Mines had a project in San Juan County, Colorado, which included sampling and drilling of potential mineral reserves. Mr. Scott Hance was in charge, and he obtained tracings of the A.S.R.Co. maps, copies of which are attached as Fig. 2, 3 and 4, in connection with a project to drill the Isabella vein from the Kittimac and Caledonian Mines. Apparently funds were not appropriated to continue the program, and the drilling planned, as shown on Fig. 2, was not done.

Walter W. Bentley
Silverton, Colo.

In June, 1956, the applicant obtained a lease and option from the Receiver on the Kittimac mine, and transferred this agreement to a Syndicate organized to re-open the mine. This Syndicate drilled three diamond drill holes as shown on Fig. 5, and based on the results, dropped out. The applicant had no voice in the location of the holes, was not permitted to handle the core in any way, nor permitted to suggest that certain standard methods be employed in recording core recovery. In all three holes, fissures and caved areas were soon encountered, so that there was no sludge recovery from any hole. In no case was core carefully measured as it was removed from the barrel, nor careful measurements made of penetrations in any run, so that exact core recovery can only be estimated. In Hole #1, core recovery was probably as low as 75% for highly mineralized part of the core, and the assay returns of a split of this core are attached as Exhibit II. In Hole #2, core recovery was probably somewhat less. This core was not split nor assayed, and is now in the possession of the applicant. In Hole #3, in at least one 5 foot run, core recovery was 0% and overall probably averaged less than 50%. There was so small an amount of core recovered in the best part of the vein that all the core was required to make a volume sufficient for assay. The results are attached as Exhibit III.

It should be noted that the drilling was planned from the information available on Fig. 5, and that beyond sample #40 on that figure, the workings were inaccessible because of water that filled the drift to the back. After the drilling was finished, it was found that this water had been drained by the drill holes and Fig. 5 was prepared at a later date.

In conclusion, as to the drilling, the applicant is of the opinion that it is not a practical method in this mine. The above program cost in excess of $10 per foot, and if the holes had been properly cased and cemented, if indeed it would have been possible to cement fissures of the magnitude that could drain such a volume of water in a few days, then the costs would have soared to a prohibitive figure, with results probably no more satisfactory than those in the present program. The galena, bornite, chalcopyrite and sphalerite tend to be rather friable in the area of this mine, and may well have been reduced to sludge. Lacking any sludge recovery, and with poor core recovery, the applicant is of the opinion that the drilling neither proved nor disproved anything, other than that other methods are preferrable for exploration of the property.

After the termination of the drilling, the applicant prepared the map attached as Fig. 5, and in October, 1956, obtained a new five year lease and option on the mine.

As to accessibility, referring to Fig. 5, it is now possible to wade with hip boots from the foot of the ladder shown at Point "D" to the faces at "H" and "K" and to the caved stope fill at "K". However, the drifts are filled to knee deep or more with a sludge carried into the mine by surface water entering the mine through a stope which was holed

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to surface in the area between "F" and "G". The sill timber supporting a 80 feet depth of shrink stope ore has failed between "B" and "C", so that the drift has been dammed and the sludge has been collecting for several decades. From "E" to "G" and from "J" to "K", the drifts are timbered and apparently stoped out above, as the material seen between the back lagging appears to be wall rock broken for stope fill in a "cut and fill" stope system. It is too fine to be sorted material.

IV (b)

The past production figures have been copied from U. S. Bureau of Mines records, which show production from 1908 to 1918, inclusive, during 1916 and 1917, and a small tonnage of dump ore during 1944 and 1945. There has been no production since 1948. The record is attached as Exhibit IV. There are no records available as to the efficiency of the Kittimac mill, but it is doubted that the results were better than others in the district at that time, with recoveries ranging from 40% to 60%.

The U. S. Bureau of Mines samples are shown on the attached Exhibit V, and their locations shown on Fig. 5. Samples #375 to #378, taken by the applicant, are shown on the attached Exhibit VI, and their locations are shown on Fig. 5.

With regard to ore reserves, the block from Point "D" to the pillar at "D", Fig. 5, can be classed as "positive" ore to a depth of 25 feet, with an additional 25 feet below that of "probable" ore, and an additional 50 feet of "possible" ore. Using the A.S.&R.Co. samples, as shown on Fig. 5, and dropping #25 and #24 as being an area that would not be stoped, and #35 and #36 as being left in a stope pillar in usual mining practice, there is a net length of 165 feet. This will yield 2454 tons "positive", 2454 tons "probable" ore, and 4908 tons "possible" ore, using a width of 5.9 ft. and a factor of 10 cu. ft. per ton.

For the blocks "E" to "G", and "J" to "K", the lack of samples will not allow for assuming any positive ore, but it should be reasonable to assume from the stoping above a 50 feet depth of probable, and a further 50 feet of possible ore under these stopes. Using a width of 7.0 ft., and length of 280 feet and 40-plus feet, these two blocks would yield 9100 tons "probable", and 9100 tons "possible" ore. To recap, to 100 foot depth below present stopes:

Positive:-	Block G - D,	2454 positive,	2454 probable,	4908 possible
	Block E - G,		9700 "	9700 "
	Block J - K,		1400+ "	1400+ "
		2454 positive,	11854+ probable,	16008+ possible

Using the A.S.&R.Co. samples, and excepting the four as above, yield a weighted average as follows:

Width - 8.9 ft. Au .02 oz., Ag 5.76 oz., Pb 5.73%, Cu 2.68%, Zn 8.11%

Using current prices of Au $35.00, Ag. 90¢, Pb 16¢, Cu 87¢, Zn 10¢ the above ore would have a gross value of $40.00 per ton.

The positive ore figure at this value would yield $113,911.20 gross value, and if the remaining tonnage of probable and possible were of the same tenor, the gross value of the 25,502 tons in them would be $1,193,493.60, or a total gross value of $1,307,404.80.

IV (e)

The country rock in the Kittimac workings is the andesite that is common to the major mines and ore bodies on the South side of the Animas River. It is a favorable host rock for mineral deposition, and the Shenandoah-Dives, Highland Mary, Pride of the West, Buffalo Boy, and other smaller mines have found their principal ore bodies in this rock. It is underlain by the Burns latite, and in general when productive veins enter the latite they are no longer commercial. The andesite is flat lying, with a slight dip to the northeast, and the contact between the andesite and latite is believed to be between 800 and 900 feet below the present Kittimac workings. The workings of the Caledonian, which is the adjoining mine to the northwest, are approximately 300 feet lower than the Kittimac, and are all in andesite.

The vein between "C" and "D", and "E" and "H", Fig. 5, is quartz, with about 5% to 10% iron pyrite, with galena, chalcopyrite, bornite and sphalerite as the ore minerals.

The present program was based on the premise that the known ore bodies would persist downward, probably to the latite below, and would in themselves constitute a mineable reserve. To mine those reserves most economically would require a new lower tunnel level, to avoid the costs of drainage, extra handling of ore incidental to hoisting, hoisting equipment and operating costs, and very importantly, ventilation. To justify the driving of a lower level, it was planned to prove the downward extension of known ore by diamond drilling, but this program was poorly executed and the results inconclusive other than indicating that a well-conducted drilling program would be excessively costly.

A more practical approach was to clear out the caved area, remove the ore under the stoped areas, sample under the old stopes and then if ore was disclosed by this work to sink to a depth sufficient to justify the lower tunnel. Shipping the ore mined by sinking would also provide a more accurate assay of the ores, and defray a part of the costs.

Clearing out the caved area would also provide access to the west face at "H", which shows commercial ore but is only 8.9' wide. This drift should be extended, because the

outcrop of the Isabella vein is 8 to 10 feet wide on the Camilla claim, several hundred feet to the west. The outcrop directly over the face at "H" and for several hundred feet to the west is buried under heavy slide rock.

The crosscut from "A" to "H" would give access to the Isabella vein, so that driving to the east would be possible if warranted. This appears to be a more feasible approach to this vein in this area than to clear out the caved stope fills at "K", the extent of which are unknown. Any work done to the east would be approaching the Caliber vein, which would be the objective of a later development program in view of the reports of good values in it. There are also reports that very good sulphide ores outcrop on the claims in the southeast corner of the property, which have never been exploited because of their inaccessibility. These ore bodies would become available if the Caliber vein were developed.

IV (d)

There is a good road to the portal of the Kittimac workings, which is maintained by the County. It is 3.1 miles from the portal to the mouth of Minnie Gulch, where this road intersects the state highway. From Silverton, Colorado, to this intersection is 7 miles, of which one mile is blacktop and the rest a good gravel road. From the mine to the nearest custom mill is 5 miles. This is the "Pride of the West" mill, which accepts 500 ton lots for milling on a toll basis. From this mill, mine concentrates can be trucked 5 miles to Silverton and loaded on D.&R.G.W. narrow gauge cars for shipment to Amarillo, Texas, with transfer to standard gauge at Alamosa, Colorado. Some shippers prefer to truck 57 miles from this mill to Ridgeway, Colorado, where the concentrates are loaded in standard gauge cars. Lead concentrates can go from Ridgeway to Salt Lake City smelters, or to the Leadville, Colorado, smelter. Zinc concentrates are shipped from Ridgeway to the Anaconda Company at Great Falls, Montana.

Fuel, explosives, lumber, small tools, etc. can be obtained in Silverton, Colorado. Equipment can be obtained in Grand Junction, Colorado, 124 miles, or Denver, Colorado, 334 miles. Mine crews would reside in Silverton, Colorado.

IV (e)

There is a good supply of manpower in Silverton, Colorado, which is a mining community. Materials and supplies are also obtainable there. There is a surplus of water available for all purposes. The electrical power supply is adequate, but the power lines from the Animas Valley to the mine, 3.2 miles, have been removed. For the proposed program diesel powered equipment will be required.

V (a)

It is proposed to explore for copper, lead and zinc.

V (b)

The proposed work would be divided into two phases, A and B. Phase A would be conducted on an exact-cost basis, and has been divided into three parts in an effort to estimate costs more accurately. Part One would be the removal of caved material from Point "B" to Point "C", Fig. 8, and retimbering the drift through this area. There would be minor cleanup required from the Portal to Point "B", which is now cleaned up, but will require a few shifts by spring. There is a good track from the portal to Point "A", with 30# rail, except for a switch at the waste dump. There are no rails beyond "A". There are 12 mine cars in the mine, which require only cleaning and greasing to be put in service. Part Two would be the removal of mud from Point "C" to "O" and from "J" to "K". The present plan is build a dam in the drift east of Point "C", and impound water there. This drift now produces water sufficient to fill a two inch pipe, so that by damming it up an adequate supply will be available. Then install a pump at "O", with water lines to "C", to be extended as required, and use water under high pressure to remove as much as possible of the mud. It may be necessary to use a mucking machine or hand mucking for some part of the mud, but the pump should remove the greater portion of the most liquid material, and perhaps all of the mud.

Part Three would include removal of rails, and cleaning out trenches at 10 foot intervals under the stoped areas "B" to "D", "E" to "I", and "J" to "K", including diversion of water through pipes or ditches, and sampling of each trench from wall to wall. If the assays of these samples indicate sufficient ore of satisfactory grade to justify further exploration, then a Phase "B" would be started, but if not, then the project could be shut down.

Phase "B" would be carried out on a unit cost basis, and be divided into two parts. Part One would be sinking an exploration shaft on the vein to a depth of 150 feet. The shaft to be carried from wall to wall of the vein, which will probably be from 6 to 8 feet, and 6 feet along the vein, to provide a 2 feet ladderway and 4 foot hoisting compartment, separated by stulls. The requirements for head room above for dumping buckets and storing muck, as well as safety considerations bearing on the condition of stope timber in open stopes above, would probably limit the location to some point between "G" and "B", or else at the manway shown near "G". There is insufficient headroom elsewhere between "E" and "G". It is proposed to leave this final selection of a site until a member of the field inspection team can see the conditions and agree on the choice.

Part Two would consist of driving a cross cut from "A" to "E", or approximately 50 feet, but sufficient to cross the Isabella vein at that point, or hole to old workings if already drifted on. This cross cut to be 7' x 8' in section, and to be driven with the same equipment used in sinking, except for a mucking machine. The crew would work on night shift so as to have sufficient compressed air, and not interfere with the sinking crew.

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V (c)

The work will start in the spring, after the heavy snows are over, and the County road crews have cleared the roads of snow. The roads are not kept clear of snow to inactive properties. Starting date is estimated to be May 15, 1957 and will be completed within 7 months, or December 15, 1957.

V (d)

The applicant expects to do the supervisory work on this project. Has had over 30 years experience in the mining industry, including more than 20 years with the Anaconda Copper Mining Co., in all categories from miner to mine foreman. Since 1946 has been superintendent of two local mines and of an Uranium property.

VI

The estimated costs are as follows:

Phase "A" - Part 1 - Cleanup and Retimbering (3 men-6 weeks-Est.)

Estimate of Supplies Required.

*3-1/2 Tons 30# Rail	high?	@ $240. (new)	$910.00
32 prs. 30# Rail Splices	@	1.35 pr.	45.20
2 - Track Bolt Wrenches	@	2.95 ea.	5.90
100# Track Spikes	@	.21	21.00
110 - Track Ties	@	.65	71.50
100# Track Bolts	@	.34	34.00
1 - 30# Switch	@	50.00	50.00
1 - Rail Bender	@	65.00	65.00
*1500 ft. 2" Pipe (air line)	high	@ ? .59 (new)	932.20
6 - 2" Unions	@	2.70	16.20
10 - 2" Tees	@	1.80	18.00
10 - 2"x1" Reduced Bushings	@	.59	5.90
10 - 1" x 30" Pipe	@	.26-1/2¢ ft.	79.50
10 - 1" Valves	@	2.85	28.50
3 - 2" Valves	@	13.50	40.50
16 - C.P. Quick Hose Couplers	@	1.15	18.40
50 ft. - 1" Air Hose	@	69.00	69.00
500 ft. Lineal Ft. Round Stull Timber for 10 drift sets	@	.40	200.00
1000 ft. BM 5"x12"x5' Lagging and 2" x 6" staging	@	80.00 BM	80.00
10 pcs. 4"x4"x12' Spiling-160'BM	@	80.00	12.80
100# Nails and Spikes	@	15.50	15.50
Hauling Charges, Pipe, Lumber, etc. Est.			100.00
200# Carbide	@	10.00	20.00
			[illegible]
Plus 10% for expected price increases			[illegible]

$118.91

Phase "A" - continued

Estimated Payroll - Part 1

4 shifts	- clean tunnel from Portal to Point A			
2 "	- " " " Point A " " B			
60 "	- muck out caved material - Point B to Point C			
50 "	- timber - " " " " "			
8 "	- spiling one set - partly caved set at F			
10 "	- install compressor and air line, Portal to Point A			
8 "	- clean, oil and repair 10 mine cars.			
8 "	- repair surface track, install switch, extend waste track			
4 "	- hand muck est. 40 tons at F - too low for mucker			
		Total - 188 shifts @ $16.00 -		$3008.00
		Overtime -		144.00
45 "	- Supervisor	Supervisor - 1-1/2 @ 800.00		1200.00
8 "	- Mechanic for repairs- Outside mechanic			72.00
				$4516.00

Estimated Rental of Equipment - Part 1

** 1-1/2 months	- Compressor-Diesel Power Unit, 365 c.f.m.	@ $41.00/mo.	$41.00
** 1-1/2 "	- Air Trammer, 6 H.P.	@ 150.00/mo.	225.00
** 1-1/2 "	- Mucker	@ 275.00/mo.	412.50
	Freight on delivery of Rental Equipment, est.		500.00
			$1178.50

* Used, to be purchased

** Rental quotations by Western Machinery Co., Grand Junction, Colorado on basis of used units then available. All equipment is on rental purchase basis, and the particular units quoted are priced as follows:

	Mo. Rental	New Price	Used Price
Kimco 12-B Mucker	275.00	3450.00	1950.00
Air Trammer - 6 H.P.	150.00	2055.00	1250.00
Compressor - 365 c.f.m.	541.00	11050.00	5250.00
Air Hoist - 2000# rope pull	100.00	1500.00	900.00

90% of rentals apply on purchase price. Advised to add 5% to above new prices to cover price increases expected after January 1 on new equipment.

Estimated Fuel and Supplies - Part 1

1000 gal. Diesel Fuel	@ 19¢ gal.	190.00
50 gal. Gasoline	@ 30¢ gal.	15.00
3 sets Fuel and Oil Filters	@ 5.40	16.20
50 gal. Motor Oil	@ .95 gal.	47.50
50 gal. Compressor Oil	@ .75 gal.	37.50
1 - Fuel Pump	@30.00	30.00
Estimated gas, oil, grease, repairs for transport equipment for 45 days, 30 miles per day per vehicle @ 20¢ per mile		270.00
One vehicle for transportation of crew, and pickup for supply and service haulage and transportation for supervisor.		/1061.20

Phase "A" continued

Estimated Cost Insurance - Deposits, etc. - Part 1

Comprehensive and $50.00 deductible and medical payment Insurance on pickup and jeep	@ 100.00 yr. each	- $200.00
State Workmens Compensation Deposit		100.00
Liability Insurance		50.00
Workmens Compensation (2% of payroll)		100.48
State Unemployment Tax (3.1% of payroll)		100.56
F.I.C.A. Tax (2% of payroll)		62.52
Est. of 2% Sales Tax		124.27
	Total -	$[illegible]

Grand Total - Part 1 - $[illegible]

Phase "A" - Part 2 (3 men - 3 weeks - estimated)

Removal of Mud from Point "E" to "H" and from "J" to "K"

Estimate of Supplies Required - Part 2

350 ft. 2 inch Pipe	@ 59¢ ft. (new price, but used will be obtained)	206.50
4 - 2 " " Unions	@ 2.70	10.80
50 ft. 1" Hose	@ 69.00	69.00
		$286.30

Estimate of Payroll - Part 2

8 shifts	- install pump at Point "O", and construct dam in drift at "O" to store water	
8 "	- install water line Point "O" to Point "F"	
40 "	- washing mud	
10 "	- cleaning ditches and track	
21 "	- Supervisor	
	Total - 56 shifts @ 16.00	- $896.00
	Overtime	- 72.00
	Supervision	- [illegible]
		$[illegible]

Estimated Rental of Equipment - Part 2

3/4 months	- Compressor	@ 561.00	420.75
3/4 "	- Air Trammer	@ 150.00	112.50
3/4 "	- Mucker	@ 275.00	206.25
3/4 "	- Jeep or pickup, crew transportation		100.00
3/4 "	- Pickup for service and Supervisor transportation		100.00
3/4 "	- High Pressure Pump	@ 100.00	75.00
			$[illegible]

W[illegible]r W. Bentley
Silverton, Colo.

Phase "A" continued

Estimated Cost Insurance - Deposits, etc. - Part 1

Comprehensive and $50.00 deductible and medical payment Insurance on pickup and jeep	@ 100.00 yr. each -	$200.00
State Workmens Compensation Deposit		100.00
Liability Insurance		50.00
Workmens Compensation (2% of payroll)		108.48
State Unemployment Tax (3.1% of payroll)		109.56
F.I.C.A. Tax (2% of payroll)		72.32
Est. of 2% Sales Tax		126.97
	Total -	$767.33

Grand Total - Part 1 - $19,[illegible]

Phase "A" - Part 2 (3 men - 3 weeks - estimated)

Removal of Mud from Point "B" to "H" and from "J" to "K"

Estimate of Supplies Required - Part 2

350 ft. 2 inch Pipe	@ 59¢ ft. (new price, but used will be obtained)	206.50
4 - 2 " " Unions	@ 2.70	10.80
50 ft. 1" Hose	@ 69.00	69.00
		286.30

Estimate of Payroll - Part 2

3 shifts	- install pump at Point "O", and construct dam in drift at "O" to store water	
3 "	- install water line Point "O" to Point "F"	
40 "	- washing mud	
10 "	- cleaning ditches and track	
21 "	- Supervisor	
	Total - 56 shifts @ 16.00 -	$896.00
	Overtime -	72.00
	Supervision -	600.00
		$1568.00

Estimated Rental of Equipment - Part 2

3/4 months	- Compressor	@ 561.00	420.75
3/4 "	- Air Trammer	@ 150.00	112.50
3/4 "	- Mucker	@ 275.00	206.25
3/4 "	- Jeep or pickup, crew transportation		180.00
3/4 "	- Pickup for service and Supervisor transportation		180.00
3/4 "	- High Pressure Pump	@ 100.00	75.00
			$1174.50

Walter W. Bentley
Silverton, Colo.

Phase "A" continued

Estimate of Fuel and Supplies - Part 2

500 gals. Diesel Fuel	@ 19¢	95.00
10 gals. Gasoline	@ 30¢	3.00
2 sets Fuel and Oil Filters	@ 5.40	11.80
10 gals. Motor Oil	@ .95	9.50
10 gals. Compressor Oil	@ .75	7.50
Est. cost operation transportation vehicles 21 days, 50 miles per day per vehicle @ 25¢/mi.		315.00
		$441.80

Estimated Cost - Insurance, etc. Part 2

Workmens Compensation Tax (3% payroll)	47.04
State Unemployment Tax (3.1% payroll)	48.61
F.I.C.A. Tax (2% payroll)	31.36
Est. Sales Tax 2%	35.21
	$160.22

Grand Total - Part 2 - $3,[illegible]

Phase "A" - Part 3

Removal of truck, cleaning loose rock, digging sample trenches and cutting samples, Point "B" to "D", "J" to "K", and "E" to "G" (29 trenches @ 10' intervals)

Estimate of Supplies Required - Part 3

30 - Sample Sacks - ore sacks	@ 1.50	45.00
29 - Assays (Au, Ag, Cu, Pb & Zn)	@ 6.00	174.00
1 - " (cadmium)		25.00
1 - Spectrographic Analysis		15.00
		259.00

Estimate of Payroll - Part 3

5 shifts - removal of truck
15 " - cleaning sample trenches
15 " - sampling
7 " - Supervisor

Total - 55 shifts @ 16.00 -	528.00
Overtime	24.00
Supervision	200.00
	752.00

Estimated Rental of Equipment - Part 3

1/4 mo. Compressor	@ 561.00 mo.	140.25
1/4 mo. Air Trammer	@ 150.00 "	37.50
1/4 mo. Mucker	@ 275.00 "	68.75
1/4 mo. Pump	@ 100.00 "	25.00
		271.50

Walter W. Bentley
Silverton, Colo.

Phase "A" - Part 3 - continued

Estimate of Fuel and Supplies - Part 3

150 gal. Deisel Fuel	@ 10¢ gal.	28.50
Est. cost operation transportation vehicles, 7 days @ 30 mi. per day per vehicle	@ 25¢ mi.	105.00
		133.50

Estimated Cost - Insurance, etc. - Part 3

Workmens Compensation Tax (3% of payroll)	22.56
State Unemployment Tax (3.1% of payroll)	24.82
F.I.C.A. Tax (2% of payroll)	15.04
Est. 2% Sales Tax	9.92
	72.34

Grand Total, Part 3- $1,488.34

Phase "B" - Part 1.

Sinking on Vein (Est. 4 months - 3 men)

Estimated Unit Cost per foot - Labor and Supplies 150 feet at $85.00 per foot		$12,750.00
Estimated - Supervision 4 months at $800.00 per month		3,200.00
Estimated Rental of Equipment		
4 months - Compressor	@ 561.00	2,244.00
4 " - Air Trammer	@ 150.00	600.00
4 " - Pump	@ 100.00	400.00
4 " - Hoist	@ 100.00	400.00
4 " - Ventilation Fan	@ 75.00	300.00
		7,144.00
Estimated - Purchase of Equipment		
2 - Jackhamers complete with fittings, hoses, steel		2400.00
1 - Tungsten Carbide Bit Grinder		540.00
3000 BM Timber and Lumber for Head Frame and Bin		225.00
1 - Sheave Wheel	@ 55.00	55.00
250 feet Hoisting Cable	@ 52.60 per c.	81.50
150 feet Ventilation Fan Tubing	@ 1.00	150.00
		3251.50
Estimated Cost - Taxes, etc.		
Workmens Compensation Tax (3% of payroll)		276.00
State Unemployment Tax (3.1% of payroll)		303.60
F.I.C.A. Tax (2% of payroll)		184.00
Estimated Sales Tax - 2%		65.02
		[illegible]

Grand Total - Part 1$10,432.01

Phase "B" - Part 2 - Driving Cross-Cut Point "A" to Point "B"

Estimated - 12 shifts - 2 men

Using same equipment as used for sinking in Part 1, except addition of mucker, but operating night shift

Estimated Unit Cost per foot - Labor and Supplies 50 feet @ $40.00 per foot		$2,000.00
Rental of Equipment		
1/2 mo. Mucking Machine	@ $75.00	187.50
Estimated Cost - Taxes, etc.		
Workmens Compensation Tax (3% payroll)		60.00
State Unemployment Tax (3.1% payroll)		31.00
F.I.C.A. Tax (2% of payroll)		20.00
Est. Sales Tax - 2%		2.75
		83.75
Grand Total - Part 2		$2281.25

Recap:-

Phase "A" - Part 1	$10,432.04	
Phase "A" - Part 2	3,630.82	
Phase "A" - Part 3	1,488.34	
Phase "B" - Part 1	27,174.12	
Phase "B" - Part 2	2,221.25	
	$ 44,946.57	
Accounting, Consultants, etc.	940.00	
Contingencies, est.	4,494.65	
		$50,381.22

VI(b)

Miners pay scale locally is $1.875 per hour, where men are assured of steady employment. In the clean up and drilling project recently completed, it was found that for temporary jobs it was necessary to pay $2.00 per hour to obtain men, and estimates are based on that figure. It is expected that during Phase "A" three miners will be employed.

During Phase "B" five to six miners will be employed on a unit cost basis.

Walter W. Bentley
Silverton, Colo.

The Supervisor is to be paid $800.00 per month.

Surveyor, to complete survey of tunnel level after mud is cleared - 6 days at $40.00 per day	$240.00
Geologist, to map geology cleared area, 4 days at $100.	400.00
Accounting, est. 6 months @ $50.00 per mo.	300.00
	$940.00

VII (a)
Yes

(b)
The partnership is prepared to pay their share of project costs in cash.

Durango, Colorado

CERTIFICATE OF ASSAY

DESCRIPTION	Ozs. Per Ton 2000 Lbs. GOLD	SILVER	Per Cent Lead (wet)	Per Cent Copper (wet)	Per Cent Zinc	Per Cent Insoluble	Per Cent Iron	VALUE $ PER TON
[illegible] - 360'	0.00	1.10	2.70	0.35	4.20			
[illegible] - 362'	Trace	0.[illegible]	1.30	0.20	1.90			

Colorado

ASSAYERS

SHIPPERS' AGE

Durango, Colorado

CERTIFICATE OF ASSAY

DESCRIPTION		Ozs. Per Ton 2000 Lbs. GOLD	SILVER	Per Cent Lead (wet)	Per Cent Copper (wet)	Per Cent Zinc	Per Cent Insoluble	Per Cent Iron	VALUE $ PER TON
[illegible]	30"	0.01	0.7	0.30	0.12	1.10			
	32"	0.02	1.2	0.50	0.16	3.80			
	37½"	Trace	0.2	nil	0.02	nil			
	35½"	Trace	0.3	0.20	0.08	0.80			
	15½"	0.01	0.6	0.40	0.12	1.20			
	36"	0.02	1.6	2.30	0.26	1.10			
	23½"	0.01	0.9	1.30	0.20	1.40			
	12½"	0.01	0.7	0.40	0.12	1.70			
	30½"	Trace	0.2	0.10	0.04	0.80			
[illegible]		Trace	0.2	Random pieces showed more than usual pyrite.					

Colorado

ASSAYERS

EXHIBIT IV - [illegible] MINING - PRODUCTION RECORD (From U.S.B.M.)

[illegible] Silverton, Colo.

Year	Tons	Gold		Silver		Copper		Lead		Zinc	
		Oz. Recovered	Value	Oz. Recovered	Value	Gross # in Concentrate	Value	Gross # in Concentrate	Value	Gross # in Concentrate	Value
1908	110	12.05	249.00	32	17.00						
1909	10,847	26.35	543.00	34,607	18,342.00	176,627	28,260.00	504,167	22,687.00	22,861	1,485.00
1910	3,685	37.22	767.00	11,794	6,250	63,939	10,230.00	288,094	10,714.00	24,438	1,588.00
1911	372	1.87	38.00	591	313.00	3,674	588.00	6,241	280.00	59,025	3,836.00
1912	195	25.82	532.00	1,724	914.00	15,625	2,500.00	24,781	1,115.00	-	-
1913	none										
1914	none										
1915*	(13.02)	-	-	20	-	1,615	258.00	4,850	219.00	3,280	213.00
1916	5,000	18.25	376.00	5,819	4,772.00	48,647	7,784.00	124,820	5,617.00	74,060	4,810.00
1917	3,500	15.78	325.00	5,257	4,310.00	77,623	12,240.00	157,857	7,104.00	91,048	5,918.00
1918-1943	No production										
1944	45	1.29	-	109	-	1,135	-				
1945	211	2.00	-	486	-	4,212	-	2,634	-	3,088	-
(Current prices)		$35.00/oz.			90¢/oz.		37¢/#	10,746	-	9,900	
									16¢/#		10¢/#
Total	23,965	140.63	4,922.05	60,439	54,395.10	393,097	145,445.89	1,074,190	171,870.40	287,630	28,765.00

Grand Total - $405,396.44

* 13.02 Tons concentrate from mill clean up
** Dump Ore

EXHIBIT V - SAMPLES BY U.S.B.M. - See Fig. 5

Sample #	Width	Oz. Au.	Oz. Ag	Cu %	Pb %	Zn %	Wt. of Sample	Total Value
7	7.0'	0.79	2.6	2.6	4.0	4.8	25#	11.6
8	7.0'	0.01	0.8	2.5	2.1	2.8	40#	7.4
9	6.0'	0.03	2.8	3.4	4.6	6.8	40#	14.8
10	6.0'	0.08	17.1	3.6	5.6	7.0	25#	16.2
11	6.0'	0.15	5.2	9.0	4.9	12.0	25#	25.9
12	5.0'	0.12	1.2	1.6	2.6	3.5	30#	7.7
13	4.0'	0.01	0.5	2.1	3.9	4.4	20#	9.4
14	5.0'	0.03	3.2	5.4	4.3	6.2	35#	13.9
15	6.0'	0.01	2.4	5.4	3.9	5.4	25#	14.7
16	3.5'	0.03	0.6	0.0	0.4	0.9	15#	1.3

W-13 - Greb from chutes for a distance of about 150 feet running S.E. from tunnel intersection

	Au	Ag	Cu	Pb	Zn	
W-13	0.01	-	2.65	2.9	4.8	10.35
W-14	.01	-	3.75	41.6	11.3	59.95
W-15	Tr.	-	0.65	0.2	6.1	6.95

W-14 - Selected sample from pillar in stope about 120' east of tunnel intersection.

W-15 - Floor sample about 200' southeast of tunnel intersection.

EXHIBIT # No. 6

Walter W. Bentley
Silverton, Colo.

C O P Y

THE COLORADO ASSAYING COMPANY, Inc.
2013 Walton Street
Denver, Colorado

Report on determinations made for Mr. W. Bentley,
Silverton, Colo.

September 26,1956.

Sample Marks	Metals	Amount per Ton Ozs.	Lbs	Per Cent	Value Per Ton	
#375						
Kittimac-Face of drift	Gold	.01			.35	
at West end beyond cave	Silver	4.00			3.60	
8.9 ft. width	Copper			1.35%	10.80	
	Lead			4.6%	13.80	
	Zinc			4.3%	6.45	
						35.00
#376	Gold	.01			.35	
do: at 20 ft. East of	Silver	.70			.63	
#375 - back - 2.4' wide	Copper			0.30%	2.40	
	Lead			0.9%	2.70	
	Zinc			1.2%	1.80	
						7.88
#377	Gold	.005			.18	
do: at 40 ft. East of	Silver	.90			.81	
#375 - back - 2.8' wide	Copper			0.25%	2.00	
	Lead			0.7%	2.10	
	Zinc			1.1%	1.65	
						6.74
#378						
Resample of trench cut	Gold	.01			.36	
by A.E.&M. Number 33	Silver	2.20			1.98	
4.8 plus feet wide	Copper			1.70%	13.60	
	Lead			2.2%	6.60	
	Zinc			3.4%	5.10	
						27.65

Gold at $35.00 per ounce
Silver at 90¢ per ounce
Lead at $3.00 per unit
Copper at $8.00 per unit
Zinc at $1.00 per unit

C O P Y

AGREEMENT

THIS AGREEMENT, Made and entered into this 10th day of October, 1936, by and between WILLIAM A. WAY, as the duly appointed, qualified and acting RECEIVER of the properties of The Kittimac Mines Company of Arizona, The Kittimac Mines Company of Wyoming, and the Kittimac Mine and Mill Company of Colorado, of the Town of Silverton, County of San Juan, and State of Colorado, as LESSOR, and as Party of the First Part, and WALTER W. BENTLEY, of Silverton, Colorado, as LESSEE and as Party of the Second Part, WITNESSETH:-

That, whereas, the said Party of the First Part and herein designated as the LESSOR, is now and since the twenty-fourth day of September, 1925, has been the duly appointed, qualified and acting RECEIVER of and for the properties hereinafter described, and heretofore owned or controlled by The Kittimac Mines Company of Arizona, the Kittimac Mines Company of Wyoming, and the Kittimac Mine and Mill Company of Colorado, or some one or more of them, under order of appointment as such, entered by the Judge of the District Court in and for the County of San Juan, State of Colorado, in case No. 1401; and, whereas, under and by virtue of such appointment, said Party of the First Part has had and now holds the exclusive possession and custody of all the property and mining claims hereinafter described in accordance with the laws of the State of Colorado, and the terms and conditions of his said order of appointment; and, whereas, it appears to be for the best interest of all parties and corporations involved in said receivership proceedings that the properties constituting said receivership estate, and hereinafter more fully described, shall be operated under lease and option under the terms and conditions hereinafter stated to the end that such property may produce some revenue in the near future and may eventually be sold to produce sufficient revenue to pay receivership expenses, including taxes, and the satisfaction of claims, in whole or in part, heretofore filed against said receivership in the order of priority established in and by said Court; and whereas,

said Party of the Second Part, is desirous of obtaining a lease and option of purchase on said mining properties on the terms and conditions hereinafter set forth.

THEREFORE IT IS HEREBY COVENANTED AND AGREED AS FOLLOWS:

That the said LESSOR, for and in consideration of the royalties hereinafter reserved and the covenants and agreements hereinafter expressed, and by the said LESSEE to be paid, kept and performed, has granted, demised and let, and by these presents does grant, demise and let unto the said LESSEE all of the following described lode mining claims and mining property, situate in the Eureka Mining District (although a small portion thereof may be situate in Animas Mining District), San Juan County, Colorado, to-wit:

The CALIBER LODE MINING CLAIM, the original location certificate of which is recorded in Book 97 at page 370 and the amended location certificate of which is recorded in Book 98 Page 461 of the records of San Juan County.

The CALIBER NO. 1 LODE MINING CLAIM, the original location certificate of which is recorded in Book 111 Page 142 and the amended location certificate of which is recorded in Book 98 at Page 462 of the records of San Juan County.

The CALIBER NO. 2 LODE MINING CLAIM, the original location certificate of which is recorded in Book 111 at Page 145 and the amended location certificate of which is recorded in Book 98 at Page 465 of the records of the County of San Juan.

TheCALIBER NO.3 LODE MINING CLAIM2 the location certificate of which is recorded in Book 111 at Page 685 of the records of San Juan County.

The PURSER LODE MINING CLAIM, the original location certificate of which is recorded in Book 97 at Page 241 and the amended location certificate of which is recorded in Book 98 at Page 202 of the records of San Juan County; also in Book 111 at Page 582.

The PURSER No. 1 LODE MINING CLAIM: the location certificate of which is recorded in Book 111 Page 583 of the records of San Juan County.

The PURSER NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 584 of the records of San Juan County.

The HOME LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 480 of the records of San Juan County.

The HOME NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 Page 482 of the records of San Juan County.

The HOME NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 Page 482 of the records of San Juan County.

The SLIDE LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 489 of the records of the County of San Juan.

The SLIDE No. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book _____ Page ____ of the records of San Juan County.

The DETROIT LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 599 of the records of San Juan County.

The GLOBE LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 598 of the records of San Juan County.

The LIVERPOOL LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 597 of the records of San Juan County.

The MICHIGAN LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 600 of the records of San Juan County.

The GRAND RAPIDS LODE MINING CLAIM, the location certificate of which is recorded in Book 111 Page 601 of the records of San Juan County.

The NEW YORK LODE MINING CLAIM, THE LOCATION CERTIFICATE OF WHICH IS RECORDED in Book 111 Page 602 of the records of San Juan County.

The CHICAGO LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 603 of the records of San Juan County.

The ANN ARBOR LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 604 of the records of the County of San Juan.

The DURANGO LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 585 of the records of San Juan County.

The PITTSBURGH LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 586 of the records of San Juan County.

The HELENA LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 587 of the records of San Juan County.

The LAKE CITY LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 588 of the records of the County of San Juan.

The SILVERTON LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 589 of the records of San Juan County.

The DENVER LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 590 of the records of San Juan County.

The BERLIN LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 591 of the records of San Juan County.

The ST LOUIS LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 592 of the records of the County of San Juan.

The LONDON LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 593 of the records of the County of San Juan.

The PARIS LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 594 of the records of the County of San Juan.

The BALTIMORE LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 595 of the records of San Juan County.

The BOSTON LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 596 of the records of San Juan County.

The IRON LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 87 of the records of the County of San Juan.

The IRON NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 116 at Page 225 of the records of the County of San Juan.

The IRON NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 116 at page 226 of the records of the County of San Juan.

The IRON no. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 116 at Page 227 of the records of the County of San Juan.

The IRON NO. 4 LODE MINING CLAIM, the location certificate of which is recorded in Book 116 at Page 228 of the records of the County of San Juan.

The IRON DUMP LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 29 of the records of the County of San Juan.

The IRON AGE LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 28 of the records of San Juan. County.

The FOREST QUEEN LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 267 of the records of San Juan County.

The FOREST QUEEN NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 268 of the records of the County of San Juan.

The FOREST QUEEN NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 269 of the records of the County of San Juan.

The FOREST QUEEN No. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 270 of the records of the County of San Juan.

The FOREST QUEEN NO. 4 LODE MINING CLAIM, the location certificate of which is recorded in Book111 at Page 271 of the records of the County of San Juan.

The FOREST QUEEN NO. 5 LODE MINING CLAIM; THE LOCATION CERTIFICATE OF WHICH IS RECORDED IN Book 111 at Page 272 of the records of the County of San Juan.

The FOREST QUEEN NO. 6 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 35 of the records of the County of San Juan, and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 7 LODE MINING CLAIM, the location certificate of wich is recorded in Book 114 at Page 36 of the records of the County of San Juan and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 8 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 37 of the records of the County of San Juan and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 9 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 38 of the records of the County of San Juan and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 10 LODE MINING CLAIM; the location certificate of which is recorded in Book 114 at Page 39 of the records of the County of San Juan and said claim now being patented and now known by U. S. Survey No. 18843.

The FOREST QUEEN NO. 11 LODE MINING CLAIM; the location certificate of which is recorded in Book _____ at Page _____ of the records of the County of San Juan.

The ISABELLA LODE MINING CLAIM, the original location certificate of which is recorded in Book 111 at Page 256 and the amended location certificate of which is recorded in Book 111 at Page 415 of the records of the County of San Juan.

The ISABELLA NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 616 of the records of the County of San Juan.

The ISABELLA NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 617 of the records of the County of San Juan.

The ISABELLA NO. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 618 of the records of the County of San Juan.

The ISABELLA NO. 4 LODE MINING CLAIM, the location certificate of wh which is recorded in Book 111 at Page 619 of the records of the County of San Juan.

The ISABELLA NO. 5 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 620 of the records of the County of San Juan.

The ISABELLA NO. 6 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 621 of the records of the County of San Juan.

The ISABELLA NO. 7 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 622 of the records of the County of San Juan.

The ISABELLA NO. 8 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 623 of the records of the County of San Juan.

The MONITOR LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 24 of the records of the County of San Juan.

The MONITOR NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 25 of the records of the County of San Juan.

The MONITOR NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 114 at Page 26 of the records of the County of San Juan.

The MONITOR NO. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 483 of the records of the County of San Juan.

The MONITOR NO. 4 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 484 of the records of the County of San Juan.

The MONITOR NO. 5 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 485 of the records of the County of San Juan.

The MONITOR NO. 6 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 606 of the records of the County of San Juan.

The MONITOR NO. 7 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 607, of the records of the County of San Juan.

The MONITOR NO. 8 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 608 of the records of the County of San Juan.

The MONITOR NO. 9 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 609 of the records of the County of San Juan.

The MONITOR NO. 10 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 610 of the records of the County of San Juan.

The MONITOR NO. 11 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 611 of the records of the County of San Juan.

The MONITOR NO. 12 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 612 of the records of the County of San Juan.

The MONITOR NO. 13 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 613 of the records of the County of San Juan.

The MONITOR NO. 14 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 614 of the records of the County of San Juan.

The AURORA LODE MINING CLAIM, the location certificate of which is recorded in Book 97 at Page 369 and the amended location certificate of which is recorded in Book 92 at Page 450 of the records of San Juan County.

The AURORA NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 Page 144 and the amended location certificate of which is recorded in Book 92 at Page 451 of the records of San Juan County.

The LITTLE JOE LODE MINING CLAIM, the location certificate of which is recorded in Book 97 Page 65, and the amended location certificate of which is recorded in Book 92 at Page 449 of the records of San Juan County.

The WANDA LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 633 of the records of the County of San Juan.

The FOUNTAIN LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 479 of the records of the County of San Juan.

The CAMILLA LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 634 of the records of the County of San Juan.

The MIDNIGHT SUN NO. 1 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 486 of the records of the County of San Juan.

The MIDNIGHT SUN NO. 2 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 487 of the records of the County of San Juan.

The MIDNIGHT SUN NO. 3 LODE MINING CLAIM, the location certificate of which is recorded in Book 111 at Page 488 of the records of the County of San Juan.

Also the FOREST QUEEN MILLSITE CLAIM, the location certificate of which is recorded in Book D-2 at Page 109 of the records of the County of San Juan.

The MONITOR MILLSITE CLAIM, the location certificate of which is recorded in Book D-2 Page 110 of the records of the County of San Juan.

That Portion of the J. H. FRENCH (also known as the JOHN H. FRENCH) PLACER MINING CLAIM, U. S. SUR. NO. 45, described in the decree of the District Court of San Juan County, Colorado, (1259) in Case 1299, and awarded to the Minnie Gulch Mining and Tunnel Co., et al, a copy of which is recorded in the office of the County Clerk and Recorder of San Juan County, Colorado in Book 137 at Page 266.

Also that certain water right, location and filing known as the Bijou Water Right, as described in the records of San Juan County, Book D-2 Page 56, and the amended description thereof in Book D-2 Page 84 of the records of San Juan County.

Also that certain water right, location and filing known as the D. M. Estey Water Right, as shown by the records of said San Juan County, in Book D-2 Page 61 and the amended filing shown in Book D-2 Page 83.

TOGETHER with all and singular the mine structures, buildings, improvements and machinery upon and about said above-described property, including an air compressor, compressor house, boarding house, tramway terminal, blacksmith shop, crushers and crusher house, tracks, mine cars, ore bins, air pipe, tramway, including all tower, cable, buckets, equipment and

terminals, mill buildings and contents, including crushers, rolls, ball mill, tables, motors, driers, boiler and other machinery; bunk house and contents; boarding house and contents, and all other materials, tools, machinery and equipment as shown and listed in the inventory thereof hereto attached, marked Exhibit "A" and made a part hereof.

AND TOGETHER with the Kittimac Water Right, water tank and 700 feet of flume.

AND generally together with all and singular the surface and underground improvements thereon, therein and thereabout situate; and all tunnels therein and thereabout located, and all surface rock deposits and mine dumps therefrom, thereon, and thereabout situate, and any and all water, water rights, ditches, pipe lines, flumes and rights of way therefor used in connection therewith or thereto appertaining and together with all and singular the other appurtenances thereto belonging.

All of the above being suitate in the Eureka Mining District and principally in the County of San Juan in the State of Colorado, and a small portion of said property being situate in the County of Hinsdale, in the State of Colorado.

TO HAVE AND TO HOLD the same and all thereof unto the said LESSEE from and after the date hereof to and until the 20th day of October, 1961, unless sooner forfeited or determined through the violation of any covenant or agreement hereinafter made, or to be performed by the said LESSEE or Tenant.

And in consideration of the said demise, the LESSEE does covenant and agree to and with the said LESSOR as follows:

FIRST: To enter into said mine and mining premises and properties within five days after the approval of this agreement by the District Court of San Juan County, Colorado, and thereafter to remain in custody and control thereof during the life of this agreement and as hereinafter required to work the same mine fashion and in manner necessary to good, safe and economical mining, so as to take out the greatest amount of ore possible with due regard to preservation of such premises as a workable mine, and to the special covenants hereinafter reserved. Inasmuch as winter storms may be expected in the near future, it is understood and agreed that work on such properties may be discontinued to and until June 20, 1957, but work thereon shall be resumed on or before such date and continued thereafter during the life of this agreement and not less than ninety shifts of work performed on such properties each calendar month thereafter during the life of this

SIXTH: To occupy and hold all mineral deposits which may be discovered upon or in said premises by said LESSEE, or any person under him, whether such mineral deposit or deposits are in the form of cross or parallel lodes, veins, pockets, chimneys, blossoms, slovents, shutes, dikes, spurs, or known by any other name, which mineral deposit or deposits shall be and shall become the property of the said LESSOR; and that said mineral deposit or deposits shall be worked and mined under the terms of this lease as the property of the said LESSOR, whether found, located or discovered in or by the working of any new or old drift, cross-cut, shaft, raise, stope, tunnel, winze or other workings of any kind or character whatsoever.

SEVENTH: To at all times keep all drifts, shafts, tunnels and other workings in said mine, made or used by him, thoroughly drained and clear of loose rock and rubbish, in accordance with the usages of good mining, unless prevented from so doing by an extraordinary mining casualty.

EIGHTH: To make all shafts seven (7) feet long and four (4) feet wide in the clear; and all drifts seven (7) feet high by four and one-half (4 1/2) feet wide, all in the clear.

NINTH: To pay to said LESSOR a royalty of ten percent (10%) of the net smelter or mill returns paid on all ore shipped and sold from said property, the net smelter returns being defined as the sum of money paid by the smelter for the ore purchased after deducting railroads freight and smelter treatment charges only, or if shipped from mine to smelter by truck, after deducting trucking charges and smelter treatment charges only. If such ore shall be shipped to a custom mill, the net mill returns shall be the amount paid the shipper for such ore after deducting transportation charges from mine to mill. A signed copy of this agreement placed with such smelter or custom mill shall be full authority to it to pay over to the said LESSOR royalty above reserved. Duplicate smelter or mill returns on all such ore and

concentrates so shipped and sold shall be mailed to the LESSOR at Silverton, Colorado, or to his successor in office, at such address as may be given to the purchaser of such ore.

TENTH: The LESSEE shall carry Workman's Compensation Insurance at all times when said property shall be operated, under and in compliance with the Workmen's Compensation Act of the State of Colorado and any amendments thereof covering all men working in and about the said demised property, and shall comply with all the terms and provisions of said Workmen's Compensation Act. He and his assigns shall indemnify and save harmless the said LESSOR from and against any and all claims and actions for injury to or damage suffered by any person or persons employed in and about the said leased premises, and any and all other persons who suffer injury or damage while upon such premises.

ELEVENTH: The LESSEE shall at all times hereafter during the term of this lease post, and keep posted, in conspicuous place or places upon the said property where any work is being performed, and especially upon the buildings and at the mouth of the tunnel used in operating such property, notice, or notices, in due form of law, stating that such property and premises are being worked and operated under lease only, and that the LESSOR and said property will in no wise be liable for any labor performed upon the said premises or materials and supplies furnished for the development and operation thereof. Such notices shall be in due form of law under the terms and provisions of the laws of the State of Colorado relating to mechanic's liens pertaining to the operation of mining property, so as to protect said property and the said LESSOR from Mechanic's liens. The LESSOR will sign such notices at any time hereafter upon request.

TWELFTH: The LESSOR agrees to pay all taxes now constituting a lien upon the property above described, and any part thereof, but only out of monies paid hereunder. It is understood and agreed that should it become impossible to recover the patented properties mentioned and described in paragraph one, page 2 hereof, no taxes shall be paid on any of said property hereunder, and the LESSEE shall hereafter pay all taxes levied and existing against the said property promptly as

the same become due, commencing with the taxes for the 1956 and payable in 1957.

THIRTEENTH: The LESSEE agrees to notify the LESSOR herein of the shipment of any ore or concentrates made from said leased property during the term of this agreement and the name of the mill, smelter, or other ore buyer to whom or to which the said shipment is made. A signed copy of this agreement deposited with such purchaser is authorization to make remittance of the royalty as herein above provided, the remainder of the purchase price of such ore to be sent to the LESSEE and his assigns.

FOURTEENTH: At the termination of this lease in any manner herein provided for, the said demised premises with the appurtenances and all improvements thereon shall be returned to the LESSOR in good order and condition, with all drifts, shafts, tunnels and other passages made or used by LESSEE within six month prior to such termination, clear of loose rock and rubbish, and said mine ready for immediate continued working thereof without further demand or notice, and said LESSEE upon compliance with the conditions in this paragraph reserved shall have the right to remove all machinery, tools and equipment installed by him upon said premises, but he shall not remove any buildings, tramway or ventilating pipe and mine rails and track heretofore or hereafter installed upon and in said property.

FIFTEENTH: And, finally, that upon the violation of any covenant herein reserved, and by the LESSEE to be kept, paid and performed, the term of this lease may, at the option of the LESSOR expire, and the same and the said premises shall become forfeit to the LESSOR. Provided, however, that no forfeiture shall be declared or taken hereunder until the expiration of sixty (60) days after notice of such ground of forfeiture shall be given the LESSEE, and if during such period of time he shall cure or remedy such breach in the performance of the covenants hereof, no forfeiture shall be taken hereunder. If the LESSEE shall not cure or remedy such breach and the

covenants hereof within the sixty (60) day period herein reserved, the said premises, with the appurtenances, shall be and become forfeited to the LESSOR, and his agent or attorney, may thereupon, after demand in writing, repossess said premises with or without process of law, and take possession thereof and repossess the same as of the LESSOR'S former estate, and expel, remove and put out the said LESSEE, or any other person or persons claiming by, through or under him; and if the said LESSEE, or any person claiming under him, retains possession of said demised premises after his right of possession has expired as herein provided, he and all persons holding, by, through or under him, shall be deemed guilty of unlawful detainer under the laws of the State of Colorado, and proceeded against accordingly.

SIXTEENTH: Each and every clause and covenant of this lease shall extend to bind and inure to the benefit of the heirs, executors, administraters and assigns of the LESSEE, and to any lawful successor in interest of the LESSOR, as receiver, save and except a trustee in bankruptcy, or an assignee under a general assignment for creditors; and it is mutually agreed by the parties hereto that if the said LESSEE, or his lawful assigns, shall be adjudicated to be a bankrupt, or shall make a general assignment for the benefit of creditors, this lease in such event shall become null and void, and shall have no further force and effect thereafter, and the said LESSOR herein shall then have the right to immediate possession of all the demised premises and appurtenances as of his former estate, without further notice; and that in the event an attachment or writ of execution is levied against the said LESSEE'S interest in this lease, or upon the interest of his assigns herein, and said attachment is not dissolved, or said writ of execution not released within a reasonable time or after the exercise of due diligence, such attachment or writ of execution shall work a forfeiture of this lease and entitle the said LESSOR to the immediate possession of said demised premises.

OPTION TO PURCHASE THE DEMISED PREMISES:

And in further consideration of the foregoing lease and the expenditures to be made thereunder and the well and faithful keeping of the covenants and agreements thereunder by the LESSEE, the said LESSEE shall have and is hereby given and granted the right, privilege and option to purchase the said demised premises and mining property by the payment to the LESSOR, or his successor in interest, of the full sum of Seventy-five Thousand Dollars ($75,000.00) in time and manner as follows, to-wit: the sum of One Thousand Dollars ($1,000.00) to be paid directly to said LESSOR at the time of the execution of this agreement; and the further sum of Three Thousand Dollars ($3,000.00) to be paid directly to said LESSOR on or before October 5, 1957; and the further sum of Five Thousand Dollars ($5,000.00) to be paid on or before October 5, 1958; and the further sum of Twenty-two Thousand Dollars ($22,000.00) to be paid on or before October 5, 1959; and the further sum of Twenty-two Thousand Dollars ($22,000.00) to be paid on or before October 5, 1960; and the further and final sum of Twenty-two Thousand Dollars ($22,000.00) to be paid on or before October 5, 1961. Time is of the essence hereof as to such payments and each of them. It is understood and agreed that any royalty payments under the lease herein given shall apply upon and constitute part payment of the next succeeding payment of purchase price due hereunder, and if he so elects the LESSEE and his assigns may at any time hereafter pay the then remaining balance of purchase price and be entitled to take deed hereunder as soon as the LESSOR, or his successor in interest, can secure authorization from the District Court of San Juan County, Colorado to issue such deed. It is further agreed that should LESSEE desire to complete the purchase of such property at any time prior to October 5, 1961, he may give written notice of such desire to the above named LESSOR and if the payments previously made to the said LESSOR shall equal Twenty-Nine Thousand Dollars ($29,000.00), the LESSOR shall immediately

take the necessary legal steps to secure the authority from the said District Court of San Juan County, Colorado to issue the deed required to convey said property, and thereupon the unpaid remainder of such purchase price shall be paid at the time of the delivery of such deed.

Upon the payment of the total purchase price hereinabove provided for, either through royalty payments or otherwise, in compliance with the terms hereof, the LESSOR will, after obtaining the proper and requisite authority from the District Court of San Juan County, Colorado so to do, and under and in accordance with the orders of said court, and after giving the requisite and proper notice to the persons and corporations for whom and for which the LESSOR acts as receiver, make, execute, acknowledge and deliver, at the expense of said receivership, a good and sufficient receiver's deed in the nature of a mining deed, or deeds of conveyance, to all of said demised property, conveying the title of the corporations and companies for which he acts as receiver, free and clear of any claim or lien thereon asserted by any of the creditors of any of said three Kittimac companies, or of the Minnie Gulch Mining and Tunnel Company a defunct corporation. Of the properties above listed, the Forest Queen No. 6, Forest Queen No. 7, Forest Queen No. 8, Forest Queen No. 9, and Forest Queen No. 10 have heretofore been patented and it is agreed that when said sum of Twenty-nine Thousand Dollars ($29,000.00) shall have been paid, said LESSOR will at the expense of said receivership secure abstracts of title to the portion of the John H. French Placer Mining Claim, U. S. Survey No. 45, now held by him as a part of said receivership property and also of said Forest Queen lodes above described as being patented, and deliver such abstracts to the LESSEE for examination and such examination of title shall be completed by the LESSEE within (30) days, and said abstracts returned to the LESSOR above named.

The said LESSEE, upon ascertaining or being advised of any defect or defects in the title to said properties as shown by said abstract, shall promptly notify the LESSOR of the

nature thereof, and the said LESSOR herein shall have a reasonable period of time, not to exceed one (1) year from the date of the notification of the nature of such title defects, in the absence of mutual agreement otherwise, in which to cure and remove the same, so far as he, in the capacity of receiver, is able so to do with the assistance and equity supervision of the receivership court. Further than the above, the said LESSOR as such receiver shall not be obligated to convey to the said LESSEE, or his assigns, any better title to said demised properties than he as such receiver obtained under and by virtue of said receivership proceedings; except that the same when conveyed shall be conveyed free and clear of any and all claims of receivership and tax lien creditors of the three Kittimac companies, and free and clear of the claims and liens of any other claims to said demised property so far as said receivership court shall have or be construed to have jurisdiction over said claimants by reason of said receivership proceedings.

The forfeiture, surrender or termination of the above and foregoing mining lease for any cause therein provided shall render this option void and of no further effect.

It is further herein understood and agreed that in the event said foregoing option is terminated by reason of the forfeiture of the above and foregoing mining lease, all payments theretofore made on the purchase price of the above described properties in said option stated, regardless of how the same may be paid and whether as royalty or other wise, shall be retained by the said LESSOR as liquidated damages for the breach and non-performance by the said LESSEE of his covenants and agreements in said lease and in said option contained and by him to be performed.

It is further agreed and understood that at this time San Juan County, Colorado has acquired and holds a tax deed to the patented property above described, to-wit: the Forest Queen No. 6, Forest Queen No. 7, Forest Queen No. 8, Forest Queen No. 9, Forest Queen No. 10 and a portion of the John H. French Placer, Survey No.

45, 76.087 acres in extent; that such deed appears to be invalid, but that if said receiver cannot acquire and deliver such title to the second party by October 1, 1961, the purchase price above named shall be reduced Ten Thousand Dollars ($10,000.00) and the final payment hereunder shall be reduced to the sum of Twelve Thousand Dollars ($12,000.00) instead of the sum of Twenty-two Thousand Dollars ($22,000.00) less any royalties theretofore paid, and the same property hereinabove mentioned shall be delivered over to the LESSEE excepting only such patented mining property.

It is further understood and herein agreed that the said LESSEE shall have and is hereby given the right to cancel the above set out lease and option at any time during the life thereof, by the surrender of said demised property and of the possession thereof to the said LESSOR in the same manner and upon the same conditions as upon the termination of said lease, and thereby said LESSEE shall be relieved from and against all further liability for the performance of the covenants of said lease and in said option contained and by him to beperformed, PROVIDED that said LESS shall give to said LESSOR thirty (30) days written notice of his intention and election so to do by delivering said written notice to said LESSOR or by mailing said written notice to said LESSOR at Silverton, Colorado not less than thirty (30) days prior to the date of the surrender of said lease and option for cancellation, and it is further herein understood and agreed that a surrender of said lease for cancellation as above provided shall ipso facto constitute a surrender of said option likewise for cancellation, and in any such event the said LESSOR may retain any and all payments thereunder made and credited upon said option price as liquidated damages for the non-performance of said option agreement, and the said LESSEE in the event of the surrender of said lease and option in the manner hereinabove provided shall not thereafter be liable for the further specific performance of the provisions and agreements thereof and herein contained.

It is understood that this agreement is made and given by the first party as receiver only, and that he assumes no liability except as receiver for any covenant or condition herein contained.

It is understood and agreed by all parties that this agreement is made subject to the approval of the said District Court of San Juan County, Colorado, by whom the LESSOR was appointed and will be in effect only when so approved.

WITNESS the hands and seals of the respective parties hereto this 10th day of October, 1956, it being understood and represented that the execution hereof by said LESSOR as Receiver has prior hereto been authorized and directed by appropriate order of the District Court of the County of San Juan, State of Colorado, having jurisdiction over said receivership proceeding.

(Signed) Wm. A. Way (SEAL)
As Receiver of the Properties of The Kittimac Mines Company of Arizona, The Kittimac Mines Company of Wyoming and the Kittimac Mine and Mill Company of Colorado, San Juan County, District Court Case No. 1401, as LESSOR and Party of the First Part.

(Signed) Walter W. Bentley (SEAL)
As LESSEE and Party of the Second Part.

EXHIBIT " A "

INVENTORY OF TOOLS, MATERIALS, MACHINERY, and EQUIPMENT now on demised property and included in the aforegoing lease.

A. PROPERTY IN ORE HOUSE:

One (1) 9 x 15 Blake Type Crusher in place

One (1) 9 x 15 Blake Type Crusher - dismantled

One (1) General Electric Induction Motor #64198 - 50 H.P. 440 Volt.

The above property is now located in what is known as the ore house, situate on the Kittimac mine property.

B. PROPERTY AT TRAM TERMINAL:

Twenty (20) Trenton Iron Works tramway buckets and tramway brake and control machinery, the latter of which is only in fair condition.

C. PROPERTY IN BLACKSMITH SHOP:

Ten (10) - 16 foot ore cars in poor condition but usable. (There are now no blacksmith tools or equipment now ~~no blacksmith tools or equipment now~~ located in and about this shop)

D. PROPERTY IN COMPRESSOR HOUSE:

One Box

(1) General Electric induction motor #136439 - Type 1-10-75A-728 Form K - 60 cycles - 78 H.P.H. 440 volts - 93 Amps.

One (1) 4' x 10' Air Receiver

One (1) [illegible] and Compressor: R.H. side #13692 P.P. 15 x 12
L. H. side #13691 P.P. 9 x 12

Value gear and connecting rods on the above are absent. Other small parts such as the oiler are missing and must be replaced prior to operation.

E. TRAMWAY:

One old tramway consisting four miles approximately 1" carrier cable (lock coil stationary cable) and a like length of 7/8" traction cable, extending between the old Kittimac Mill and the upper tramway terminal at the Kittimac mine, together with existing tramway terminals and tramway towers and fittings.

Surname

3/4/59 Klugerscheid 500

130

110

220

225

WRHuisnold 500

[illegible]

January 31, 1959

Re: Docket No. DMEA-4549 (Lead-Zinc-Copper)
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado.

Memorandum for Docket

Subject: Withdrawal of Pending DMEA Applications

Effective this date, this pending DMEA application is considered withdrawn for statistical purposes.

If, at a later date, the applicant requests reconsideration under the CME program, all pertinent material in the DMEA file should be transferred to the new CME docket.

Frank E. Johnson
Frank E. Johnson
Acting Director

What about pertinent documents?

We should return what was requested but retain a copy or make a copy of each item for our files. JEJ

OFFICIAL FILE COPY
O. M. E.
MAR 26 1959
CODE
3/26 C
220
225

324 New Customhouse
Denver 2, Colorado
March 24, 1959

Mr. Walter H. Bentley
833 East Kiowa-th, Apt. 205
Denver 9, Colorado

Re: Docket No. DMEA 4549 (Lead-Zinc Copper), Kittimac Mining Company, (Kittimac mine), San Juan County, Colorado

Dear Mr. Bentley:

At the request of the Washington office GSA, returned herewith are the following data:

Figure 1 - Claim Map - Kittimac Property - 4 copies
Figure 2 - Map - 4 copies
Figure 3 - Map - Kittimac Mine - 4 copies
Figure 4 - Topographic Map of Kittimac Mine - 4 copies
Figure 5 - Map of Kittimac Mine - 4 copies
Application - 14 pages - 3 copies
Knot & Barton - 2 assay sheets - Exhibits 2 & 3 - 4 copies
Agreement - 17 pages - 4 copies
Exhibit "A" - 1 page - 4 copies
Exhibit 4 - 1 page - 4 copies
Exhibit 5 - 1 page - 4 copies
Exhibit 6 - 1 page - 4 copies

Very truly yours,

Original signed by
J. W. TOWNSEND

J. W. Townsend
Executive Officer
GSA Field Team, Region III

Enclosures

HMC/ff
cc: Chmn. Op. Comm. (2)
Harshman
DMEA Docket 4549
Chron.

MME Form 7
(10-58)

OFFICIAL FILE COPY

Date	Surname	Code
3/17	Klugescheid	500
	Iverson	500
	[illegible]	130
3/17	Johnson	110
		~~100~~
		~~HB~~
3/18	C	220
		225

500

MAR 17 1959

Memorandum

To: Executive Officer, OME Field Team,
Region III, Denver, Colorado

From: Chairman, Operating Committee, OME

Subject: Return of data to Operator as requested by him for Docket No. DMEA-4549 (Lead-Zinc-Copper), Kittimac Mining Company, Kittimac Mine, San Juan County, Colorado.

We have recently received a letter from Mr. Bentley withdrawing his application.

He has requested that all maps and reports that he submitted with the application be returned to him. We are enclosing the following data:

Figure 1 - Claim Map - Kittimac Property - 2 copies
Figure 2 - Map - 2 copies
Figure 3 - Map - Kittimac Mine - 2 copies
Figure 4 - Topographic Map of Kittimac Mine - 2 copies
Figure 5 - Map of Kittimac Mine - 2 copies
Application - 14 pages - 1 copy
Root & Norton - 2 assay sheets - Exhibits 2 & 3 - 2 copies
Agreement - 17 pages - 2 copies
Exhibit "A" - 1 page - 2 copies
Exhibit 4 - 1 page - 2 copies
Exhibit 5 - 1 page - 2 copies
Exhibit 6 - 1 page 2 copies

These are all the copies in our possession but we have made copies of everything so that we have a complete file.

Will you kindly forward these copies to Mr. Bentley and include any that may be in your possession.

/s/ George C. Selfridge

Enclosures
APPROVED:

H. G. Iverson
Member, Bureau of Mines

Thor H. Kiilsgaard
Member, Geological Survey

WPKlugescheid/er 3/17/59
Copy to: Docket
Dir Read File
Op. Committee
Mr. Bishop, USBM
Mr. Kiilsgaard, USGS
Chron.

P.S. Please return the copies you have to Mr. Walter E. Bentley at 833 East Ellsworth, Apt. 203, Denver 9, Colorado.

43683

OFFICIAL FILE COPY
O. M. E.
RECEIVED FEB 24 1959

DATE	INITIALS	CODE
2/24	C	220
3/3	1 chg	500

833 East Ellsworth, Apt.#203,
Denver 9, Colorado.

February 17, 1959

Mr. Frank Johnson, Acting Director,
Office of Minerals Exploration,
Department of the Interior,
Washington 25, D.C.

Re: Docket #D.M.E.A.-4549
Kittimac Mine
San Juan County, Colorado

Dear Mr. Johnson:

After considering the requirements for further processing of the above application, I have decided to withdraw from the D.M.E.A. program. Will you please return the maps and reports submitted in connection with this application to me at the Denver address shown at the top of this page. As I remember there were five copies of all maps and records submitted with the application.

Sincerely yours,

Walter W. Bentley

Walter W. Bentley

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
1/19	Klugescheid	500
		500
1/2	Selfridge	120 ~~110~~
		~~100~~
1/29		225
		500

JAN 29 1959

Mr. Walter W. Bentley
Kittimac Mining Company
Post Office Box 541
Silverton, Colorado

Re: Docket No. DMEA-4549 (Lead-Zinc-Copper)
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado

Dear Mr. Bentley:

Enclosed is a copy of the regulations for obtaining Federal assistance in financing mineral exploration under which the new Office of Minerals Exploration will operate.

If you wish that your partly processed DMEA application be considered under the OME regulations, please complete and return four of the copies of the attached application, OME Form 40.

Your attention is called especially to the certification which when signed declares that you would not ordinarily undertake the proposed exploration under current conditions and circumstances at your sole expense, and to Item 1(a) - and 1(b) if applicable - which relates to information used to determine your financial eligibility under the new exploration program. Information that is included in your DMEA application need not be repeated in the OME application, but you can add new information if you so desire.

We would like to call attention to the letter of the Administrator of DMEA, dated March 12, 1958, concerning proof of your right to possession of the property. This proof would be necessary for further processing of the application.

The present status of the Agreement must also be submitted.

Also enclosed are six copies of the Lien and Subordination Agreements, OME Form 52, referred to in Item 2(c) of the application. Early submittal of five completed copies of the form will save time in case you apply for exploration assistance under the OME program and a contract is granted.

If you do not wish to participate in the OME program, we shall appreciate being so informed.

WPKlugescheid/er 1/19/59
CC: Docket
Dir Read File
Reg. III (2)
Chron.

Sincerely yours,
Frank E. Johnson
Acting Director

Enclosures

8623

DMEA Form 7
(12-56)

SEP 19 [illegible]

OFFICIAL FILE COPY

Date	Surname	Code
9/19	[illegible]	500
		110
9	[illegible]	100
		225

Mr. Walter W. Bantley
Kittimac Mining Company
Post Office Box 541
Silverton, Colorado

Re: Docket No. DMEA-4549 (Lead-Zinc-Copper)
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado

Dear Mr. Bantley:

As you have an application for exploration aid pending in our office, perhaps you may wish to study the proposed Office of Minerals Exploration regulations and comment on them before October 17 as provided in the first paragraph of the enclosed notice reprinted from the Federal Register of September 17.

Some time after October 17 when the final regulations become effective, we will send you the new application form so you may furnish any additional information necessary to process your application for aid under the new program.

Sincerely yours,

[illegible]

Director

Enclosure
WRGriswold/er 9/19/58
Copy to: Docket
Admr R File
Region III (2)
Chron.

8623

Details of F.T. Costs and Project
and
Recalculation according to our Ideas.

Let us assume 4"x8" inside timber
and 5' sets of 8"x8" Timber.

Wall plates: 8"x8"x10'-0" = 2x53.33 = 107

End Plates + Divider: 8"x8"x6'-0" = 3x32 = 96

Posts: 8"x8"x5'-0" = 6x27 = 162

Lagging 2"x10'x5'-0" Assume 50% = 11x10 = 110

475 Bd. Ft.

@ $80.00/1000 Bd. Ft. gives 80x0.475 = 38.00

38/5 = $7.60/M.

365 Cu. Ft/min Compr

Sinco 12B sucker.

If we assume 6"x6" Timber.

6"x6"x10'-0" = 2x30 = 60.00

6"x6"x6'-0" = 3x18 = 54.00

6"x6"x5'-0" = 6x15 = 90.00

Lagging as above 110.00

314.00

80x0.314 = 25.12/5 = $5.06/M.

Calculated advance per day 110'/3 mos = 3[illegible]/month. which is not very good. This is only 37/25

25 | 37 | 1.44/day.
25
120

F.T. Project.

Details of Sinking

110' Sinking	Cost	Cost/foot
Labor	4,800.00	$43.64
Supervision	1,800.00	16.36
		$60.00
Operating Materials + Supplies.		
Explosives	360.00	$ 3.27
Bits	140.00	1.27
Timber	400.00	3.64
Tools.	50.00	0.45
Fuel Oil + Sub. Oils etc.	633.50	5.76
Fuel Pump.	20.00	0.18
2 Jeeps, Oil + Repairs.	300.00	2.73
	1903.50	$17.30
Equipment Rental		
Compressor, Hoist, Fan, etc.	3,648.00.	33.16
Equipment Purchased.		
Various.	220.20	2.00
Miscellaneous.		
Bookkeeping, Workmen's Comp. etc.	622.50	5.66
Total Cost/foot for Sinking		$118.12.

Assuming 210' of sinking @ $118.00 = $24,780.00

Calculated advance per day
100' a month @ 25 days or 4'/day. OK

Stage I.

Drifting 200' of 5'x7'	Cost	Cost/ft
Labor	$3,200.00	$ 16.00
Supervision	1,200.00	6.00
		$22.00
Operating Materials & Supplies		
Explosives	472.00	$ 2.36
Bits etc.	210.00	1.05
Fuel Oil, Lag, Lub. Oil etc.	296.00	1.48
Oil, Gas, Repairs - 2 Jeeps	200.00	1.00
	1178.00	5.89
Operating Equipment Rental		
Pump, Hoist, Compressor etc.	2,982.00	14.91
Operating Equipment - Purchased		
Ventilation Pipe	200.00	1.00
Miscellaneous		
Bookkeeping, Workmen's Compensation	415.00	2.08
		$ 45.88

Extra 200' for Stage II.

Assuming 400' @ $38.00 = $15,200.00

Cost of Drilling 210' @ $118.00 $24,780.00
Cost of Drifting & Crosscutting 400' @ 38.00 15,200.00
39,980.00
Sampling & Analysis 360.00
40,340.00

Summary Field Team Costs.

Cleanup and Rehabilitation.

Time: 2½ months.

Labor + Supervision	$4,452.00
Materials + Supplies	4,154.04
Operating Equipment	3,215.00
Miscellaneous	445.39
	$12,266.43

Sink 110 feet

Time: 3 months

Labor + Supervision	$6,600.00
Materials + Supplies	1,903.50
Equipment Rental	3,648.00
" Purchased	230.20
Miscellaneous	612.50
Total	$13,994.20
10 Samples (6 determ. each @ $6/sample)	60.00
Cost/foot = $118.13/foot	$13,054.20

(4'x8' size)

Drifting Start L-200' (size 5'x7')

Time: 3 months

Labor + Supervision	$4,400.00
Materials + Supplies	1,178.00
Equipment Rental	2,982.00
" Purchased	200.00
Miscellaneous	415.00
	$9,175.00
Cost/foot = $45.88	120.00
20 Samples @ 6 ea	$9,295.00

Drifting, stage II

200 feet of 5'x7' as in stage I @ $45.88/ft.

Line: 2 months $9,175.00

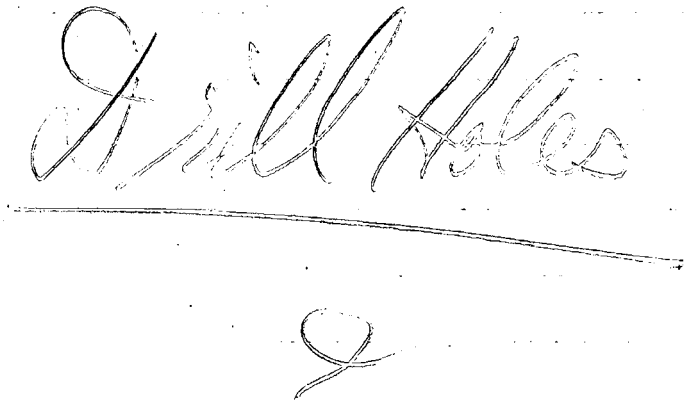
20 samples @ $6.00 ea. 120.00

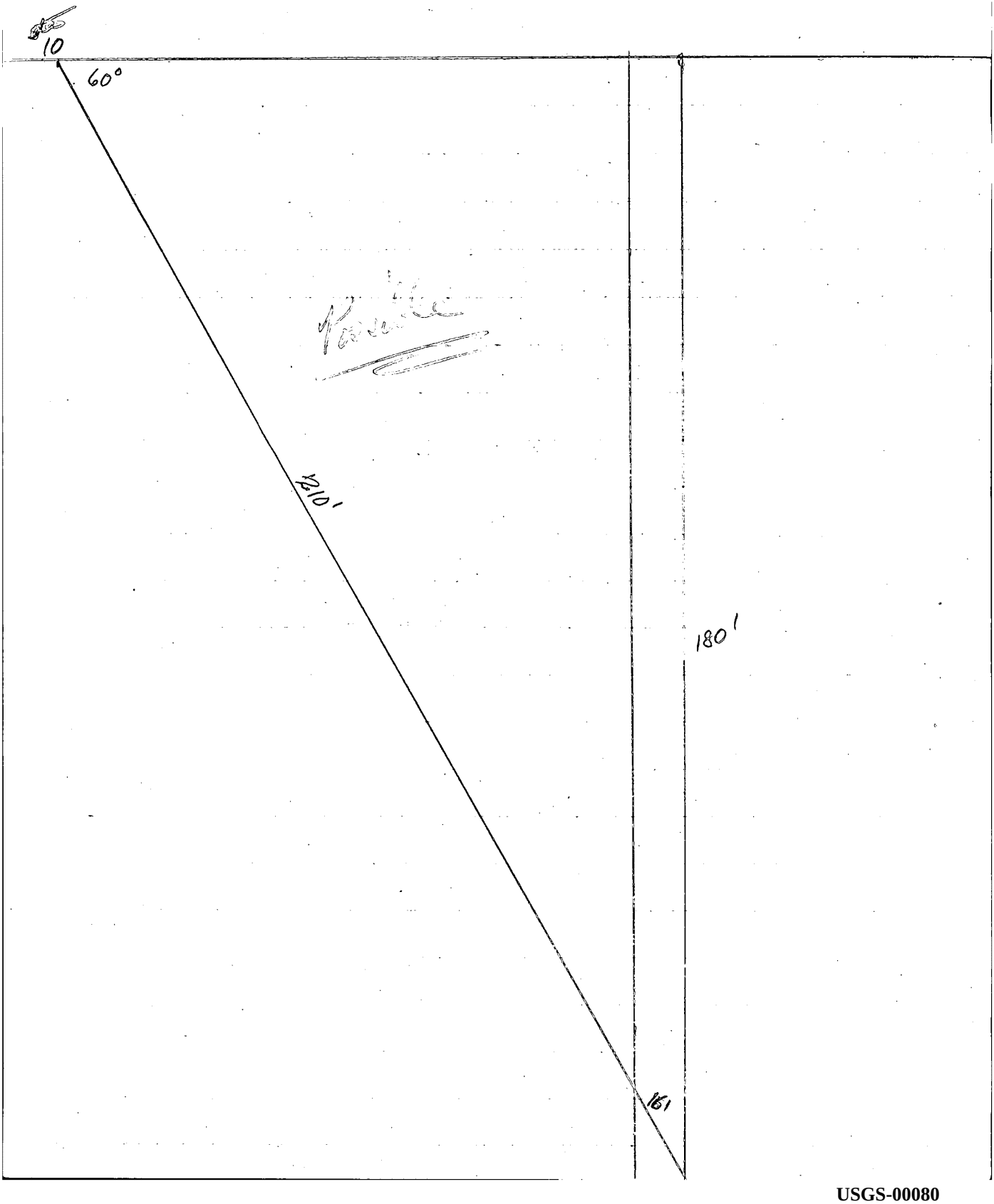
$9,295.00

~~Work~~ ~~Footage~~ ~~Cost~~ ~~Cost/ft~~

Work	Time	Footage	Cost	cost/ft.
Cleanup & Rehabilitation	2.5 mos.	—	$12,266.43	—
Sinking	3.0 "	110'	12,994.20	118.13
Drifting (Stage I)	2.0 "	200'	9,175.00	45.88
" (Stage II)	2.0 "	200'	9,175.00	45.88
50 Samples @ $6.00 ea			300.00	
	9.5 mos.		$43,910.63	

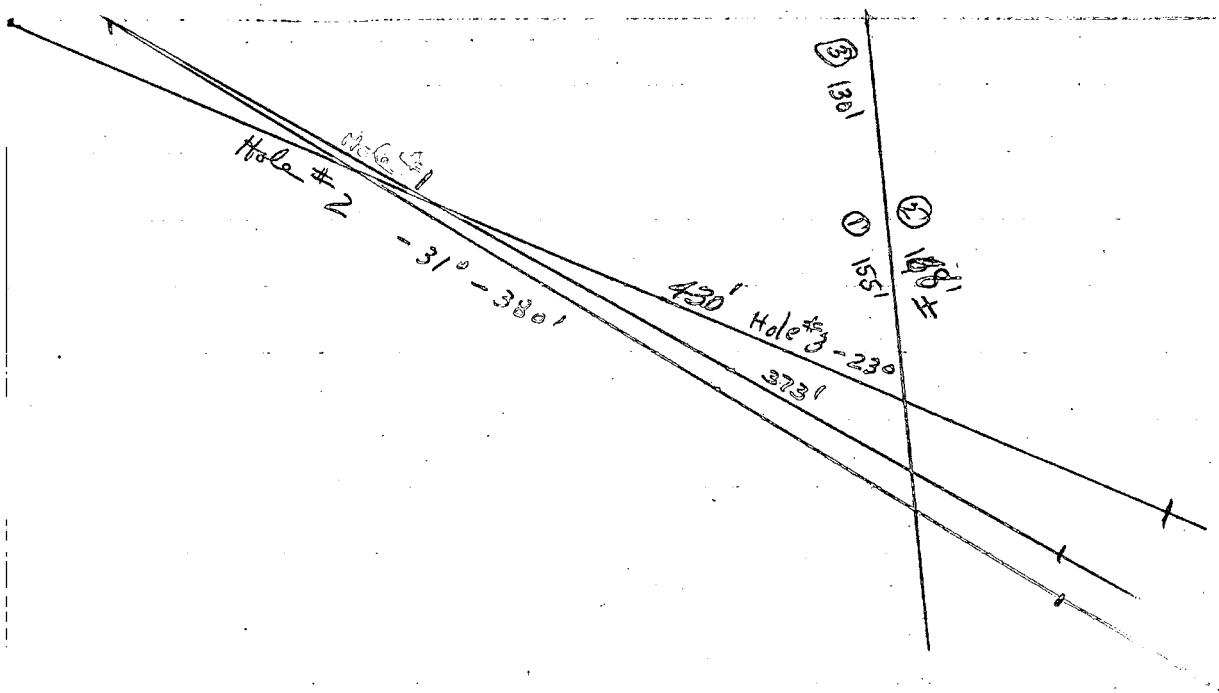
say 12 months.




10
60°
Partial
210'
180'
161

60 Scale

Drill holes Drilled (N.G.)



Kettimac Mining Co. Summary

DMEA-4549

Phase A. Part 1. Cleanup & Rehab

Supplies	3,118.51
Payroll	3,616.00
Equipment Rental	1,929.00
Fuel & Supplies	1,001.20
Insurance etc.	767.33
	10,432.04

Feet of Rehab & Cleanup.

Portal to "A"	340'
"A" to "B"	70'
"B" to "C"	50'
	460'

Part 2 Supplies 286.30

Payroll	1,568.00
Equipment Rental	1,174.50
Fuel etc.	441.80
Insurance etc.	160.22
	3,630.82

Part 3.

Sampling, assaying etc.	259.00
Payroll	752.00
Equip. Rental	271.50
Fuel etc.	133.50
Insur. etc.	72.34
	1,488.34

Preliminary

Total $15,551.20

Total Cleanup & Rehab (Parts 1 + 2) = $14,062.86

for 460' amounts to = $30.57/ft.

Sampling, assaying etc for roughly 30 samples (Part 3) = $49.61/Sample

Total cost as proposed for Sampling (Parts 1, 2, & 3) = $518.37/sample

Phase "B" Part 1

Sinking on vein	150' @ $85, (6'x8')	12,750.00
only really sensible procedure	Supervision	3,200.00
	Equip. Rental	7,144.00
	Equip Purchase	3,251.50
	Taxes etc.	828.62
	Total	27,174.12

Too high $100 + maybe but not $181! or a total cost of $181.16/ft.

Part 2

(5'x7') Driving XC - 50' @	$40.00/ft.	2,000.00
	Equip. Rental	137.50
	Taxes etc	83.75
	Total.	2,221.25

or a total cost of $44.43/ft.

slightly high and so short it would not prove anything

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
7/14	Klugescheid	500
	Heismed	500
7/14	Martin	130
7/14	Lamb	130
7/14	Kiilsgaard	130
"	Johnson	110
"	Mittendorf	100
		225

JUL 14 1958

Mr. Walter W. Bentley
Kittimac Mining Company
Post Office Box 541
Silverton, Colorado

Re: Docket No. DMEA-4549 (Lead-Zinc-Copper)
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado

Dear Mr. Bentley:

Early in June we sent you the Department of the Interior Information Service Release dated June 6, which announced that no new Defense Minerals Exploration Administration contracts could be executed after June 30th because of the ending of the present program for exploration assistance.

We regret to inform you that your application, identified above, could not be completely processed before June 30th because necessary information was not supplied.

However, we will be glad to hold your application until the Congress acts on pending legislation to continue exploration aid. If the aid is continued, we will then ask you to state whether you wish us to consider your application under regulations established for the new program.

Sincerely yours,

C. O. Mittendorf (for)

Administrator

WPKlugescheid/er 7/12/58
Copy to: Docket
Admr R File
Op. Committee
Mr. Bishop, USBM
Mr. Kiilsgaard, USGS
Region III (2)
Chron.

8623

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
	Long	
	Dwyer	
	App'd. Sol. Off.	
	Selbridge	
3/12	J. Munson	
"	Rutherford	100
3/13	C	220
		500

MAR 12 1958

Mr. Walter W. Bentley
Kittimac Mining Company
P. O. Box 541
Silverton, Colorado

Re: Docket No. DMEA 4549
(Lead-Zinc-Copper)
Kittimac Mine
San Juan County, Colo.

Dear Mr. Bentley:

Your letter of February 5, 1958, addressed to Mr. W. H. King requests that you be advised as to the nature of the proof which will satisfy our legal department of your right to possession of the subject property.

The attorneys call attention to the fact that Mr. Way was appointed Receiver of the property some 33 years ago, during which time there were periods when the property was not being worked and no assessment work was performed. In such periods it would have been possible for unknown third parties to relocate the claims. In fact, Mr. Way's letter of December 2, 1957, indicates that there were several attempts to jump the claims and when he knew of such attempts he took action to protect the ground. Although Mr. Way states that in three different cases he was upheld by the District Court, he admits that he was not aware that in 1929 Mr. Samuel G. Martin located the Bear Group of claims over the same ground, and consequently did not bring suit against him. Your application states that in 1946 the A. S. & R. Co. was active on the property, but that suit was instituted against it by claim-jumpers and the company "dropped the project." In view of these statements, the attorneys point out that: (1) it is possible there may have been other third parties who have valid claims of ownership; (2) without an opportunity to review the decisions referred to by Mr. Way, they are unable to ascertain their effect; (3) and aside from Mr. Way's statement, there is no showing that Mr. Martin's second locations (i. e., the Bear Group) are

8623

invalid, and, therefore, subsequent purchasers of Martin's interest, evidenced by Sheriff's Deed, are without good title.

Article 12 and the last paragraph on page 15 of your lease and option agreement of October 10, 1956, refer to existing tax liens and the payment of taxes. Page 13 of the agreement contains provisions regarding the lessee's payment of $1,000.00 upon execution of the agreement and an additional $3,000.00 payment on or before October 5, 1957. Please advise us on the current tax status of the property and whether or not you, as lessee, have made the above mentioned payments.

The third paragraph of your letter of February 5 indicates that the Court has approved transfer of the title to you. Please furnish us with copies of all pleadings filed with the Court concerning your lease and option agreement, the Court's Order or Judgment, and the deed mentioned in your letter, in order that our attorneys may examine the same. If all should be in order and satisfactory, we will be able to continue processing your case.

If such is not the case, we would require either a title opinion by an attorney, based upon an abstract of title or personal examination of the county records, or a performance bond to be furnished by your company in an amount equal to the sum to be provided by the Government.

Sincerely yours,

(for)

Administrator

RWLong:md
3/5/58
CC: DMEA Docket
Admin. Reading File
Operat. Com.
Field Team Reg III (2)
Mr. Griswold
Mr. Bishop
R. P. Dwyer
R. W. Long
Chron
Pending

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
	Long	140
	[illegible]	140
	Appd. Sec. [illegible]	
3/6	[illegible]	500
	[illegible]	[illegible]0
		110
		100
		220
		500

Mr. Walter W. Bentley
Kittimac Mining Company
P. O. Box 541
Silverton, Colorado

Re: Docket No. DMEA 4549
(Lead-Zinc-Copper)
Kittimac Mine
San Juan County, Colo.

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8623

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If such is not the case, we would require either a title opinion by an attorney, based upon an abstract of title or personal examination of the county records, or a performance bond to be furnished by your company in an amount equal to the sum to be provided by the Government.

Sincerely yours,

Administrator

CC: RWLONG
Chron
Pending

RWLong:md
3/5/58
CC: DMEA Docket
Admin. Reading File
Operating Com.
T. H. Kiilsgaard, USGS
Field Tea Reg. III (2)
Mr. Griswold
Mr. Bishop
R. P. Dwyer

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
2/24	Klugescheid	500

500

February 24, 1958

Memorandum

To: Associate Solicitor, Division of Mineral Resources

From: Director, Division of Base Metals

Subject: Answer to Letter of Walter W. Bentley, dated February 5, 1958, Kittimac Mining Company, Kittimac Mine, San Juan County, Colorado, Docket No. DMEA-4549 (Lead-Zinc-Copper)

We do not know whether this letter of Mr. Bentley will shed any further light on the question of the property rights in this project. Possible the third paragraph will give some clue as to what further action is indicated.

Would you kindly study this matter and then prepare a letter to the applicant telling him what he will have to do to prove title.

W. R. Griswold

WPKlugescheid/er
Copy to: Docket
Chron.

8623

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
224 New Customhouse
Denver 2, Colorado

February 10, 1958

OFFICIAL FILE COPY
DMEA
RECEIVED FEB 13 1958

DATE	INITIALS	CODE
2/13	C	220
2/13	[illegible]	500

Memorandum

To: Chairman, Operating Committee, DMEA

From: Executive Officer, DMEA Field Team, Region III

Subject: Docket No. DMEA 4549 (Lead-Zinc-Copper) Kittimac Mining Company (Kittimac Mine) San Juan County, Colorado

Please refer to our letter to Mr. Bentley, dated January 13, 1958, which was written to him as suggested in your letter to the Executive Officer, dated January 6, 1958.

Enclosed are the original and one copy of Mr. Bentley's reply dated February 5, 1958. Will you please assist us in this matter by making a reply direct to Mr. Bentley or provide us with the information that will permit us to make a proper reply.

W. H. King

Enc.

Original file copy
DMEA
RECEIVED FEB 13 1958
DATE | INITIALS | CODE

DMEA
DEPARTMENT OF THE INTERIOR
FEB 10 1958
REGION III
DENVER, COLORADO

P.O. Box 541,
Silverton, Colorado.

February 5, 1958.

Mr. W. H. King,
Executive Officer, D.M.E.A.
Field Team, Region III.
224 New Customhouse,
Denver 2, Colorado.

Re: Docket No. DMEA 4549
Kittimac Mine, San Juan Co.,Colo.

Dear Mr. King:

You have requested that I inform you as to whether I would be willing to spend the time and money to prove legal possession of the Kittimac Mine. Inasmuch as I do not know what is required to satisfy your legal department, I do not know how to answer the question.

As to their questioning the title, I had Mr. Way answer the previous correspondence, feeling that an attorney, and also receiver for the property for 33 years and hence interested in the matter, could better satisfy your attorneys.

For my part, I feel there is no question about the title. On three occasions an attempt has been made to "jump" the claims. On all three occasions the District Court has ruled in favor of the Receiver. In my opinion, if the Courts hold that Mr. Way is in legal possession of the property, and the Court approves transfer of the title to me, which is the case, then I have a good and sufficient title. Since that time the assessment work has been performed for the current two years, which will establish the writer in possession of the property.

If Sam G. Martin were to have made legal discovery shafts or tunnels, and provided stakes for more than 70 claims, all within the few days when such work can possibly be done at an elevation of 11,500 to over 13,000 feet, he would necessarily have to employ a score or more men. In a small community such as Silverton, where the employment of even 3 or 4 men is cause for comment, such a working force would have rated excitement, and drawn the attention of the Receiver who would have had him ejected, as he has all others who made the same attempt. In Mr. Martin's case, the Receiver was not aware that anyone was employed on the property, and in any event in the quarter century

or more since Mr. Martin's death, none of the heirs, assigns or others have come forward to assert any right alleged to have been created by his act.

If your legal department can inform me as to what is required, I will be better able to judge my ability to meet the costs, and will furnish the data or request the application be withdrawn.

Very truly yours,

Walter W. Bentley.

Walter W. Bentley.

WWB.g

OFFICIAL FILE COPY
DMEA
RECEIVED FEB 13 1958
DATE | INITIALS | CODE

224 New Customhouse
Denver 2, Colorado

February 10, 1958

Mr. Walter W. Bentley
Kittimac Mining Company
P. O. Box 541
Silverton, Colorado

Re: Docket No. DMEA 4549
(Lead-Zinc-Copper)
Kittimac Mine
San Juan County, Colo.

Dear Mr. Bentley:

This will acknowledge receipt of your letter dated February 5, 1958, which is being forwarded to the Washington Office, DMEA, for their consideration.

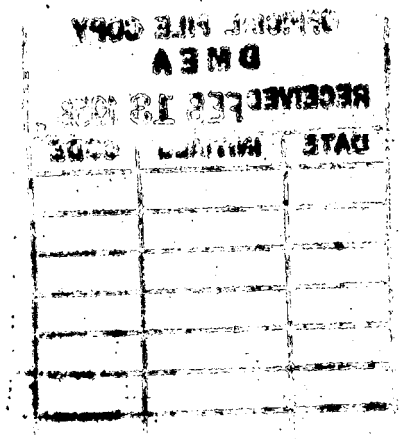
You may hear directly from them, or they may advise this office as to their legal requirements.

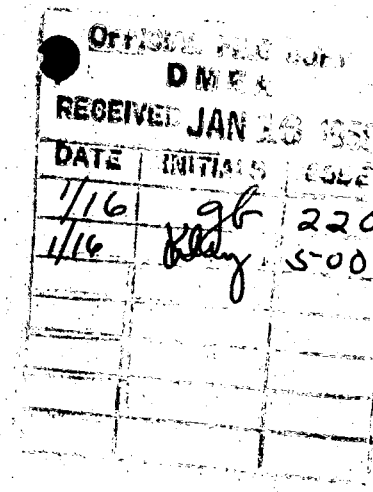
Very truly yours,

Original signed by
W. H. KING

W. H. King
Executive Officer, DMEA
Field Team, Region III

HMC:bh
cc: Chairman, Op. Comm. (2)
Harshman
DMEA/DFC
Docket
Chron.


ORIGINAL FILE COPY
DMEA
RECEIVED FEB 18 1982
DATE



224 New Customhouse
Denver 2, Colorado

January 13, 1958

Mr. Walter W. Bentley
Kittimac Mining Company
P. O. Box 541
Silverton, Colorado

Re: Docket No. DMEA 4549 (Lead-zinc-copper)
Kittimac Mine, San Juan County, Colorado

Dear Mr. Bentley:

Our Legal Division advises that Mr. William A. Ways' letter of December 2, 1957, does not clearly establish your legal right to possession of the property. There is also doubt as to whether Mr. Ways, after all these years, he, as Receiver, is still in Legal possession of the claims. There is some question as to whether the locations made by Sam G. Martin were valid. If they were, the subsequent sheriff's deed and any later deeds would also probably be valid.

It will be possible to continue to process your application when sufficient proof is offered that you are really in legal possession of the property to be explored.

Your application will be held in our active file for a reasonable period of time, if you should care to make the effort to properly investigate and gather the necessary data to prove you have legal possession of the property. Will you please advise this office, as soon as possible, if you are willing to spend the time and money to prove your sufficient interest in the land for a DMEA project.

Very truly yours,

Original signed by
W. H. KING

W. H. King
Executive Officer, DMEA
Field Team, Region III

HMC:eh

cc: Ch. Op. Comm. (2)
Harshman
DMEA/DFC
Docket
Chron.

OFFICIAL FILE COPY
DMEA
RECEIVED

DATE	INITIALS	CODE
1/7	gh	220
		500

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

January 6, 1958

Re: DMEA 4549; Pb-Zn-Cu; $39,781
Kittimac Mining Co.
Kittimac Mine
San Juan County, Colo.

Memorandum

To: W. R. Griswold, DMEA

From: O. M. Bishop, USBM

Subject: Review of Supplemental Report by Field Examiners, dated December 9, 1957 and transmitted by Field Team 12/27/57.

I consider the exploration program outlined in the Supplemental Report to be much superior to that proposed earlier in that the location of the winze is better and the level interval is such as to represent exploration rather than development.

In making the final winze site selection it seems there would be some advantage to placing the winze in the footwall and that provision should be made for a rope raise and some facility for handling muck as hoisted from the winze.

I recommend that a contract be prepared on the basis of the field teams recommendation.

O. M. Bishop

cc: Division of Minerals
Mr. Kiilsgaard
Mr. Lamb
Mr. Bishop
F I L E S

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
12/31	[illegible]	500
	[illegible]	500
1/3	[illegible]	130
/	[illegible]	110
3	[illegible]	100
		HP
1/6	[illegible]	220
/		500

JAN 6 1958 500

Mr. W. H. King, Executive Officer
DMEA Field Team, Region III
224 New Customhouse Building
Denver 2, Colorado

Re: Docket No. DMEA-4549 (Lead-Zinc-Copper)
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado

Dear Mr. King:

As requested, we have submitted Mr. Wm. A. Way's letter, dated December 2, 1957, to the legal division for their opinion as to the property rights existing on the cited project.

We are enclosing copies of a memorandum from the legal division, dated December 23, 1957, setting forth their conclusions concerning said property rights.

You will note that they endeavored to obtain the required information from the Bureau of Land Management here in Washington, but the records were incomplete. It may be possible to obtain sufficient data in Denver to either prove or disprove the validity of the property rights.

A suit to quiet title would probably take considerable time, even if the Applicant were willing to institute it. It is difficult to see how the lessors would be interested in such an expenditure of money.

Unfortunately, Mr. Way's letter does not establish proof of ownership in any way and is apparently based largely on hearsay.

It will therefore be necessary to inform the Applicant that we will not be able to continue processing the application until such time as sufficient proof is offered that it is really in legal possession of the property to be explored.

8623

We would be willing to let things rest for a reasonable period of time if the Applicant should care to make the effort to properly investigate and gather the necessary data. As we see it, there is at the present time no positive proof of ownership whatsoever. It would be difficult to imagine a more involved setup.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee (GCS)

Enclosures

APPROVED:

P. F. Yopes (GCS)
Member, Bureau of Mines

Thor H. Kiilsgaard (GCS)
Member, Geological Survey

WPKlugescheid/er 12/31/57
Copy to: Docket
Admr R File
Op. Committee
Mr. Bishop, USBM
Mr. Kiilsgaard, USGS
Chron.

IN REPLY REFER TO:

OFFICIAL FILE COPY
DMEA
RECEIVED JAN 3 1958

DATE	INITIALS	CODE
1/6		330
1/6		500

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

January 3, 1958
Re: DMEA 4549
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado
Applicant's Est. $50,381.22
Recommended Est. $39,781.00
Lead-zinc-copper

Memorandum

To: W. R. Griswold, Defense Minerals Exploration Administration

From: N. E. Nelson, U. S. Geological Survey

Subject: Review of Field Team Report

The applicant requested assistance in rehabilitating old mine workings, diamond drilling, winze sinking, and drifting in veins credited with the production of considerable ore.

The examiners recommended an alternative program and the Division office and Operating Committee still another program. The last proposal meets with the approval of the examiners and is recommended by them and the Field Team.

I concur with their recommendation.

N. E. Nelson

N. E. Nelson

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

224 New Customhouse
Denver 2, Colorado

December 27, 1957

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DMEA
RECEIVED DEC 30 1957

DATE	BY	CODE
12/30	C	220
1/3/58	WHK	130
1/6	C	220
1/6	King	500

Memorandum

To: Chairman, Operating Committee, DMEA

From: Executive Officer, DMEA Field Team, Region III

Subject: Docket No. DMEA 4549 (Lead-zinc-copper), Kittimac Mining Company (Kittimac mine), San Juan County, Colorado

Please refer to your memorandum of November 1 regarding the exploration program covered by the subject docket.

The field examiners have studied your letter and their report of October 8 and have accepted your suggestions. Enclosed are the original and two copies of a supplemental report prepared by the field examiners covering the matter. The engineers now recommend sinking of a winze on the vein to the depth of 210 feet. When the winze has been completed, they proposed 400 feet of drifting along the Isabella vein. They estimated that the cost of the program will be $39,781.00 and accordingly, the Government participation at 50 percent will be $19,890.50. The Field Team concurs in this recommendation.

Also enclosed are eight extra copies of Figure 3a for use in the contract.

W. H. King

Reviewed by
DMEA OPERATING COMMITTEE
1-3-58
(date)

IN REPLY REFER TO:

DMEA
DEPARTMENT OF THE INTERIOR
DEC 23 1957
REGION III
DENVER, COLORADO

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Defense Minerals Exploration Administration
Denver Federal Center
Denver, Colorado

DATE		
1/3/58	JB	130
		220

December 9, 1957

WHK
HMC

Memorandum

To: Executive Officer, DMEA Field Team, Region III
Through: E. N. Harshman

TRANSMITTED
DEC 27 1957

From: Carl Belser
W. N. Sharp

Subject: Docket No. DMEA 4549 (Lead-zinc-copper), Kittimac Mining Company (Kittimac mine), San Juan County, Colorado

SUPPLEMENTAL ON-SITE REPORT

The changes suggested by Washington in the recommended exploration program for the Kittimac mine, DMEA 4549, have been considered and are agreeable to the examining team. These changes are suggested in a letter dated November 1, 1957, to the Acting Executive Officer of Region III, from the Chairman, Operating Committee, DMEA, and amount to moving the location of the winze and increasing its length to 210 feet. Drifting at 200 feet depth will be northwestward along the "Kittimac" vein and proceed to the Isabella vein which continues to be the principal target.

A new site for the winze at the adit intersection on the "Kittimac" vein is agreeable. This site was recommended for consideration originally by the applicant because the site had been considered for a winze at an earlier date, and is partially prepared. However, a small amount of additional clearance work may be necessary to gain adequate room for a winze at this point.

Reviewed by
DMEA OPERATING COMMITTEE
1-3-58
(date)

A winze at this location on the "Kittimac" vein would be inclined at about 85° northeastward to follow the vein downward, and at the 200-foot level would have a horizontal offset of about 20 feet from the position on the adit level (fig. 3A).

Exploratory drifting will turn from the winze at the 200-foot level and continue northwestward along the "Kittimac" vein through and beyond the fault zone at "D" to substantial ground. At this point a crosscut northward will be driven to intersect the Isabella vein. The remaining footage allowed will be used in exploring the Isabella vein northwestward.

It is recommended that the fault zone at "D" be crossed directly by extending the drift along the "Kittimac" vein instead of crosscutting northward before crossing the fault zone as recommended by Washington. To cross the fault directly at the "Kittimac" vein intersection puts the operator in a relatively secure position beyond the fault. We know that the Isabella vein is north of this point.

To crosscut northward before passing the fault zone involves some uncertainties. The offset on the fault zone is not known and partly as a consequence, little is known about the vein represented at "H" and its relation to the mine geology. This vein may be an extension of the Caledonia vein, it may be the Isabella vein, or it may be a segment of an entirely different vein. To crosscut east of the fault appears likely to evolve two problems: (1) to locate the vein at "H" in the crosscut, which location may be farther north than

expected if the vein flattens in its dip, and (2) to determine after crossing the fault, at such point, the relative position of the Isabella vein.

Crossing the fault with the "Kittimac" drift appears to be the most logical approach to the Isabella vein. Unless unforeseen difficulties are encountered in locating the Isabella vein on the 200-foot level, the 400 feet of drifting allowed in the program should be adequate to explore the Isabella vein to a point in line with the station at "G".

This memo is supplemented with a revised copy of the Kittimac mine map, that shows the new winze location. Also included is a map that illustrates graphically all that can be determined about the diamond drilling performed at the property in 1956, about which Mr. Bishop seemed interested.

Estimated cost of modified program

This estimate is based on a two-stage exploration program that includes (Stage I) a 210-foot winze and (Stage II) 400 feet of drifting. A station will be made at the 200-foot level only, and drifting will turn from this point. A small amount of work is considered for rehabilitating the adit and providing adequate clearance for the headframe and working area at the winze site.

Estimated cost follows:

Stage I

Sinking winze on vein 210 feet. Minimum size 4 feet by 8 feet in the clear - 2 compartment. Time required 4 months.

Independent contracts

None

Labor and supervision

Mechanic 3 shifts at $24.00/shift	$ 72.00	
400 man shifts at $16.00/day	6,400.00	
Supervision 4 months at $600.00/mo.	2,400.00	
		$ 8,872.00

Operating material and supplies

Explosives	$ 460.00
Caps-wire (1,070 caps)	229.00
Bits 16 insert at $17.50 each	280.00
Stulls 1,200 feet at $0.40	480.00
Lumber 3,000 BM at $80.00	240.00
Hand tools	75.00
3,500 gals. diesel fuel at $0.19/gal.	665.00
140 gals. motor oil at $0.95/gal.	133.00
140 gals. compressor oil at $0.75/gal.	105.00
200 lbs. nails at $15.50/100	31.00
400 lbs. carbide at $10.00/100	40.00
Oil, gas, and repairs, 2 jeeps 4 months at $100.00/mo.	400.00

2 fuel pumps at $20.00 each	$ 40.00	
5 sets fuel and oil filters at $5.40 each	27.00	
2 percent tax	64.10	
		$ 3,269.10

Operating equipment

Rentals

Compressor 4 months at $561.00/mo.	$ 2,244.00
Air trammer 4 months at $150.00/mo.	600.00
Hoist 4 months at $100.00/mo.	400.00
Pump 4 months at $100.00/mo.	400.00
Ventilation fan 4 months at $75.00/mo.	300.00
2 sinker drills, complete, 4 months at $150.00/mo.	600.00
2 jeeps 4 months at $60.00/mo.	240.00
Freight	100.00
	$ 4,884.00

Purchases

1 sheeve wheel	55.00
1 mine bucket	100.00
300 feet hoisting cable at $32.60/100	97.80
200 feet ventilation tubing at $1.00/ft.	200.00
400 feet 2-inch air line at $0.59/ft.	236.00
200 feet 1-inch pipe at $0.265 per ft.	53.00

4 - 2" unions at $2.70 each	$ 10.80	
2 - 2-inch TS at $1.80 each	3.60	
2 - 2-inch valves at $13.50 each	27.00	
6 - 2-inch to 1-inch reducing bushings at 39¢ each	2.34	
2 percent tax	15.71	
	$ 801.25	
Total operating equipment		$ 5,685.25

Rehabilitation and repairs (Repair air line and track in main adit as follows:)

Labor (extra)	$ 200.00	
Operating material		
1,200 feet 2-inch pipe at $0.59/ft.	$ 708.00	
4 - 2-inch 45 s at $1.50 each	6.00	
3 - 2-inch unions at $2.70 each	8.10	
2 - 2-inch Ts at $1.80 each	3.60	
1 - 2-inch valve at $13.50 each	13.50	
3 - 2-inch to 1-inch reducing bushings at $0.39 each	1.17	
4 - 1-inch valves at $2.85 each	11.40	
1-1/2 ton 30 lb. rail at $260.00/ton	390.00	
20 pairs 30 lb. rail splices at $1.35/pr.	27.00	
1 track bolt wrench at $2.95	2.95	
100 lbs. track spikes at $21.00/100	21.00	

50 lbs. track bolts at $0.34/lb.	$ 17.00	
1 - 30-lb. track switch	50.00	
1 rail bender	65.00	
60 ties at $0.65 each	39.00	
2 percent tax	27.27	
Total operating material	$ 1,390.99	
Total rehabilitation and repairs		$ 1,590.99
New buildings, installations, improvements		
Labor (on headframe)	$ 200.00	
Timber and iron (headframe)	200.00	
Total headframe		$ 400.00
Miscellaneous		
Bookkeeping 4 months at $50.00/mo.	$ 200.00	
Payroll taxes, workmen's compensation and liability insurance 7% of $9,472.00	663.04	
		$ 863.04
Total estimated cost including sinking		$20,680.38
Less cost of headframe, track, and air line repair		$ 1,990.99
Estimated cost of 210 feet of sinking (only)		$18,689.39
Estimated cost per foot $89.00		
20 samples for Au, Ag, Pb, Cu, Zn at $6.00 each		$ 120.00
Total cost of Stage I		$20,800.38

Stage II

Drifting 400 feet of 5-foot by 7-foot drift on 200-foot level. Time required 4 months.

Independent contracts

None

Labor and supervision

400 man shifts at $16.00/day	$ 6,400.00	
Supervisor 4 months at $600.00/mo.	2,400.00	
Surveyor 6 days at $50.00	300.00	
Total labor and supervision		$ 9,100.00

Operating material and supplies

Explosives (2,400 lbs.)	$ 576.00	
Caps and fuse	368.00	
24 insert bits at $17.50 each	420.00	
2,400 gal. diesel fuel at $0.19/gal.	456.00	
80 gal. motor oil at $0.95/gal.	76.00	
80 gal. compressor oil at $0.75/gal.	60.00	
Oil, gas, repairs, 2 jeeps 4 months at $100.00/mo.	400.00	
400 lbs. carbide at $10.00/100	40.00	
2 percent tax	47.92	
		$ 2,443.92

Operating equipment

Rentals

Compressor 4 months at $561.00/mo.	$ 2,244.00
Air trammer 4 months at $150.00/mo.	600.00

Hoist 4 months at $100.00/mo.	$ 400.00	
Mucking machine 4 months at $275.00/mo.	1,100.00	
Pump 4 months at $100.00/mo.	400.00	
Ventilation fan 4 months at $75.00/mo.	300.00	
2 jeeps 4 months at $60.00/mo.	240.00	
	$ 5,284.00	
Purchase		
400 feet ventilation pipe at $1.00/ft.	$ 400.00	
4,200 lbs. - 16 pound rails at $260.00/ton	546.00	
100 lbs. track spikes at $21.00/100	21.00	
50 track splices and bolts at $0.50 each	25.00	
100 track ties at $0.50 each	50.00	
2 percent tax	20.84	
	$ 1,062.84	
Total operating equipment		$ 6,346.84
Rehabilitation and repairs		
None		
New buildings, improvements, installations		
None		
Miscellaneous		
Bookkeeping 4 months at $50.00/mo.	$ 200.00	
Payroll taxes, workmen's compensation and liability insurance 7% of $9,300.00	651.00	
		$ 851.00

Total estimated cost for 400 feet of drifting	$18,741.76
Estimated cost per foot $46.85	
40 chemical analyses for Au, Ag, Pb, Zn, Cu at $6.00 each	240.00
Total estimated cost of Stage II	$18,981.76
Total estimated cost of program	$39,782.14

Recapitulation

Stage I

Sinking 210 feet at $89.00/ft.	$18,690.00
Constructing headframe	400.00
Repairing track and air line	1,591.00
20 chemical analyses for Au, Ag, Pb, Zn, Cu at $6.00 each	120.00
Total estimated cost of Stage I	$20,801.00

Stage II

Drifting 400 feet at $45.85/ft.	$18,740.00
40 chemical analyses at $6.00 each	240.00
Total estimated cost of Stage II	$18,980.00
Total estimated cost of program	$39,781.00
Government participation 50 percent or	$19,890.50
Time for completion, 8 months	
(Machinery rentals total $10,168.00)	

for H. M. Connors
Carl Belser, Mining Engineer

W. N. Sharp
W. N. Sharp, Geologist

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SOLICITOR
WASHINGTON 25, D. C.

DEC 23 1957

MEMORANDUM

TO: Administrator, DMEA
ATTENTION: Director, Division of Base Metals

FROM: Associate Solicitor, Division of Mineral Resources

SUBJECT: Property Rights of the Kittimac Mining Company, Kittimac Mine, San Juan County, Colorado, Docket No. DMEA-4549 (Lead-Zinc-Copper)

We are in agreement with the opinion expressed in your memorandum of December 11, 1957. Mr. William A. Way's letter of December 2, 1957, does not clearly establish applicant's legal right to possession of the property. Mr. Way's letter raises considerable doubt as to whether, after all these years, he, as Receiver, is still in legal possession of the claims; also, there is some question as to whether the second locations made by Sam G. Martin were valid. If they were, the subsequent sheriff's deed and any later deeds would also probably be valid.

In an attempt to expedite matters, we searched the local records of the Bureau of Land Management to determine the status of the two patent applications. Unfortunately, these records are not complete enough to be of assistance. In all probability, the Denver office of the Bureau of Land Management contains the necessary information.

Regardless of what information is obtained from Bureau of Land Management records, there is little likelihood of ever determining whether the ground was located by third parties during the periods that assessment work was not performed. From Mr. Way's letter it appears that no assessment work was performed for several years immediately prior to the commencement of work by the contract applicant. In the absence of more complete information from the applicant or his lessor, it would appear that a suit to quiet title would be the most expeditious manner of removing the defects which apparently exist.

Robert P. Dwyer

[illegible] must invariably be used by the Office Cadastral Engineer in advising the General Land Office and [illegible] local land office of the approval of a mineral survey. *Paragraphs 37 and 147, Mining Regulations, approved May 21, 1907*

Department of the Interior

PUBLIC SURVEY OFFICE

at Denver, Colorado,

, 1931.

The Hon. Comm. *of the* General *Land Office.*

Sir: I have to advise [illegible] on [illegible] 1931 approved the following described mineral survey:

[illegible] 20403 name and area of claim Bear lode 20.661 acres

Bear No. 1 lode	[illegible] acres	Bear No. 2 lode	20.661 acres;
Bear No. 3 lode	[illegible] acres	Bear No. 4 lode	20.661 acres;
Bear No. 5 lode	[illegible]	Bear No. 6 lode	20.661 acres;
Bear No. 7 lode	[illegible] acres	Bear No. 8 lode	20.661 acres;
Bear No. 9 lode	[illegible] acres	Bear No. 10 lode	20.661 acres;
Bear No. 11 lode	20.661 acres;	Bear No. 13 lode	20.661 acres;

Name and survey number of each approved mineral survey with which actually in conflict, as conflicting claims are actually marked, defined, and established on the ground: Surs. Nos. 14544 Home No. 1; Home No. 2; Wanda; [illegible] No. 1; Midnight Sun No. 2; Midnight Sun No. 3; Aurora; Aurora No. [illegible]; Monitor No. 3; Monitor No. 4; Monitor No. 5; Monitor No. 6; Monitor [illegible]; Monitor No. 9; Monitor No. 10; Monitor No. 11; Monitor No. [illegible]; [illegible]; London; Caliber; Caliber No. 1; Caliber No. 2; Caliber [illegible]; Little Joe; Pursur; St. Louis; Isabella; Isabella No. [illegible]; Isabella No. 3; Isabella No. 4; Isabella No. 5; Detroit; New [illegible] and Liverpool and 15304 Mountain Eagle lodes,

Applicant for survey (name and address) Samuel J. Martin, c/o C. N. Leeme, 104 Interstate Trust Bldg., Denver, Colorado.

Survey made by [illegible] Anderson, Mineral Surveyor

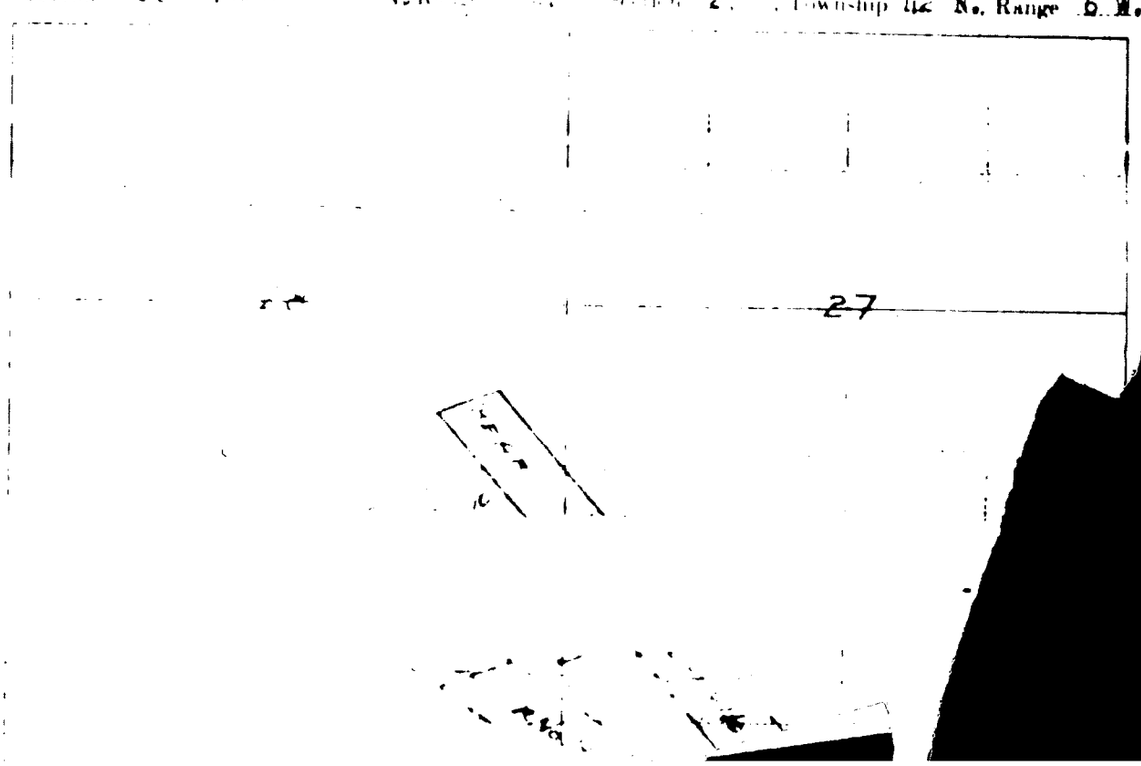
Legal subdivision [illegible] upon surveyed lands [illegible] by the survey and as shown on the public survey diagram following [illegible] with respect to the lines of the public surveys as [illegible] actually marked, defined and established on the ground, the words and figures [illegible] and distances being omitted.

Suspended [illegible], R. 6 W. of the [illegible] M.

NOTE. [illegible] whether or not there are any conflicting approved mineral surveys [illegible] upon the sketch.

Approximately Section 28 Township [illegible] N. Range [illegible]

Approximately Section 27 Township 42 N. Range 6 W.



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DMEA Form 7
(12-56)

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December 11, 1957

Memorandum

To: Associate Solicitor, Division of Minerals Resources

From: Director, Division of Base Metals

Subject: Property Rights of the Kittimac Mining Company, Kittimac Mine, San Juan County, Colorado, Docket No. DMEA-4549 (Lead-Zinc-Copper)

There is considerable doubt as to whether the Applicant really is in possession of the land on which aid has been requested for exploration.

We requested proof of ownership of the claims by the lessor and Mr. Harshman forwarded a letter, dated December 2, 1957, from an attorney, Mr. Wm. A. Way, concerning the matter.

We would like to have your opinion as to whether this letter proves anything, and also your advice concerning any further procedure on our part. We fail to see where this letter contains any proof that the property is really legally held by the Applicant. The lease may be all right but maybe the lessor has no rights on which to base an agreement.

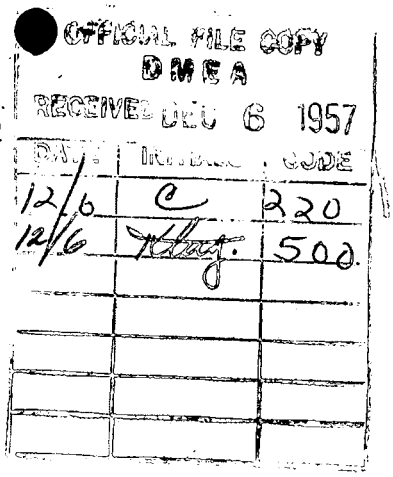
W. R. Griswold

WRG/er
Copy to: Docket
Chron.

8623

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
224 New Customhouse
Denver 2, Colorado

December 4, 1957



Memorandum

To: Chairman, Operating Committee, DMEA

From: Executive Officer, DMEA Field Team, Region III

Subject: Docket DMEA-4549 (Lead-Zinc-Copper) Kittimac Mining Co. (Kittimac mine) San Juan County, Colorado

Enclosed are the original and one copy of an unsigned letter on the stationery of William A. Way, Attorney at Law, Silverton, Colorado, which is in reply to our letter to the Applicant, dated November 7, 1957.

It appears to us that the enclosed letter does not supply the documentary proof of ownership we requested in accordance with your letter to us, dated November 1, 1957.

Will you please advise if the enclosed letter is acceptable to the legal division.

W. H. King

Enclosure

DMEA
DEPARTMENT OF THE INTERIOR
DEC 3 - 1957
REGION III
DENVER, COLORADO

WWK
HNH

WILLIAM A. WAY
ATTORNEY AT LAW
SILVERTON, COLO.

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DMEA
RECEIVED DEC 6 1957
DATE | INITIALS | CODE

December 2, 1957.

X

Mr. E. N. Harshman,
Acting Executive Officer,
Defense Minerals Exploration Administration,
224 New Customhouse,
Denver 2, Colorado.

Re: Docket No. DMEA 4549 (Lead-Zinc-Copper)
Kittimac Mines, San Juan County, Colorado.

Dear Mr. Harshman:

I have before me your letter of November 7th addressed to Mr. Walter W. Bentley of this place and relative to the above named property, and in answer thereto will say that on August 15, 1910, the Minnie Gulch Mining and Tunnel Company conveyed to the Kittimac Mines Company of Arizona all of the above property by deed recorded in Book 144 at page 90 of the records in the office of the County Clerk and Recorder of San Juan County, Colorado. There were a few additional claims included in this deed but that of course is immaterial for your purposes.

A few years later, the Kittimac Mines Company of Arizona, the Kittimac Mines Company of Wyoming and the Kittimac Mine and Mill Company were all made defendants in a suit brought by Joseph Bordeleau in the District Court of this County, same being numbered 1401, and incidental to such action, Mr. H. E. Curran was appointed Receiver. Later on, Mr. Curran died and I was appointed as Receiver of the property involved, which includes the mining claims mentioned in your letter.

Naturally the sale of mining property --especially a large group like this one-- was difficult to bring about. Several options have been given under which perhaps $30,000 or $40,000 worth of work was done (in fact I think there was more than that amount of work done by the different option holders) but no sale of the property has resulted. During a good many of the years I have held possession of the property as Receiver, it was possible to file declarations of intent and where this could be done, it was done. At this time, I do not remember the years in which such declarations were filed, and the affidavit of labor were not always filed, even during the years when the work was actually performed. The last affidavit of labor, however, was filed last year by Mr. Bentley, who has been working the property for the past two years.

DMEA
DEPARTMENT OF THE INTERIOR
DEC 3 - 1957
REGION III
DENVER, COLORADO

WHK
HMC

WILLIAM A. WAY
ATTORNEY AT LAW
SILVERTON, COLO.

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RECEIVED DEC 6 1957
DATE | INITIALS | CODE

December 2, 1957.

Mr. E. N. Harshman,
Acting Executive Officer,
Defense Minerals Exploration Administration,
224 New Customhouse,
Denver 2, Colorado.

Re: Docket No. DMEA 4549 (~~Lead-Zinc-Copper~~)
Kittimac Mines, San Juan County, Colorado.

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WILLIAM A. WAY
ATTORNEY AT LAW
SILVERTON, COLO.

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RECEIVED DEC 6 1957
DATE

Now as to the connection of Samuel G. Martin with this group, I might say that he was the original locater and promoter of the group. He sold the property to the Minnie Gulch Mining and Tunnel Company and the Minnie Gulch Company made the application for patent, as stated in your letter. I have no abstracts of title on any of these claims, but it is my understanding that the Minnie Gulch Mining and Tunnel Company was divested of all title by the deed I mentioned above and that the Kittimac Mines Company of Arizona has any and all rights the Minnie Gulch Company had before. The Minnie Gulch Company has long been defunct and as far as I know it has no property standing in its name.

In 1929, Mr. Martin was General Manager of a mining company called the Treasure Mountain Gold Mines and Power Company which afterwards lost all its property to a group of creditors, some of whom I represented in the different actions that were brought, and some time later, Mr. Martin died. His estate has never been administered, as far as is known, and in any event no work was ever done on the so called Bear group by anyone. At the time he located this group, I knew nothing about it, but I am quite certain that the necessary work was not done as there would have been current reports among the people of the town as to the work being done in this locality. There was no watchman at the property and Mr. Martin evidently located the ground and adopted the work done by the Kittimac people as being the work he intended to apply on the patent application. He was joined as a defendant in the suit brought against the Treasure Mountain Gold Mines and Power Company and in that way the creditors of the Treasure Mountain Gold Mines and Power Company acquired a Sheriff's deed to his interest in the Bear Group. These creditors and their trustee were not interested to any extent in the unpatented claims and when they finally sold the property, they were many years in default as to the performance of annual labor. In addition to this, the original location was void for the reason that no application was made to the Court for permission to locate the ground then in the possession of the Court through its Receiver. This matter came up later in [illegible] actions where this precise question was involved and that has been the holding of three different District Judges in the District Court here, so I think the matter is well covered by the subsequent actions taken. Without a valid location having been made, the old Minnie Gulch Mining and Tunnel Company title and its successors in interest will stand and the property has never been abandoned and was as well protected as it could be under the cirdumstances.

There have been a few attempts made to jump these claims, or some of them, at different times. When I knew of these attempts, I have taken appropriate court action to protect them and have been successful

WILLIAM A. WAY
ATTORNEY AT LAW
SILVERTON, COLO.

in all of these actions. The Court (regardless of who was the Judge) has found these trespassers guilty of comtempt of court in their attempts to seize the ground. I did not bring Mr. Martin into Court and have a similar adjudication as to him, for the reason above stated, that I knew nothing about his locations and while I knew he was locating a large number of claims there was nothing in the certificates or any current gossip to inform me that he was trespassing on the Kittimac ground. Whatever enchoate rights he might have believed he had, were abandoned years ago. The creditors of the Treasure Mountain Gold Mines and Power Company never expended any money on these claims and they were only names to them, as I happen to personally know, but none of the unpatented claims had any value to the creditors and they were probably turned over to the buyer of the patented claims as a sort of bonus for this reason. The purchasers, however, have not interfered with my possession of the claims and if they had I would have taken the same action that was taken against the other trespassers.

I trust this gives you an understanding of the situation. I b elieve the property is in the same position it was when the first Receiver was appointed and when I was appointed, and that I have control of it. An order has been entered by the District Court directing the sale of this property in all of the proceedings where a sale was attempted and I hope a sale can be consummated. The creditors, of course, do not want the group of mining properties, but as far as the selling price will suffice, they are anxious to have something paid on their claims. There is no possibility of the full amount of the claims being received for the property and the old companies have no equity in it, regardless of their claims among themselves.

Very truly yours,

Wm. A. Way.

WAW.b
CC: Mr. Walter W. Bentley.

224 New Customhouse
Denver 2, Colorado

11/12 C 220
11/12 WRK 500

November 8, 1957

Memorandum

To: E. N. Harshman) W/enclosures
DMEA/DFC Att: Carl Belser)

From: DMEA Field Team, Region III

Subject: Docket No. DMEA 4549 (Lead-Zinc-Copper) Kittimac Mining Company (Kittimac Mine) San Juan County, Colorado

Enclosed is a copy of a letter on the subject docket from the Chairman of the Operating Committee dated November 1, 1957, and attached memoranda of review of field examination report by O. M. Bishop and W. P. Williams.

Please review items two and three of the enclosed letter and forward your joint recommendations to this office so that we may reply to the Chairman.

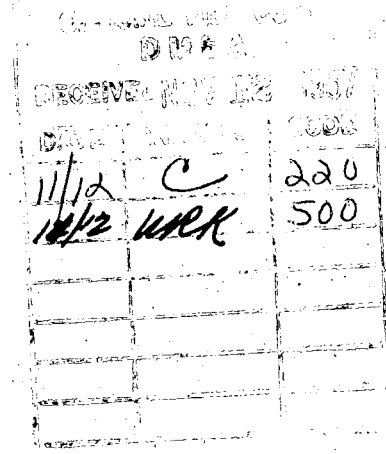
E. N. [illegible]

E. N. Harshman
Acting Executive Officer

Enclosures

HMC:eh

cc: Sec. Op. Comm. (2)
Docket
Chron.



224 New Customhouse
Denver 2, Colorado

November 7, 1957

Mr. Walter W. Bentley
Kittimac Mining Company
P. O. Box 541
Silverton, Colorado

Re: Docket No. DMEA 4549 (Lead-zinc-copper)
Kittimac Mine, San Juan County, Colorado

Dear Mr. Bentley:

Records in the Bureau of Land Management show the following claims were surveyed in November 1900 for the Minnie Gulch Mining and Tunnel Company; were assigned Mineral Survey No. 14544, but did not go to patent:

Home, Home No. 1, Home No. 2, Midnight Sun No. 1, Midnight Sun No. 2, Midnight Sun No. 3, Little Joe, Aurora, Aurora No. 1, Monitor No. 3, Monitor No. 4, Monitor No. 5, Wanda, Camilla, Pursur No. 2, Racine, Pursur No. 1, Michigan, Pursur, Detroit, Caliber, Caliber No. 1, Monitor No. 6, Isabella, Monitor No. 7, Isabella No. 1, Monitor No. 8, Isabella No. 2, Monitor No. 9, Isabella No. 3, Monitor No. 10, Isabella No. 4, Monitor No. 11, Isabella No. 5, Monitor No. 12, Isabella No. 6, Monitor No. 13, Isabella No. 7, Monitor No. 14, Isabella No. 8, Kalamazoo, Grand Rapids, Ann Arbor, Caliber No. 4, Caliber No. 2, Caliber No. 3, New York, Chicago, London, Liverpool, Paris, Globe, Berlin, Baltimore, St. Louis, Boston, Denver, Pittsburgh, Durango, Helena, Lake City and Silverton Lodes

Apparently the annual assessment work was not kept up and Samuel G. Martin staked the Bear Claims through the Minnie Gulch and Tunnel Company Claims. These Bear Claims were surveyed in July 1929 and received Mineral Survey No. 20403, but did not go to patent.

Before further processing of your application can take place, it will be necessary that you supply documentary proof that the claims as listed above under Mineral Survey No. 14544 actually confer ownership of the ground involved, and that the Bear Claims listed under Mineral Survey No. 20403, in which you profess no interest, are not the valid ones.

Please advise the last year that a notice of the completion of annual assessment work was filed on the Bear Claims; also the last year prior to 1929 that a notice of completion of annual assessment work was filed on the claims covered by Mineral Survey No. 14544.

E. N. Harshman

E. N. Harshman
Acting Executive Officer

HMC:eh

cc: Ch. Op. Comm. (2)
Harshman
DMEA/DFC
Docket 4549
Chron.

DMEA Form 7
(12-56)

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Date	Surname	Code
10/31	[signature]	500
	[signature]	500
11/1	[signature]	130
11/1	[signature]	110
	[signature]	~~100~~
		~~HB~~
11/4	[signature]	225
		500

500

Mr. E. N. Harshman
Acting Executive Officer
DMEA Field Team, Region III
224 New Customhouse Bldg.
Denver 2, Colorado

NOV 1 1957

Re: Docket No. DMEA-4549 (Lead-Zinc-Copper)
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado

Dear Mr. Harshman:

We refer to your memorandum, dated October 11, 1957, and the "Joint Engineering and Geologic Report" by W. N. Sharp, Geological Survey, and Carl Belser, Bureau of Mines, dated October 8, 1957.

After a careful study of all the data at hand we would like to bring the following matters to your attention:

1. We have discussed the problem of property rights with our legal division and they state that it will be necessary for Mr. Bentley to supply documentary proof that the claims listed under Survey No. 14,544 actually confer ownership of the ground involved, and that those claims listed under Survey No. 20,403, in which Mr. Bentley has no interest, are not the valid ones. If it is true, as you mentioned in your memorandum, that assessment work was not continued on the optioned claims, it could mean that none of the claims under said Survey No. 14,544 are valid. This matter is of paramount importance and must be cleared up before any further processing of the application can take place. We quite agree that only those claims covered by Mineral Survey No. 14,544 would be of value for the proposed project.

Will you kindly contact Mr. Bentley and clear up the question of property rights as soon as possible.

8623

2. DMEA does not participate in projects which would strictly fall within the classification of development. A winze sunk only 110 feet would permit only a single level interval and would certainly fall in this category. Upwards of 200 feet of sinking would give a better basis for a true exploration project. If the location of the winze were changed to the intersection of the adit with the Kittinac Vein drift, the extra sinking could be done with the funds which are at present allotted to rehabilitation. We try to avoid all rehabilitation we possibly can as we do not consider it as within the scope of our work in most cases. The location of the winze as proposed, practically under the old stope which is broken to the surface, is far from desirable and the tramming and maintenance difficulties and costs would be increased. If there is a certain amount of water to be disposed of from the western end of the workings, this can be done by constructing a small bulkhead near the intersection with the adit, and the water could then be piped out to the surface or into a ditch.

The advance per day given for the sinking operation is only 1.4 feet and this is very little even for one shift operation. The really large item of cost given for all of the work is the equipment rental and with two shift operation this would decrease greatly on a cost per foot basis. The cost of timber given for the winze is $3.64 per foot and we doubt very much if this would be sufficient. There was no method of timbering or size of proposed timber given but for a nearly vertical or vertical winze it would have to be of sufficient size to insure safety.

3. The four hundred feet of drifting and some crosscutting could be very productive of results if carried on at a depth of about 200 feet below the present level. We would suggest drifting on the Kittinac vein for some distance to the west and then crosscutting to the other vein to the north at approximately the position "C" on Fig. 3. Then drift on the north vein through the fault some, crosscut to the Isabella vein on the west side of the fault and then drift on this vein to the west. In this way we would be doing the maximum amount of useful work and, should the ore continue to this depth, we would be delineating a considerably greater ore reserve.

The cost of drifting as presented by the Field Team is $45.88 per foot. This is somewhat high for this district as most costs in the past have been between $35.00 and $40.00 per foot including the cost of hoisting. The advance per day is about 4 feet on the basis of one shift operation.

We are enclosing copies of memoranda dated October 17 and 22, 1957, by W. P. Williams, Geological Survey and O.M. Bishop, Bureau of Mines, respectively, relating to the project for your information. You will note that Mr. Bishop also disagrees with the proposed location of the winze. Diamond drilling in this case would be very helpful if the rock were not so badly fractured as to make it of little value.

Some preparatory expense will probably be necessary in order to put the adit in readiness. The property certainly looks promising and interesting and we hope that some mutually acceptable plan of exploration may be evolved soon so that we may proceed with the processing of a proposed contract.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee (GCS)

Enclosures

APPROVED:

P. F. Yopes (GCS)

Member, Bureau of Mines

Thor H. Kiilsgaard (GCS)

Member, Geological Survey

W.P.Klugescheid/er 10/31/57
Copy to: Docket
Admr R File
Op. Committee
Mr. Bishop, USBM
Mr. Kiilsgaard, USGS
Chron.

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OCT 22 1957
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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

October 22, 1957

Re: DMEA 4549; Cu-Pb-Zn;
$43,910
Kittimac Mining Company
Kittimac Mine
San Juan County, Colo.

Memorandum

To: W. R. Griswold, DMEA

From: G. M. Bishop, USBM

Subject: Review of field examiner's report of 10/8/57 on application

A mile east of the Animas River and between Edith and Minnie Gulches in the Silverton quadrangle, Colorado, the northwesterly striking Isabella and Caledonia veins intersect to form an ore-shoot that has been stoped from the Little Joe adit level over 200 feet to the surface. The applicant proposes to rehabilitate 300 feet of drift, cutting sill samples; and to explore the veins below the adit level by 150 feet of winzing. The applicant estimated the total cost of his proposal at $50,381.22.

The DMEA field team concurs that development of ore below the adit level is justified, but modifies the proposal with a recommendation that limits the winze to 110 feet of depth and adds four hundred feet of drifting from the winze on the 100-foot level. Costs were estimated at $43,910.63.

In reviewing both the application and the field recommendation, I have questioned whether the work proposed is exploration. The applicant and the field team seem amply satisfied that the structure cut by the adit level is ore at the sill. Since the ore above the level has been extracted the next step in mining is to develop another level at the proper level interval to permit stoping. Such work is preponderantly development - not exploration, and that is the work proposed.

If the program is determined by DMEA to fit its definition of exploration and the work outlined is undertaken it might be well to consider another location for the winze. The site indicated by

the applicant and field team has the disadvantage that it requires rehabilitation of 300 feet of drift at a cost of $12,266 in order to put the winze at the far end of the ore shoot previously mined. This cost might be avoided by placing the winze in the footwall near the intersection of the Little Joe adit with the Kittimac vein. Not only would this save $12,000, but it would place the winze under unmined ground and reduce tramming and servicing costs.

In general the assay data on the stope backs represented by samples 401 to 416 and on the sill represented by samples 25-38 indicate mineable ground providing the operation is properly financed and well run and the ore proves amenable to concentration with good recoveries.

The sample data presented relative to the Syndicate diamond drilling indicates careless work. The location of the holes is not indicated, and the fact that results from Hole 2 were lost and that neither logs nor core were saved from any hole suggests certain gross inadequacies.

I recommend that the application be denied in its present form and that consideration be given to contract diamond drilling from one or more drill stations of the Little Joe crosscut adit. Such holes should be able to explore the section between A and E both above and below the level.

for O. M. Bishop

Copy to: Division of Minerals
Mr. Killsgaard
Mr. Lamb
Mr. Bishop
F I L E S

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

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DMEA
IN REPLY REFER TO:
RECEIVED OCT 18 1957

DATE	INITIALS	CODE
10/18	C	220
10/18	Ktag	300

Memorandum

October 17, 1957

To: W. R. Griswold, Defense Minerals Exploration Administration

From: W. P. Williams, U. S. Geological Survey

Subject: Review of field examination report, DMEA 4549 (copper, lead, zinc), Kittimac Mining Co., Kittimac mine, San Juan County, Colorado.

The examining team report that geologic conditions at the Kittimac mine are favorable for undiscovered base metal ore deposits. They show that several veins in the area are well mineralized, strong and persistent. The Isabella and Caledonia veins have been mined in part; and both show good ore-grade material. The width and grade of the veins are good, by mining standards. The ore deposits are expected to become better with depth as the Burns latite, the main producing unit in the district, is approached and entered.

The examining team recommend approval of a DMEA contract that would provide for mine rehabilitation, winzing, and drifting at a total estimated cost of $43,911. I agree with the recommendations of the Field Team, for the main reason that the proposed project appears to have a good chance for success.

W. P. Williams

W. P. Williams

Explanation of [illegible]
applied [illegible]
by Field Team

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
224 New Customhouse
Denver 2, Colorado

October 11, 1957

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DATE	INITIALS	CODE
10/14	C	220
10/16	JB	130
10/17	C	220
10/19	Klug	500

Memorandum

To: Secretary to the Operating Committee, DMEA

From: DMEA Field Team, Region III

Subject: Docket DMEA-4549 (Copper-Lead-Zinc) Kittimac Mining Company (Kittimac mine) San Juan County, Colorado - Joint Report of Examination

Enclosed are the original and two copies of a Joint Engineering and Geologic Report by William N. Sharp, USGS, and Carl Belser, USBM.

We note that the John M. French Placer and the Forest Queen claims 6 to 10 inclusive are approximately two miles from the group of claims on which DMEA work is recommended. The whereabouts of the following in the court list of claims is not shown on the Applicant's map or in the records of the Bureau of Land Management:

x Slide	x Forest Queen
x Slide No. 1	x Forest Queen No. 1
x Iron	x Forest Queen No. 2
x Iron No. 1	x Forest Queen No. 3
x Iron No. 2	x Forest Queen No. 4
x Iron No. 3	x Forest Queen No. 5
x Iron No. 4	x Forest Queen No. 11
x Iron Dump	x Monitor
x Iron Age	x Monitor No. 1
Fountain	x Monitor No. 2

Records in the Bureau of Land Management reveal that the group of claims where exploration is recommended was assigned Mineral Survey No. 14544 but did not go to patent. Apparently assessment work was not continued on these claims, and the Bear group of claims was located covering much of the same area as shown [illegible] the Connecting Sheet of Sec. 34, T. 42 N., R. 6 W., two copies of w[illegible]h are enclosed. The Bear group was assigned Mineral Survey No. 20403 [illegible] did not go to patent.

R[illegible] by
DMEA O[illegible] CO[illegible]
10-16-57

The Applicant's claims in the proposed exploration area are in conflict with the Bear claims, as follows:

Mineral Survey No. 14544

Applicant's claims	Discovery date
Midnight Sun No. 1	July 21, 1900
Midnight Sun No. 2	October 1, 1900
Little Joe	May 25, 1896
Aurora	August 4, 1896
Monitor No. 3	September 12, 1900
Monitor No. 4	October 1, 1900

Mineral Survey No. 20403

Samuel G. Martin claims	Discovery date
Bear	April 11, 1929
Bear No. 9	April 15, 1929
Bear No. 10	April 14, 1929
Bear No. 11	April 14, 1929
Bear No. 13	April 14, 1929

The Field Team recommends DMEA aid as outlined in the report of examination, provided the Legal Division believes the Applicant has a sufficient interest in the land. While some advantage might result by subordinating the entire group of claims as recommended in the report of examination, we believe that the Government's interest would be protected by subordinating only those claims covered by Mineral Survey No. 14544, which are shown as the east group of claims on Figure 4 of the report of examination.

Enclosed are nine copies each of Figures 3 and 4 for possible use in the contract.

E. N. Harshman

By E. N. Harshman
Acting Executive Officer

Enclosures

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DMEA
RECEIVED OCT 14 1957

DATE	INITIALS	CODE
10-16	JB	130
		220

DMEA
DEPARTMENT OF THE INTERIOR
OCT 9 - 1957
REGION III
DENVER, COLORADO

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION III

ON SITE REPORT.

DMEA 4549

Kittimac Mining Company

Kittimac Mine

San Juan County, Colorado

Copper-lead-zinc

Joint Engineering and Geologic Report

by

William N. Sharp, Geologist
Geological Survey

Carl Belser, Mining Engineer
Bureau of Mines

Reviewed by
DMEA OPERATING COMMITTEE
10-16-57
(date)

October 8, 1957

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DMEA 4549

KITTIMAC MINING COMPANY
KITTIMAC MINE
SAN JUAN COUNTY, COLORADO

INTRODUCTION AND SUMMARY

Walter W. Bentley, d.b.a. Kittimac Mining Company, P. O. Box 541, Silverton, Colorado, on November 17, 1956, submitted an application to Defense Minerals Exploration Administration for aid in a copper-lead-zinc exploration project on six patented claims and 78 unpatented claims in sections 27, 28, 31, 32, 33, 34, and 35, T. 42 N., R. 7 W., NMPM, Minnie Gulch, San Juan County, Colorado. The application called for rehabilitation and sampling of the Isabella and Caledonia drifts to the northwest, crosscutting 50 feet, and sinking 150 feet at a total cost of $50,381.22.

The property was inaccessible until early in July and a field examination was made on July 29, 1957.

Two important veins, the Isabella and the Caledonia, appear to junction in the western part of the mine. Most of the production has been from the area of intersection above the adit level. The total production from the mine amounts to about 25,965 tons of ore valued at $405,395. $15.61/ton.

The examining team believes that the ore zone merits exploration below the adit level and recommends that the adit be cleaned of the cave and that exploration consisting of 110 feet of winze sinking and 400 feet

of drifting on the 100-foot level be approved. The total estimated cost is $43,910.63. Government participation is 50 percent of this amount or $21,955.32.

ACKNOWLEDGMENTS

Walter W. Bentley and George T. McCall, geologist, Superior Oil Company, accompanied the examining team.

Memorandums of George C. Selfridge, N. E. Nelson, and O. M. Bishop were noted.

LOCATION, TOPOGRAPHY, AND CLIMATE

The property consists of two separate blocks containing a total of 84 claims in sections 27, 28, 31, 32, 33, 34, and 35, T. 42 N., R. 7 W., NMPM, San Juan County, Colorado (fig. 1). The claims are on the north side of Minnie Gulch. One block is near the Animas River between Maggie and Minnie gulches at altitudes extending upward to the east from about 9,700 feet at the river.

The other and most important claim group is about 7,000 feet farther to the east. Altitudes range upwards from about 11,000 feet (11,560 feet at the portal of the Kittimac mine) to 13,600 feet at the summit of the divide near the extreme east side of the claim group. Three of the claims are over the ridge in Hinsdale County.

The mine is connected with a fair 3-mile access road to the State Highway 110 in Animas Valley, from whence it is 7 miles south to U. S.

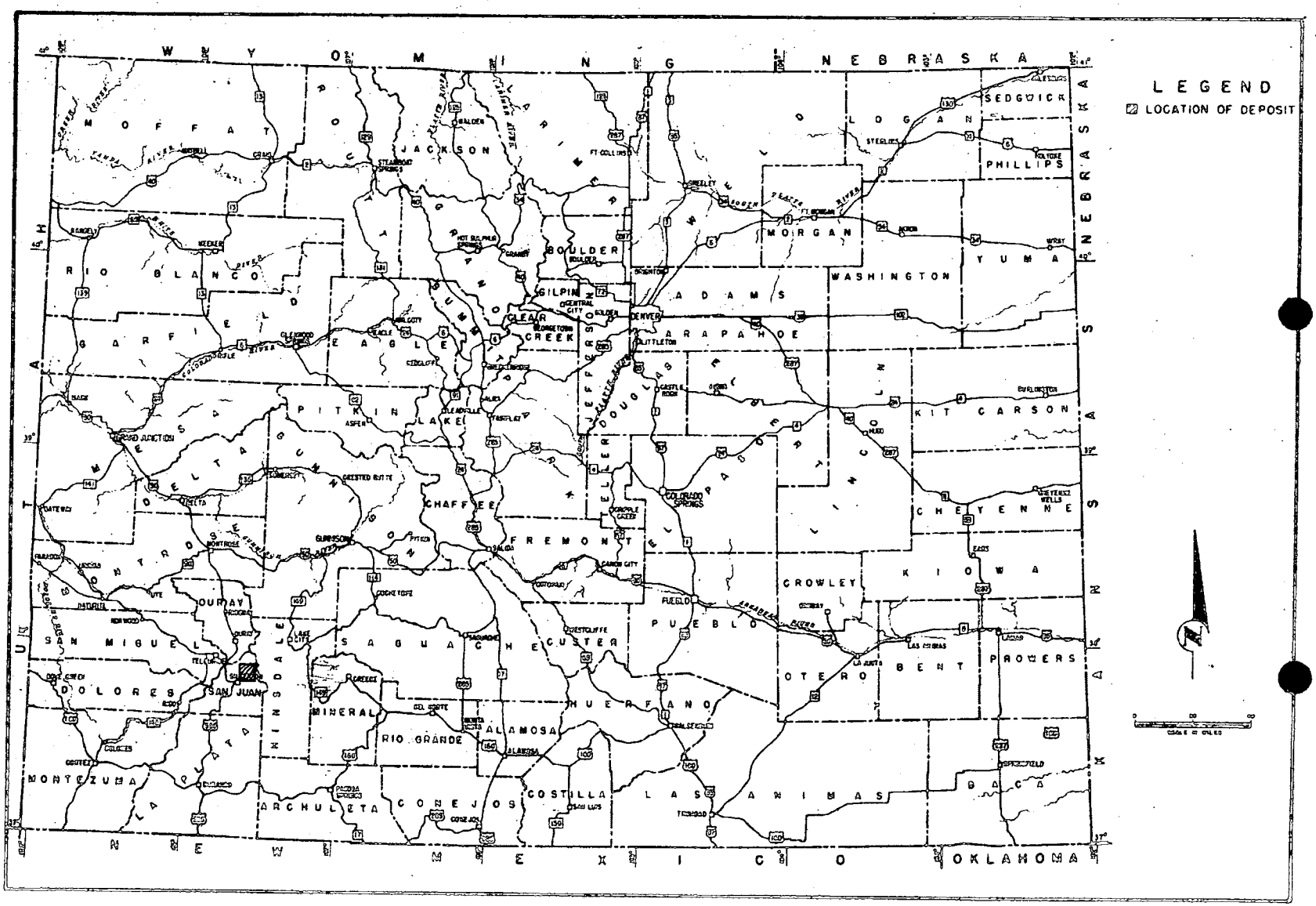

FIGURE 1 – LOCATION MAP, KITTIMAC MINE, KITTIMAC MINING COMPANY, SAN JUAN COUNTY, COLORADO. DMEA 4549

Highway 550 at Silverton. From Silverton it is 53 miles south over U. S. Highway 550 to Durango, 20 miles north to the town of Ouray and 30 miles north to the Denver and Rio Grande Western railroad at Ridgeway, Colorado.

Men and supplies can be obtained from Silverton and Ouray. Water for mining and domestic use runs down a small draw near the mine portal.

The Pride-of-the-West custom mill is 5 miles from the mine by road. From Ridgeway, lead concentrates can be shipped to Leadville, copper concentrates to Tooele, Utah, and zinc concentrates to Great Falls, Montana. Formerly the mine was connected, by a 3.2 mile electric line, to the power lines which now serve the Animas Valley.

HISTORY AND PRODUCTION

The Minnie Gulch area lagged behind much of the San Juan area in mining. The first claim on the Kittimac group was located in 1896. Arthur G. Robin and the Minnie Gulch Mines and Tunnel Company were active around 1900. An adit with about 3,400 feet of drifts was run, and an aerial tramway and mill erected. The mine was closed by the bondholders in 1917. Since then practically no work has been done. The applicant received a lease and bond on the property in 1956 and drilled three underground core holes. The results of the core drilling were very poor.

Total production from 1908 to 1945, inclusive, is estimated as 25,965 tons containing 140.63 oz. gold, 60,439 oz. silver, 363,097

pounds copper, 1,054,190 pounds lead, and 287,630 pounds zinc with a total value of $405,396.44.

OWNERSHIP AND EXTENT

The applicant holds leases on the Kittimac group of 84 claims, two mill sites, and a 76-acre portion of the patented John H. French placer. The Forest Queen Nos. 6 to 10, inclusive, are now being patented, all other claims are unpatented. These claims are in sections 27, 28, 31, 32, 33, 34, and 35, T. 42 N., R. 7 W., NMPM, San Juan County, Colorado. The pertinent claims are shown on figure 4. The claims are recorded in the office of the San Juan County Clerk and Recorder as follows:

Locations

Claim	Book	Page	Date located	Locators
Caliber	97	370	9/1/96	Arthur G. Robin, Louis Ackerman, J. L. Workman
Caliber No. 1	111	142	8/27/99	Arthur G. Robin
Caliber No. 2	111	142	8/28/99	" " "
Caliber No. 3	111	605	10/9/1900	Minnie Gulch Mines and Tunnel Co.
Pursur	97	241	8/2/96	Arthur G. Robin, J. L. and U. G. Workman
Pursur No. 1	111	583	10/9/1900	Minnie Gulch M. and T. Co.
Pursur No. 2	111	584	10/9/1900	" " " " " "
Home	111	480	7/29/1900	S. G. Martin
Home No. 1	111	481	10/1/1900	" " "

Claim	Book	Page	Date located	Locators
Home No. 2	111	482	10/1/1900	S. G. Martin
Slide	111	489	10/5/1900	" " "
Slide No. 1	---	---		---
Detroit	111	599	10/9/1900	Minnie Gulch M. and T. Co.
Globe	111	598	"	" " " " " "
Liverpool	111	597	"	" " " " " "
Michigan	111	600	"	" " " " " "
Grand Rapids	111	601	"	" " " " " "
New York	111	602	"	" " " " " "
Chicago	111	603	"	" " " " " "
Ann Arbor	111	604	"	" " " " " "
Durango	111	585	"	" " " " " "
Pittsburg	111	586	"	" " " " " "
Helena	111	587	"	" " " " " "
Lake City	111	588	"	" " " " " "
Silverton	111	589	"	" " " " " "
Denver	111	590	"	" " " " " "
Berlin	111	591	"	" " " " " "
St. Louis	111	592	"	" " " " " "
London	111	593	"	" " " " " "
Paris	111	594	"	" " " " " "
Baltimore	111	595	"	" " " " " "

Claim	Book	Page	Date located	Locators
Boston	111	596	10/9/1900	Minnie Gulch M. and T. Co.
Iron	114	27	11/1/1900	" " " " " "
Iron No. 1	116	225	1/22/02	S. G. Martin
Iron No. 2	116	226	1/22/02	" " "
Iron No. 3	116	227	1/22/02	" " "
Iron No. 4	116	228	"	" " "
Iron Dump	114	29	11/1/1900	Minnie Gulch Mand T. Co.
Iron Age	114	28	11/1/1900	" " " " " "
Forest Queen	111	267	6/5/1900	S. G. Martin
Forest Queen No. 1	111	268	"	" " "
Forest Queen No. 2	111	269	"	" " "
Forest Queen No. 3	111	270	"	" " "
Forest Queen No. 4	111	271	"	" " "
Forest Queen No. 5	111	272	"	" " "
Forest Queen No. 6	114	35	11/27/1900	Minnie Gulch M. and T. Co.
Forest Queen No. 7	114	36	"	" " " " " "
Forest Queen No. 8	114	37	11/16/1900	" " " " " "
Forest Queen No. 9	114	38	"	" " " " " "
Forest Queen No.10	114	39	"	" " " " " "
Forest Queen No.11	---	---		
Isabella	111	256	5/21/1900	W. Barkov, Andrew Erickson, and J. Bartelle
Isabella No. 1	111	616	10/9/1900	Minnie Gulch M. and T. Co.
Isabella No. 2	111	617	"	" " " " " "

Claim	Book	Page	Date located	Locators
Isabella No. 3	111	618	10/9/1900	Minnie Gulch M. and T. Co.
Isabella No. 4	111	619	"	" " " " " "
Isabella No. 5	111	620	"	" " " " " "
Isabella No. 6	111	621	"	" " " " " "
Isabella No. 7	111	622	"	" " " " " "
Isabella No. 8	111	623	"	" " " " " "
Monitor	114	24	11/1/1900	" " " " " "
Monitor No. 1	114	25	"	" " " " " "
Monitor No. 2	114	26	"	" " " " " "
Monitor No. 3	111	483	9/12/1900	S. G. Martin
Monitor No. 4	111	484	10/1/1900	" " "
Monitor No. 5	111	485	10/1/1900	" " "
Monitor No. 6	111	606	10/9/1900	Minnie Gulch M. and T. Co.
Monitor No. 7	111	607	"	" " " " " "
Monitor No. 8	111	608	"	" " " " " "
Monitor No. 9	111	609	"	" " " " " "
Monitor No. 10	111	610	"	" " " " " "
Monitor No. 11	111	611	"	" " " " " "
Monitor No. 12	111	612	"	" " " " " "
Monitor No. 13	111	613	"	" " " " " "
Monitor No. 14	111	614	"	" " " " " "
Aurora	97	369	8/4/96	A. G. Robin, J. L. and U. G. Workman
Aurora No. 1	111	144	8/27/99	Arthur G. Robin

Claim	Book	Page	Date located	Locators
Little Joe	97	63	5/25/96	J. L. and U. G. Workman
Wanda	111	633	9/2/1900	Minnie Gulch M. and T. Co.
Fountain	111	479	7/27/1900	S. G. Martin
Camilla	111	634	9/13/1900	Minnie Gulch M. and T. Co.
Midnight Sun No. 1	111	486	8/10/1900	S. G. Martin
Midnight Sun No. 2	111	487	10/1/1900	" " "
Midnight Sun No. 3	111	488	10/1/1900	" " "
Forest Queen M. S.	D-2	109	11/30/1900	Minnie Gulch M. and T. Co.
Monitor M. S.	D-2	110	"	" " " " " " "
J. H. French Placer	137	266	6/23/98	(Sur. No. 45) Division of French Placer with Tom Moore

The book and page of recording of Slide No. 1 and Forest Queen No. 11 were not found in the official records, neither are they given in the application.

Amendments

Claim	Book	Page	Date amended	Amendor
Caliber	92	461	10/15/1900	Minnie Gulch M. and T. Co.
Caliber No. 1	92	462	"	" " " " " " "
Caliber No. 2	92	463	"	" " " " " " "
Pursur	92	202	7/2/97	A. G. Robin and U. G. Workman
Pursur	111	582	10/9/1900	Minnie Gulch M. and T. Co.
Isabella	111	615	10/9/1900	" " " " " "
Aurora	97	369	8/4/96	A.G.Robin, J.L. and U.G.Workman
Little Joe	92	449	10/1/1900	S. G. Martin

Bijou water right Book D-2 page 56 dated 6/20/1900 by S. G. Martin Estey water right Book D-2, page 61 and Book D-2, page 83.

These claims have been kept in a group by the court in settling several disputes and liens and the claims listed above appear to be in good standing.

An agreement to lease and purchase was made October 10, 1956, between the Kittimac Mines Company, lessor, and Walter W. Bentley, lessee.

The Pursur No. 2, partly in Hinsdale County, is recorded in San Juan County. The Caliber No. 4, Racine, and Kalamazoo are in Hinsdale County (fig. 4) and are not recorded in San Juan County, nor are they included in the court lists. These three unpatented claims are not considered important to the project, and are not included on the list Bentley received as lessee, and were not checked.

The entire Bentley list of claims (court list) should be subordinated.

PRESENT STATUS

Exploration and development

The mine has been opened by two adits. The small upper adit is caved. The lower adit (Little Joe) contains 3,400 feet of drifting and crosscutting and one large stope that extends upward to the surface. Several small stopes are scattered along the drifts. There are no workings below the main adit level.

Mining and milling machinery and other facilities

The mill and tramway are wrecked and are not an asset. The following mining equipment was noted:

1,200 feet 30-lb. track

3-inch air line in poor condition - no asset

8 - 16-cu. ft. ore cars

600 feet 12-lb. track

Small number of hand tools

A fair access road connects the adit dump with the State Highway 110 in Animas Valley.

GEOLOGY

The Kittimac mine, in the northwestern part of the San Juan Mountains, Colorado, is in a region of metasedimentary and sedimentary rocks overlain by a very thick sequence of flows, tuffs, and volcanic breccias. The volcanic sequence of middle Tertiary age includes the San Juan tuff unit, the Silverton volcanic series, and the Potosi volcanic series. The bedded rocks of the region, including the volcanic rocks, are intruded by stocks and dikes of granitic and andesitic material, and the whole interval of interrelated rock units is extensively faulted and veined.

The regional geology and the geology in the vicinity of Kittimac mine is shown on the areal geology map of the Silverton quadrangle by

Cross and Howe USGS Folio 120, 1901, a part of which is used in figure 2. In the Silverton quadrangle an oval area 7 to 10 miles across has dropped relative to the surrounding country. This sunken block bounded by curved or ring faults, forms the Silverton caldera. The caldera is bounded physiographically by Red Mountain Creek and Mineral Creek on the west and the Animas River on the east. The whole region of the caldera has been extensively mined and prospected.

The Kittimac mine is outside the Silverton sunken block but near the eastern boundary which is marked by a ring fault system along the Animas River (fig. 2). The mine is near the head of Minnie Gulch drainage which enters the Animas River near Eureka. Unfortunately, the area is one that has not been mapped or studied in detail.

Almost a complete section of the Silverton volcanic series is exposed in Minnie Gulch from the Animas River reentrant to the divide crest eastward above the Kittimac mine. Eureka rhyolite, Burns latite, and pyroxene-quartz latite units totaling more than 3,000 feet in thickness are all well exposed (fig. 2). The Eureka rhyolite, the oldest unit of the exposed Silverton volcanic series, outcrops on the east side of the Animas River. It is several hundred feet in thickness above the river and forms a belt along the east side of the valley at the mouth of Minnie Gulch.

Overlying the Eureka rhyolite, on an irregular erosion surface, is the thick sequence of latite flows and tuffs of the Burns latite unit. The upper limit of this unit is apparently just below the

Kittimac mine adit (Cross & Howe, 1901). Pyroxene-quartz latite (Larson & Cross, 1956, p. 79) overlies Burns latite on an erosion surface and forms craggy steep-walled outcrops around the head of Minnie Gulch under the divide crest. The Kittimac mine workings appear to be in pyroxene-quartz latite.

In the vicinity of the Kittimac mine the units of the Silverton volcanic series are broken and offset by several prominent faults. At least two faults trend northward roughly paralleling the Animas River fault system (fig. 2). The dropped component of each of these two faults is on the west side towards the Silverton caldera. The movement on these faults must be closely related to the movement of the Silverton block, and the faults must represent boundaries of step-fault blocks that are subsidiary to the Silverton caldera block. The fault that trends northward a short distance east of the Kittimac mine portal appears to be a fault that cuts principal veins in the Kittimac mine workings. This fault is called the "Kittimac fault" for convenience.

At least three and possibly four major veins fill fracture systems in Burns latite and pyroxene-quartz latite units in the vicinity of the Kittimac mine. The major veins include the Caledonia, Isabella, and Caliber veins. The Caledonia vein, trending about N 75° W, is explored and mined in the Caledonia mine which is situated half a mile west and several hundred feet below the Kittimac mine. This vein can be traced eastward from the Caledonia mine to the Kittimac mine where it makes a junction at a small angle with the Isabella vein which trends about

N 65° W (fig. 3). The Caliber vein trends about N 40° W across the eastern and northeastern claims of the Kittimac group of claims. The vein has not been completely explored or investigated.

Several smaller veins are evident in the vicinity of the Kittimac mine. One of these--the Little Joe vein trending N 70° E--is followed by the main Kittimac mine adit (called the Little Joe adit, fig. 3) to its junction underground with the Isabella-Caledonia veins. A number of small veins appear in the southeast workings of the mine. They may be extensions of the main veins of the mine or they may be branch veins. Besides the Caledonia vein, several small veins appear to crop out near the Caledonia mine. Without doubt there are other veins in the vicinity that are poorly exposed and have not been mapped.

All of the principal veins of the Kittimac mine stand nearly vertical or dip at high angles. The Caledonia dips about 85° southward. The Isabella vein dips about 85° northward. These two veins, in the northwestern part of the mine, approach one another at a small angle and, with opposing dips, apparently converge. The vein zone of convergence was mined out between the adit level and the surface. The Little Joe vein is vertical, and the "Kittimac" vein (or eastward extension of the Caledonia or Isabella vein beyond the fault zone) is nearly vertical. Some of the smaller veins cut by the eastern workings of the mine dip at angles of about 40 degrees. The Caliber vein appears to be a vertical vein because of its almost straight outcrop pattern across the slope of the Minnie Gulch head-wall.

The Isabella vein may flatten in dip below the present drift level. The scanty hole data available from the Syndicate drilling in 1956 suggest that the Isabella vein could possibly flatten in dip from 85° to 70°. The downward projection of the vein, on the basis of its dip in the stope above the level, does not coincide with its presumed position as determined from the previous Syndicate drill holes. However, the poor core recovery and incomplete logs kept on the holes make this interpretation inconclusive. The interval of core indicated as vein may represent a small subsidiary vein to the Isabella vein.

A fault zone is cut in the western workings of the Kittimac mine that is tentatively joined with the "Kittimac" fault shown on the surface geology map (fig. 2). Underground the zone is 8 to 10 feet wide, trends a few degrees east of north, and appears to dip about 85° westward. If the underground fault and the "Kittimac fault" are the same, then the western component is probably down-faulted as much as 100 feet relative to the eastern component. The fault does not appear to be mineralized and by the nature of its relationship to the veins is a younger structure.

The veins in the Kittimac mine area are all fracture-filling veins of white quartz gangue. All contain sulfide minerals of copper, lead, zinc, and iron. Silver is present in moderate amounts but probably occurs in the vein altogether in the mineral galena. Gold, although present, is generally a minor product of milling and is not seen in the vein rock.

The common ore minerals are galena, sphalerite, enargite (?), and chalcopyrite. Pyrite and quartz are the principal gangue minerals. The vein content of any particular metal sulfide may change noticeably in a short distance horizontally and vertically. This feature of the veins in the Kittimac mine is expressed in the noticeable changes in metal content of samples along a vein. Some zones in the Isabella vein of the Kittimac mine, for example, are essentially of sphalerite. A few feet distant from a sphalerite-rich zone the vein may be rich in galena, chalcopyrite, and enargite (?).

SAMPLING AND ORE RESERVES

Sixteen samples were taken by the American Smelting and Refining Company from below the track on the adit level on the "Kittimac" vein from the Caledonia-Isabella junction to the southeast for 200 feet (fig. 3). Sample No. 40 is at the junction, No. 39 is 40 feet to the southeast, No. 38 is under the track 30 feet southeast. Samples No. 37 to No. 25 continue at 10-foot intervals to the southeast below the track. Bentley has sampled the exposed back above the level for the last 70 feet to the southeast of the area that was sampled by A. S. & R. on the level. The examining team took one sample (CB-144) as a rough check of Bentley's No. 402 (fig. 3). Three holes were also drilled by a Syndicate organized to reopen the mine in 1956. These holes cut the Isabella (?) vein at depths of 168 to 196 feet below the adit level. Core recovery on Hole No. 1 was reported as 75 percent and on Hole No. 3

about 50 percent. The results from Hole No. 2 were lost. Neither geologic logs were made of the cores nor were the cores preserved. Sample data follows:

Sample	Width in feet	Au oz.	Ag oz.	Pb (percent)	Cu (percent)	Zn (percent)	Combined sulfides
25	6.0	Tr.	0.8	0.3	0.05	0.07	1.05
26	4.0	Tr.	1.6	1.4	1.22	2.5	5.12
27	4.2	Tr.	2.0	2.7	1.78	4.3	8.78
28	4.8	Tr.	3.1	7.8	7.34	5.9	21.08
29	4.8	Tr.	3.0	1.8	2.75	7.5	12.05
30	4.0	Tr.	2.2	1.9	1.78	4.9	8.58
31	7.0	0.07	3.8	2.2	2.04	4.9	9.14
32	8.0	0.29	3.1	2.2	2.98	6.9	12.08
33	7.3	0.5	3.6	2.9	1.88	3.9	8.68
34	5.5	Tr.	2.3	2.4	1.17	4.1	7.67
35	8.2	Tr.	1.4	0.4	0.91	0.8	2.11
36	5.5	Tr.	1.6	1.4	0.91	2.3	4.61
37	5.2	0.01	6.4	3.7	3.16	4.1	10.96
38	9.5	Tr.	5.6	5.0	3.46	8.2	16.66
39	2.0	Tr.	7.0	5.2	1.17	2.6	8.97
40	8.3	0.03	20.4	6.5	1.70	1.7	9.90
Arithmatical average	5.89	0.028	4.24	2.99	2.14	4.08	9.21

Samples above level (stope Back)

Sample	Width in feet	Au oz.	Ag oz.	Pb (percent)	Cu (percent)	Zn (percent)	Combined sulfides
401	1.5	Tr.	5.2	3.7	2.50	2.7	8.90
402	1.6	Tr.	5.4	6.6	2.00	6.0	14.60
403	2.1	0.01	12.7	7.4	4.80	11.3	23.50
404	1.1	0.03	28.8	17.6	4.80	12.1	34.50
405	1.2	0.01	13.1	12.0	3.10	7.7	22.80
406	0.8	0.02	33.9	20.5	3.45	21.1	45.05
407	0.5	0.01	23.6	24.3	3.95	20.5	48.75
408	1.0	0.01	12.8	15.8	5.20	22.6	43.60
409	1.0	0.01	15.0	15.2	6.10	23.8	45.10
410	1.0	0.01	8.9	10.2	6.50	25.0	41.70
411	1.2	0.01	7.6	7.7	6.55	17.6	31.85
412	1.7	0.02	7.6	10.4	6.80	16.1	33.30
413	1.0	0.01	22.6	12.6	5.00	22.2	39.80
414	0.8	0.01	5.3	5.1	3.95	14.3	23.35
416	4.0	Tr.	0.5	0.5	0.05	--	0.55
CB 144	3.1	0.05	3.4	9.8	2.10	4.6	9.50
Arithmatical average	1.48	0.01	12.90	11.21	4.18	14.23	29.62
Drill Hole No. 1	21.1 on slope	0.01	1.00	0.60	0.83	2.37	3.80
Drill Hole No. 3	5.0 on slope	0.01	0.90	2.00	0.28	3.05	5.33

The clearing up of the cave would permit sampling and exploration of an additional 290 feet of drift west of the cave. No attempt was made to analyze the sample data except in a very rough way.

From data at hand a block of ore 5.89 feet wide, 200 feet long, and 100 feet high is indicated to be just to the southeast of the Caledonia-Isabella junction. The block is calculated to contain about 10,000 tons of ore roughly averaging Au 0.02 oz., Ag 4.24 oz., Pb 3.00 percent, Cu 2.10 percent, Zn 4.1 percent. If the Isabella vein northwest of the cave is of equal quality the indicated ore estimate should be increased about six times.

APPLICANT'S ESTIMATED COST OF PROJECT

The applicant proposes a two-phase exploration project. Phase A is to rehabilitate and sample the Isabella drift northwest and Phase B provides for sinking 150 feet. The applicant's estimated costs follow:

Phase A

Independent contracts

None

Labor and supervision

229 man-shifts of labor at $16.00/day	$ 3,264.00	
3 man-shifts mechanic at $24.00/day	72.00	
2-1/2 months supervisor at $800.00/mo.	2,000.00	
Total labor and supervision ($5,736.00)		$ 5,936.00

Operating material and supplies

3½ tons 30 lb. rail at $260.00/ton	$ 910.00
32 prs. 30 lb. rail splices at $1.35/pr.	43.20
2 - track bolt wrenches at $2.95 each	5.90
100 lb. track spikes at $0.21/pound	21.00
110 ties for track at $0.65 each	71.50
100 lb. track bolts at $0.34/pound	34.00
1 - 30 lb. switch	50.00
1 - rail bender	65.00
1,913 feet 2-inch pipe at $0.59/foot	1,138.70
10 - 2-inch unions at $2.70 each	27.00
10 - 2-inch Ts at $1.80 each	18.00
10 - 2- to 1-inch reducing bushings at $0.39/ea.	3.90
10 - 1-inch by 30-inch pipe at $0.26½ per foot	79.50
10 - 1-inch valves at $2.85 each	28.50
3 - 2-inch valves at $13.50 each	40.50
16 - C.P. Quick hose couplers at $1.15 each	18.40
100 feet 1-inch air hose	138.00
500 lineal feet round stull timber at $0.40/ft.	200.00
1,000 feet 3-inch by 12-inch by 5-foot lagging	80.00
12 pieces 4- by 4-inch spiling 12 feet long	12.80
100 lb. nails and spikes at $15.50/100	15.50
200 lb. carbide at $10.00/100	20.00
Hauling charges	100.00

1,650 gals. diesel fuel at $0.19/gal.	$ 313.50	
60 gals. gasoline at $0.30/gal.	18.00	
5 sets fuel and oil filters at $5.40 each ($27.00)	28.00	
30 sample sacks (ore sacks) at $1.50 each	45.00	
60 gals. motor oil at $0.95/gal.	57.00	
60 gals. compressor oil at $0.75/gal.	45.00	
Fuel pump for compressor	20.00	
Grease, oil, gas, and repairs for two jeeps for 2,160 miles at $0.25/mile	1,085.00	
Price increase since quotation	283.51	
Total operating material and supplies		$ 5,026.31

Operating equipment (Rentals)

365 c.f.m. compressor 2½ months at $561/mo.	1,402.50	
Eimco 12-B mucker 2½ months at $275.00/mo.	637.50	
Air trammer 2½ months at $150.00/mo.	375.00	
High pressure pump 1 month at $100.00/mo.	100.00	
2 jeeps 2½ months at $72.00/mo. each	166.00	
Freight to mine or rental equipment	500.00	
Total operating equipment		$ 3,375.00

Rehabilitation and repairs

None

New buildings, improvements, installations

None

Miscellaneous

State Workmen's compensation deposit	$ 100.00	
Workmen's compensation (3% of payroll)	178.08	
Liability insurance	50.00	
State unemployment insurance (3.1% of payroll)	183.01	
F.I.C.A. tax (2% of payroll)	118.72	
Comprehensive and $50.00 deductible and medical payment; insurance on jeeps	200.00	
Sales tax (2%)	170.09	
		$ 999.90
Total estimated cost of Phase A		$15,237.21
29 assays for Au, Ag, Cu, Pb, Zn at $6.00 each		174.00
1 cadmium assay		25.00
1 spectrographic analysis		15.00
Total cost of Phase A		$15,551.21

Phase B

Labor and supplies

Sinking, labor and supplies 150 feet at $85.00/ft.	12,750.00	
Supervision 4 months at $800.00/mo.	3,200.00	
Crosscutting 50 feet at $40.00/ft.	2,000.00	
Total labor and supplies		17,950.00

Operating materials and supplies

None

Operating equipment

To be purchased

2 - Jackhammers complete with hoses and fittings	$ 2,400.00	
1 - Grinder for insert bits	340.00	
3,000 BM Timber and lumber for head frame & bin	225.00	
1 - Sheave wheel	55.00	
250 feet hoisting cable at $32.60/100	81.50	
150 feet vent fan tubing at $1.00/ft.	150.00	
Total to be purchased		$ 3,251.50

To be rented

365 c.f.m. Compressor 4 mos. at $561.00/mo.	2,244.00	
Eimco 12-B mucker 1/2 month at $275.00/mo.	137.50	
Air trammer 4 months at $150.00/mo.	600.00	
Pump 4 months at $100.00/mo.	400.00	
Hoist 4 months at $100.00/mo.	400.00	
Ventilation fan 4 months at $75.00/mo.	300.00	
Total to be rented		4,081.50
Total operating equipment		$ 7,333.00

Rehabilitation and repairs

None

New buildings, improvements, installations

None

Miscellaneous

Workmen's compensation (3%)	$ 306.00	
State unemployment (3.1%)	334.60	
F.I.C.A. (2%)	204.00	
Sales tax (2%)	67.77	
Surveyor 6 days at $40.00/day	240.00	
Geologist 4 days at $100.00/day	400.00	
Accounting 6 months at $50.00 month	300.00	
Total miscellaneous		$ 1,852.37
Total estimated cost of Phase B ($27,135.37)		$30,335.37
Estimated cost of project		$45,886.58
Contingencies		$ 4,494.65
Total estimated cost of project		$50,381.23

A number of mistakes in addition were noted. Some costs are too high, especially supervision and transportation to and from the mine.

RECOMMENDED PROGRAM OF EXPLORATION

The program proposed by the applicant to explore the Isabella vein in the Kittimac mine in San Juan County, Colorado, is fundamentally sound. It is essentially a part of the exploration program proposed by Scott Hazen of the U. S. B. M. in 1949. However, modifications are suggested that would make the applicant's program a better balanced operation and more justifiable to DMEA. The modifications consist of deleting

sampling and the necessary preparations for sampling and proceeding directly with exploration by winzing and drifting on the vein. The winze would be sunk a maximum of 110 feet (including 10 feet for sump) and be the site, at 100 feet depth, for drifting a maximum of 400 feet on the vein. It is recommended that a minimum of 100 feet of drifting be in either direction from the winze. The remaining 200 feet of drift could be in a direction justified by results and data from the first 200 feet of drifting. This final drifting would be Stage II.

Several programs of the many possible to explore the Isabella vein were considered. The preliminary work of core drilling below the drift level as well as sampling along the drift floor was considered and dropped. Sampling and drilling prior to the actual exploratory work by winzing and drifting is dropped from the program because adequate data on the character of the vein can be developed from exposures in the mine workings. Sampling of the Isabella vein is not considered necessary because the quality and character of the vein at adit level is adequately expressed by the stope above the adit level as well as by remnants of the vein left in place. With so much of the vein space exposed from which can be determined, with good assurance, the attitude, width, and ore-bearing quality, it appears an unnecessary time and expense to DMEA to undertake additional preliminary exploration.

The recommended program will consist of rehabilitation, winzing, and drifting. The rehabilitation is necessary to provide access to the underground work site. Rehabilitation will consist of clean-up in the

drift up to Station B, the removal of the caved material in the interval between Stations B and C (fig. 3), retimbering this section of the mine drift, removal of water and mud from the Isabella drift, O to H, impounded by the cave at B to C, repairing track, and laying air and water lines to the winze site. Access from Station B to C can now be made over the top of the cave so no spiling will be required.

A site near Station G (fig. 3) is recommended for the winze. It should follow the vein to a depth of not less than 110 feet below the present drift level and be at least 4 feet by 8 feet in size. At 100 feet below the present drift level, drifts along the vein both ways (northwestward and southeastward) are recommended to extend at least 100 feet.

Stage II to the program, if warranted, would be the extension of this drifting not over 200 feet in a direction considered appropriate from character of the vein exposed by drifting in Stage I.

Justification of program

The program for exploration in the Kittimac mine appears justifiable from both geologic as well as economic aspect. The area appears to contain well mineralized veins. The several veins that outcrop in the general area of Kittimac mine are strong and persistent. The Isabella, the Caledonia, and the Caliber veins all may be traced on the surface for more than a mile. The Isabella and Caledonia veins have been mined in part, and both show good ore-grade material. The

Caliber vein has not been explored underground; the surface outcrop, however, is reported to be of a strong, wide ore-bearing vein. The Kittimac mine is situated at the junction of at least three veins. The Isabella vein, the Caledonia vein, and the Little Joe vein all come together in approximately the same location in the Kittimac mine. The upward convergence of the Isabella and Caledonia veins has produced the principal ore-shoot so far exploited in this mine.

The various veins exposed in workings of the mine show fair to good width of vein and fair to good sulfide-mineral content. The drifts, northwest of the Little Joe adit intersection, expose veins from 2 to 10 feet wide. The Isabella vein appears to be from 2 to 10 feet in width while the Caledonia vein is probably 2 to 4 feet wide. The "Kittimac" vein averages 5.5 feet in width.

Sample material from along the"Kittimac" vein as well as what can be seen of the Isabella and "Kittimac" veins left in the back of the stope show that good ore-grade material exists in the mine. The stope-cut to the surface on the Isabella vein shows that this vein for 200 feet vertically has produced ore-grade material. Without much doubt most of the total production of the mine came from this stope. On the basis of the width, vertical height, and length of the Isabella stope it seems reasonable to assume that this vein will continue downward and be of such character to produce ore-grade material. It is significant that the Kittimac mine situated apparently in the pyroxene-quartz latite unit of the Silverton volcanic series has had its production apparently

from this upper unit of the Silverton volcanic series. The greatest production of the region from lode deposits has been from the Burns latite unit that immediately underlies the pyroxene-latite. Burbank has stated that the Burns latite unit appears to have fracture qualities that in part cause the best lode deposits of the region to be in this unit (Burbank, 1933, p. 150). The exploration of the veins of the Kittimac mine downward into the Burns latite appears to be based on sound reasoning. If these veins are ore-bearing veins in pyroxene-quartz latite host rock, then their character could be equal or better as ore producers in Burns latite.

The exploration program at Kittimac mine after the mine clean-up will proceed with a winze to be sunk on the vein. The location for this winze is recommended to be at station G (fig. 5) on the Isabella vein. This position of the winze is at a manway at the edge of the large stope-out to the surface and would allow exploration of the ore-shoot downward. The principal reason for the winze to be located in the Isabella drift is to avoid the fault zone at Station D (fig. 5). If the winze is located east of this fault, say at the adit intersection where access and haulage would be better, then exploration of the Isabella vein, which possibly represents the best potential source of ore, would not be available until the fault were penetrated and its offset determined. The fault may have at least 100 feet of throw which would be nearly normal to the strike of the Isabella vein. Locating the offset portion of the vein along this fault could be a costly problem at 100 feet below the adit level.

A further advantage in placing the winze at Station G lies in its position at the edge of the ore shoot expressed by the stope. A winze at Station G and the drifting at 100 feet depth is exploration in the best possible area based on mine geology. No "dead work" is involved.

ESTIMATED COST OF PROPOSED PROJECT

Considering the location most of the applicant's estimates are reasonable and will be adopted. Rental prices for equipment should not increase in 1957.

Stage I--Clean-up and rehabilitation
(Time required - 2½ months)

Independent contracts

None

Labor and supervision

Miners	125 shifts at $16/shift 40 shifts (to clean up mud) 165	$ 2,640.00	
Mechanic	3 shifts at $24/shift	72.00	
Supervision	2½ mos. at $600/mo.	1,500.00	
Survey	6 days at $40.00/day	240.00	
Total labor and supervision			$ 4,452.00

Operating materials and supplies

3½ tons 30 lb. rail at $260.00/ton	910.00
32 pairs 30 lb. rail splices at $1.35/pr.	43.20
2 track bolt wrenches at $2.95 each	5.90

100 lbs. track spikes at $0.21/lb.	$ 21.00
100 lbs. track bolts at $0.34/lb.	34.00
1 - 30 lb. track switch	50.00
1 rail bender	65.00
110 track ties at $0.65 each	71.50
1,930 feet 2-inch air pipe at $0.59/ft. 0.50	1,138.70
10 - 2-inch unions at $2.70 each	27.00
10 - 2-inch tees at $1.80 each	18.00
10 - 2-inch to 1-inch reducing bushings at $0.39 ea.	3.90
3 - 2-inch valves at $13.50 each	40.50
300 feet 1-inch pipe at $0.26½/ft. 0.22	79.50
10 - 1-inch valves at $2.85 each	28.50
100 feet 1-inch air hose at $1.38/ft.	138.00 ✓
16 C.P. Quick hose couplings at $1.15 each	18.40
500 feet round stull timber at $0.40/ft.	200.00 ✓
1,000 feet B.M. 3" x 12" x 5' lagging and 2" x 6" staging at $80.00/BM	80.00 ✓
10 pcs. 4" x 4" x 12' spiling at $80.00/BM	12.80 ✓
100 lbs. nails and spikes at $15.50/C	15.50
200 lbs. carbide at $10.00/C	20.00
	$ 3,021.40
Plus 10 percent price increase	302.14
Hauling charges	100.00 ✓
5 sets fuel and oil filters at $5.40 each	27.00

1 fuel pump	$ 20.00	
1,650 gals. diesel fuel at $0.19/gal.	313.50	
60 gals. gasoline at $0.30/gal.	18.00	
60 gals. motor oil at $0.95/gal.	57.00	
60 gals. compressor oil at $0.75/gal.	45.00	
Oil, gas, repairs for 2 Jeeps 2½ months at $100.00/mo.	250.00 ?	
Total operating equipment		$ 4,154.04

Operating equipment (Rental, 90 percent to apply)

365 c.f.m. compressor-diesel 2½ months at $561.00/mo.	1,402.50	
6 h.p. air trammer 2½ months at $150.00 per mo.	375.00	
Eimco 12-B mucker 2½ months at $275.00 per mo.	687.50	
High pressure pump 1 month at $100.00/mo.	100.00	
Freight on above rental equipment	500.00	
2 jeeps 2½ months at $60.00/mo. (not to apply)	150.00	
Total operating equipment		3,215.00

Rehabilitation and repairs

None

New buildings, improvements, installations

None.

Miscellaneous

Bookkeeping 2½ months at $50.00/mo.	125.00	
Workmen's compensation and liability insurance and payroll tax 7% of $4,577.00	320.39	
Total miscellaneous		$ 445.39

Total estimated cost of Stage I--Clean-up and rehabilitation $12,266.43

USGS-00080
p. 140 of 176

Stage I--Sinking winze
(Time required 3 months)

Sink 110 feet (10-foot sump) on vein. Minimum size 4 feet by 8 feet in the clear--2 compartment. Erect headframe and loading chute.

Independent contracts

None

Labor and supervision

300 man shifts at $16.00/day	$ 4,800.00	
Supervision 3 months at $600.00/mo.	1,800.00	
		$ 6,600.00

Operating materials and supplies

Explosives	240.00
Bits 8 insert at $17.50 each	140.00
Caps - wire (560 caps)	120.00
Stulls 600 feet at $0.40	240.00
Lumber 2,000 BM at $80.00	160.00
Hand tools	50.00
2,200 gals. diesel fuel at $0.19/gal.	418.00
100 gals. gasoline at $0.30/gal.	30.00
100 gals. motor oil at $0.95/gal.	95.00
100 gals. compressor oil at $0.75/gal.	75.00
100 lbs. nails $15.50/100	15.50
1 fuel pump	20.00
Oil, gas, & repairs 2 jeeps 3 mos. at $100/mo.	300.00
Total operating materials and supplies	$ 1,903.50

Operating equipment

Rentals		
Compressor 3 months at $561.00/mo.	$ 1,683.00	
Air trammer 3 months at $150.00/mo.	450.00	
Pump 3 months at $100.00/mo.	300.00	
Hoist 3 months at $100.00/mo.	300.00	
Ventilation fan 3 months at $75.00/mo.	225.00	
2 sinker drills complete 3 months at $150.00/mo.	450.00	
Mine bucket 3 months at $20.00/mo.	60.00	
2 jeeps 3 months at $60.00/mo.	180.00	
Purchased		
1 sheave wheel	55.00	
200 feet hoisting cable at $32.60/100	65.20	
100 feet ventilation tubing at $1.00/ft.	100.00	
Total operating equipment		$ 3,868.20

Rehabilitation and repairs

None

New buildings, improvements, installations

None

Miscellaneous

Bookkeeping 3 months at $50.00/month	150.00	
Workmen's compensation and Employers liability insurance and payroll taxes (7% of $6,750.00)	472.50	
Total miscellaneous		$ 622.50
Estimated cost of Stage I--winzing 110 feet		$12,994.20

Estimated cost per foot	$118.13	
10 analyses for Au, Ag, Pb, Cu, Zn at $6.00 each		$ 60.00
Total estimated cost Stage I--sinking winze		$13,054.20

Stage I--Drifting, 200 feet of 5' x 7' drift
(Time required 2 months)

Independent contracts		
None		
Labor and supervision		
200 man shifts at $16/day	$ 3,200.00	
Supervisor 2 mos. at $600.00/mo.	1,200.00	
Total labor and supervision		$ 4,400.00
Operating materials and supplies		
Explosives (1,200 lbs.)	288.00	
Caps and fuse	184.00	
12 Bits (insert) at $17.50 each	210.00	
1,200 gal. diesel fuel at $0.19/gal.	228.00	
40 gal. motor oil at $0.95/gal.	38.00	
40 gal. compressor oil at $0.75/gal.	30.00	
Oil, gas, and repairs 2 jeeps 2 mos. at $100/mo.	200.00	
Total operating materials and supplies		$ 1,178.00
Operating equipment (rentals)		
Compressor 2 months at $561/mo.	1,122.00	
Air trammer 2 months at $150/mo.	300.00	
Mucking machine 2 months at $275/mo.	550.00	

Pump 2 months at $100/mo.	$ 200.00	
Hoist 2 months at $100/mo.	200.00	
Ventilation fan 2 months at $75/mo.	150.00	
2 drills 2 months at $150/mo.	300.00	
Mine bucket 2 months at $20/mo.	40.00	
2 jeeps 2 months at $60/mo.	120.00	
Purchase		
200 feet ventilation pipe at $1.00/ft.	200.00	
Total operating equipment		$ 3,182.00
Rehabilitation and repairs		
None		
New buildings, improvements, installations		
None		
Miscellaneous		
Bookkeeping 2 months at $50/mo.	100.00	
Workmen's compensation and employees liability insurance and payroll taxes (7% of $4,500)	315.00	
Total miscellaneous		415.00
Estimated cost of Stage I--Drifting (200 feet)		$ 9,175.00
Estimated cost per foot $45.88		
20 analyses for Au, Ag, Pb, Cu, Zn at $6 each		120.00
Total estimated cost of Stage I--Drifting		$ 9,295.00
Total estimated cost of Stage I--of project (Clean-up-winzing-drifting)		$34,615.63
Time required for Stage I 7½ months		

Ninety percent of the following accumulated rentals would apply on purchases, less token payment in winter:

365 c.f.m. diesel-driven compressor	$ 4,207.50
6 h.p. trammer	1,125.00
Eimco 12-B mucker	1,237.50
High pressure pump (air driven)	500.00
Air hoist	500.00
Air driven ventilation fan	375.00
	$ 7,945.00

Stage II--Drifting

Drifting additional 200 feet - 5' x 7' drift cost will duplicate previous drifting. (time required 2 mos.)

Independent contracts

None

Labor and supervision

Same as for Stage I drifting

Total	$ 4,400.00

Operating materials and supplies

Same as for Stage I drifting

Total	1,178.00

Operating equipment (rentals)

Same as for Stage I drifting

Total	3,182.00

Miscellaneous

Bookkeeping 2 mos. at $50/mo.	$ 100.00	
Workmen's compensation and employees liability insurance and payroll tax (7% of $4,500)	315.00	
Estimated cost of Stage II--Drifting (200 ft.)		$ 9,175.00
Estimated cost per foot $45.88		
20 analyses for Au, Ag, Pb, Cu, Zn at $6.00 each		120.00
Total estimated cost of Stage II--Drifting		9,295.00
Total estimated cost of project including Stage II drifting		$43,910.63
Government participation, 50 percent or		$21,955.32

Time required for project including Stage II drifting - 9½ months

CONCLUSIONS

The Kittimac mine in San Juan County, Colorado, DMEA 4549, appears to have sufficient production potential of mixed base metal ores (lead, zinc, copper, and silver) to justify the exploration program proposed in this report. The proposed program, if successful, could show data from which to calculate measured ore reserves of 20,000 to 25,000 tons.

The program which includes clean-up and rehabilitation of the mine, winzing, and drifting on the Isabella vein at depth should adequately explore the best potential ore-bearing zone in the mine.

Sampling along the floor of the present drift as well as core-drilling, preliminary to the winzing and drifting, is considered not necessary. Sufficient justification to proceed directly to winzing is deductible from mine geology.

USGS-00080
p. 146 of 176

RECOMMENDATIONS

The Kittimac Mining Company's application for DMEA assistance in an exploration program is recommended for approval. The original program requested by the applicant should be modified in accordance with the recommendations made in this report.

REFERENCES CITED

Burbank, W. S., 1933, Vein systems of the Arrasture Basin and regional geologic structures in the Silverton and Telluride quadrangles, Colorado: Proceedings of Colo. Sci. Soc., vol. 13, no. 5.

Cross, W., Howe, E., and Ransome, F. F., 1905, U. S. Geol. Survey Atlas, Silverton folio No. 120.

Larsen, Jr., E. S., and Cross, W., 1956, Geology and petrology of the San Juan region, southwestern Colorado: U. S. Geol. Survey Prof. Paper 258.

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

EXAMINATION REPORT
DMEA 4549

PREPARED FOR
DEFENSE MINERALS
EXPLORATION ADMINISTRATION

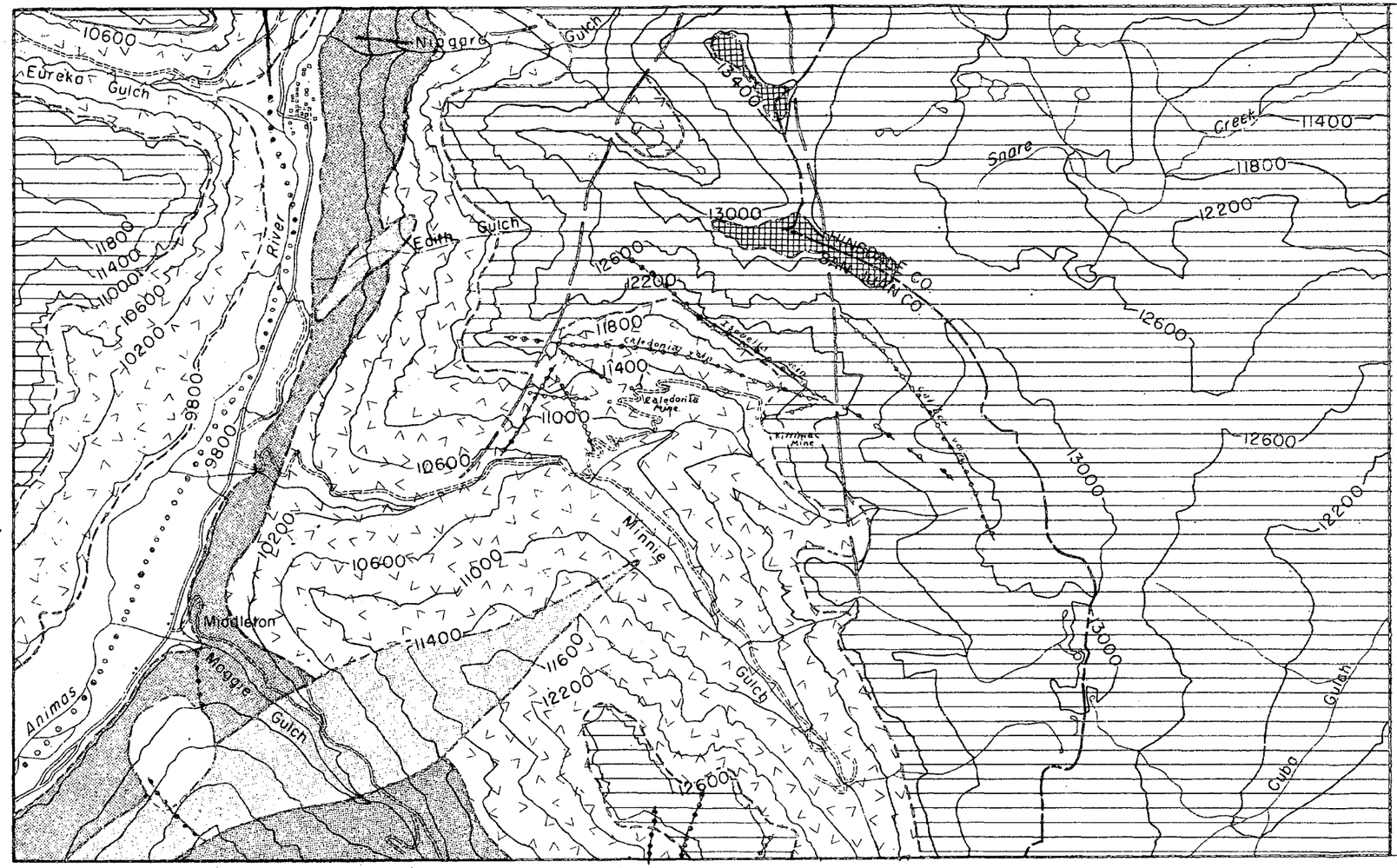

Figure 2 GEOLOGY IN VICINITY OF KITTIMAC MINE, SILVERTON QUADRANGLE, COLORADO

SCALE 1:24,000
1 1/2 0 1 MILE

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D M E A
RECEIVED OCT 14 1957
DATE | INITIALS | CODE

USGS-00080
p. 150 of 176

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

224 New Customhouse
Denver 2, Colorado

July 31, 1957

OFFICIAL FILE COPY
DMEA
RECEIVED AUG 5 1957

DATE	INITIALS	CODE
8/5	P.K.	220
8/5	Klug.	500

Memorandum

To: Chairman, Operating Committee, DMEA

From: Acting Executive Officer, DMEA Field Team, Region III

Subject: DMEA Docket-4549 (Lead-Zinc-Copper)
Walter W. Bentley, d/b/a Kittimac Mining Company,
(Kittimac Mine) San Juan County, Colorado

This is in response to your letter of July 26, 1957, requesting the present status of the subject docket.

Two weeks ago this property was inaccessible because of snow drifts. On July 25, 1957, the applicant advised that the property was now accessible and arrangements were made with him to accompany our examiners on July 30, 1957, for a field examination of the property.

E. N. Harshman

E. N. Harshman

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
7/24	Klugescheid	500
	[illegible]	500
7/26	Martin	130
"	Johnson	110
"	Butterlong	100
7/29	[illegible]	225
		500

500

JUL 26 1957

Mr. W. H. King
Executive Officer
DMEA Field Team, Region III
224 New Customhouse Bldg.
Denver 2, Colorado

Re: Docket No. DMEA-4549 (Lead-Zinc-Copper)
Walter W. Bentley d.b.a.
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado

Dear Mr. King:

We refer to a memorandum of W. P. Pratt and E. W. Buel, dated January 14, 1957, in which they stated that the mine could not be examined on account of snow. The monthly reports lately have given the status of this project as "examination waiting for accessibility".

Kindly advise us what the latest information is concerning this property and if we may expect an examination report in the near future.

Sincerely yours,

W. S. Martin
ACTING Chairman, Operating Committee (24B)

WPKlugescheid/er 7/24/57
Copy to: Docket
Admr R File
Op. Committee
Mr. Bishop, USBM
Mr. Kiilsgaard, USGS
Chron.

APPROVED:

Frank D. Lamb (24B)
Member, Bureau of Mines

Thor H. Kiilsgaard (24B)
Member, Geological Survey

8623

Ser. Op. Comm.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

IN REPLY REFER TO:
DMEA
DEPARTMENT OF THE INTERIOR
JAN 15 1957
REGION III
DENVER, COLORADO

Defense Minerals Exploration Administration
Denver Federal Center
Denver, Colorado

January 14, 1957

Memorandum

To: Executive Officer, DMEA Field Team, Region III
Through: E. H. Harshman
John F. Shaw

From: W. P. Pratt
E. W. Buel

Subject: DMEA Docket 4549 (Lead-zinc-copper), Kittimac Mining Company (Kittimac mine), San Juan County, Colorado

A trip was made to Silverton, Colorado, on January 10, 1957, by W. P. Pratt, U.S. Geological Survey, and E. W. Buel, U.S. Bureau of Mines, for the purpose of making a field examination of the Kittimac mine to evaluate the application for DMEA assistance. We were able to confer briefly with the applicant, Walter W. Bentley, in Silverton, but the mine could not be examined because of snow; a wait of several days would have been necessary before the road could be cleared.

The applicant will notify us if the mine again becomes accessible during the winter, on the chance that an examination might be worked into the schedule at that time.

W.P. Pratt
W. P. Pratt
Geologist

E. W. Buel
E. W. Buel
Mining Engineer

WPPratt:mp

Ser. Op. Com. (2)

FILE COPY
DMEA
RECEIVED JAN 18 1957

DATE	INITIALS	CODE
1-18	C	220
1/17	WBK	500

Betty

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

224 New Customhouse
Denver 2, Colorado

December 20, 1956

Memorandum

To: Secretary to the Operating Committee

From: Executive Officer, DMEA Field Team, Region III

Subject: Docket DMEA 4549 (lead-zinc-copper) Kittimac Mining Company (Kittimac Mine) San Juan County, Colorado

Enclosed is a copy of a letter from Walter W. Bentley, dated December 19, 1956, in which he requests the subject application be amended to read Walter W. Bentley, DBA Kittimac Mining Company instead of a partnership as it now appears.

Will you please place the Applicant's letter with your copy of the brochure. Copies of this letter are being forwarded to the engineer and the geologist to be included with the copies of the brochure they now hold. One copy of the letter is being included with our copy of the brochure.

W. M. Traver

Enclosure

RECEIVED
DEC 31 1956
D.M.E.A.

Silverton, Colorado.
December 19, 1956.

Mr. W. M. Traver,
Executive Officer, D.M.E.A.,
Field Team, Region III,
224 New Customhouse,
Denver 2, Colorado.

Re: Docket D.M.E.A. 4549

Dear Sir:

This is to inform you that the status of the Kittimac Mine has changed since the D.M.E.A. application was filed.

Because of the death of my brother Charles in Seattle, it has become necessary for my brother Owen to drop his interest in the Kittimac, in order to manage estate matters. Therefore, the Kittimac is now restored to the undersigned as an individual. The lease is made to me as an individual, and by this letter the application should now be amended to read Walter W. Bentley, d.b.a. Kittimac Mining Company, instead of a partnership as it now appears.

Very truly yours,

Walter W. Bentley

Walter W. Bentley.

WWB.G

DMEA
DEPARTMENT OF THE INTERIOR
DEC 20 1956
REGION III
DENVER, COLORADO

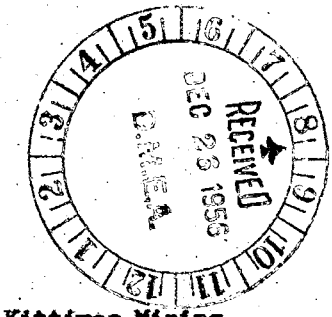
King.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

224 New Customhouse
Denver 2, Colorado

WASHINGTON 25, D. C.

December 19, 1956



Memorandum

To: W. H. King (w/brochure)
E. N. Harshman (w/brochure)

From: DMEA Field Team, Region III

Subject: Docket DMEA 4549 (lead-zinc-copper) Kittimac Mining Company (Kittimac Mine) San Juan County, Colorado

Enclosed is the subject application in the amount of $50,381.22. A field examination and suitable report are required.

Enclosed for your further information is a copy of a letter from the Chairman of the Operating Committee, dated December 14, 1956 with memoranda of review of the application by N. E. Nelson and O. M. Bishop.

We are advised that four copies of a letter will be forthcoming, concerning a possible change in the present partnership; and upon receipt by this office, one copy will be forwarded to be included with each copy of the brochure. We are also advised that the property is now accessible for a field examination.

Will you please return the brochure with your Report of Examination.

DMEA Field Team, Region III

Original signed by
W. M. TRAVER

By W. M. Traver
Executive Officer

Enclosures

BMC:ytl

cc: Sec. Op. Comm. (2)
4549 Docket
Chron.

Region III

Building 20
Denver Federal Center
Denver 2, Colorado

December 20, 1956

DMEA
DEPARTMENT OF THE INTERIOR
DEC 21 1956
REGION III
DENVER, COLORADO

Memorandum

To: W. M. Traver, Executive Officer, DMEA Field Team, Reg. III

From: Superintendent, Denver Experiment Station, Reg. III

Subject: Docket DMEA 4549 (lead-zinc-copper) Kittimac Mining Company (Kittimac Mine) San Juan County, Colorado

The application for Kittimac Mining Company, Docket DMEA 4549 in the amount of $50,381.22 was received in this office on December 20, 1956.

A field examination will be made and suitable report prepared by an engineer from the Denver office.

W. H. KING

W. H. King

cc: W. M. Traver (2)
E. H. Harshman
J. F. Shaw
Sec. O.P. Conf(2)

RECEIVED
DEC 1956
D.M.E.A.

File Copy
Surname
Hugescheid
Thiswolf
Selfridge
K Johnson
[illegible]

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

500

December 14, 1956.

Mr. W. M. Traver
Executive Officer
DMEA Field Team, Region III
224 New Customhouse Building
Denver 2, Colorado

Re: Docket No. DMEA-4549 (Lead-Zinc-Copper)
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado

Dear Mr. Traver:

The cited application for exploration assistance is being referred to your office for consideration, a field examination of the property if warranted, and recommendations.

If the project is favorably considered by the Field Team, the following points should be taken into consideration.

(1) Phase "A" (Parts 1-3) consists entirely of rehabilitation, cleanup and sampling. The total cost of this phase is $15,551.00 and the immediate objective is the taking of about thirty samples. If the sampling were not to disclose ore, no further work would be done. It is not the policy of DMEA to participate in rehabilitation and cleanup for the purpose of sampling. The mud and water poses quite a problem for their sampling plans.

(2) The shaft sinking phase is the best feature of the project. It would really show what the Applicant wants to find out and would give it a point of attack for drifting on a lower level. The tunnels are reasonably clean to the proposed starting point between O and B on Fig. 5 and waste work would not be necessary. The complete cost of sinking is high.

RGH

(3) The driving of the crosscut to the Isabella vein without any drifting on the vein does not seem to be of any great value.

(4) Three claims shown on the map do not appear in the list given with the lease. They are: Caliber No. 4; Racine, which adjoins the Purser No. 2; and another claim which adjoins the Grand Rapids but of which the name is illegible.

(5) The samples taken by the Bureau of Mines gave some very encouraging results both as to width of vein and metal content. It may be that with a field examination it would be possible to plan some other method of attack that would be acceptable to the Applicant.

(6) The partnership agreement which you requested will be necessary and the assignment of the lease to the partnership will also be a prerequisite to a contract.

It is unfortunate that the drilling results have been so unsatisfactory as they would have given the quickest and cheapest results.

This referral is being made with the hope that any necessary examination work may be done before the property becomes inaccessible for the winter.

Copies of memoranda dated December 3 and 4, 1956, by N. E. Nelson, Geological Survey, and O. M. Bishop, Bureau of Mines, respectively, relating to the project are enclosed for your information.

We are enclosing two copies of the application for the use of the Field Team.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee

WPKluegescheid/er 12/11/56

Enclosures

Copy to: Docket
Admr R File
Op. Committee
Base Metals
Mr. Bishop, USBM
Mr. Kiilsgaard, USGS
Chron.

APPROVED:

Frank D. Lamb

Member, Bureau of Mines

Thor H. Kiilsgaard

Member, Geological Survey

File Copy
Surname
Klugescheid
Griswold
Kiilsgaard
Lamb
Selfridge
Johnson

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

DEC 14 1956

Mr. Walter W. Bentley
Kittimac Mining Company
Post Office Box 541
Silverton, Colorado

Re: Docket No. DMEA-4549 (Lead-Zinc-Copper)
Kittimac Mining Company
Kittimac Mine
San Juan County, Colorado

Dear Mr. Bentley:

Your application for Government assistance to explore the cited property has been reviewed by the Base Metals Division of the Defense Minerals Exploration Administration and has been referred to:

Mr. W. M. Traver
Executive Officer
DMEA Field Team, Region III
224 New Customhouse Building
Denver 2, Colorado

If the Field Team requires additional information concerning your application, they will contact you at an early date.

Sincerely yours,

G. O. Mittendorf

Administrator

WPKlugescheid/er 12/11/56
Copy to: Docket
Admr R File
Op. Committee
Base Metals
Mr. Bishop, USBM
Mr. Kiilsgaard, USGS
Region III (2)
Ch

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

224 New Customhouse
Denver 2, Colorado

December 10, 1956

RECEIVED
DEC 12 1956
D.M.E.A.

Docket

Kittimac Mining Company
c/o Mr. Walter W. Bentley
P. O. Box 541
Silverton, Colorado

Re: Docket DMEA 4549 (lead-zinc-copper) Kittimac Mining Company (Kittemac Mine) San Juan County, Colorado

Dear Mr. Bentley:

You delivered the application on the captioned docket to this office on November 19, 1956, stating that you would furnish four copies of a Partnership Agreement pertaining thereto by November 26, 1956.

You were also requested by letter of November 20th to furnish four copies of an Assignment of the Mining Lease covering the property, from you as an individual, to the partnership.

As of today neither of these documents has been received for transmittal to Washington, and in the meantime, they are unable to process the application. Please advise when we may expect to receive both documents.

Yours very truly,

Original signed by
W. M. TRAVER

W. M. Traver
Executive Officer, DMEA
Field Team, Region III

WMT:ytl

cc
Sec. Op. Comm. (2)
Shaw (2)
Harshman
Docket 4549
Chron.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

RECEIVED
DEC 4 1956
D.M.E.A.

December 4, 1956

Re: DMEA 4549; Pb-Zn-Cu;
$50,381.22
Walter W. Bentley, d.b.a.
Kittimac Mining Co.
Silverton, Colorado
Kittimac Claims
San Juan County, Colorado

Memorandum

To: W. R. Griswold, DMEA

From: O. M. Bishop, Branch of Base Metals

Subject: Subject application, dated November 17, 1956, received by DMEA November 23, 1956

The applicant has a 5-year lease with purchase option to the 84-claim Kittimac Group, 10 miles to the northeast of Silverton, Colorado. The property has been the subject of many examinations, and several exploration campaigns. Total production from 1908 through 1945 has totaled about 24,000 short tons of ore which yielded 0.06 ounces gold, 2.5 ounces silver per ton, and 0.82 percent copper, 2.2 percent lead, and 0.6 percent zinc. The value of concentrate produced prorated back to the ore would average about $8.00 per ton and would clearly be non-commercial with the costs that would have pertained in mining and milling.

The assays given in exhibit V suggest that average value are considerably higher than recovered values, but there are no data by which to judge whether this is owing to poorer grade, poor metallurgy or refractory ores.

The applicant proposes a two stage program. The first stage is to provide for rehabilitation, clean up, and sampling at about $15,551. The second stage contingent on the first would consist of winzing on the vein to a depth of 150 feet; and crosscutting about 50 feet through the Isabella vein at a total cost of some $29,395.37.

I recommend that the application be referred to the field for review and examination. On the basis of the past production I would judge the ores to be marginal and would

suggest that unless there is reason to think further development will prove ore of better quality or of a nature more amenable to successful concentration, the application should be denied.

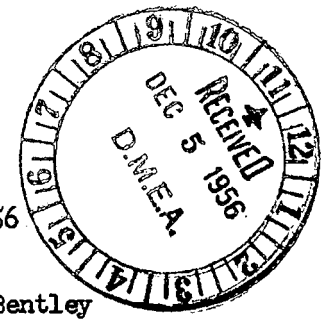
O. M. Bishop

O. M. Bishop

Copy to: Division of Minerals
Mr. Kiilsgaard
Mr. Lamb
Mr. Bishop
Files

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.



December 3, 1956

Re: DMEA 4549
Walter W. Bentley
Kittimac Mine
San Juan Co., Colo.
$50,381.22, Lead, Zinc, Copper

Memorandum

To: W. R. Griswold, Defense Minerals Exploration Administration

From: N. E. Nelson, U. S. Geological Survey

Subject: Review of application.

The applicant requests assistance in reopening, revamping and drift floor sampling of an old mine. The sampling would test a vein which has been mined above. If the results of sampling are satisfactory, shaft sinking (winze), crosscutting and drifting would be undertaken as Stage II of the proposed work program.

The vein has been stoped for a length of nearly 500 feet. Diamond drilling to test the vein below the drift was inconclusive but suggestive of the vein existence. If the sampling shows the sinking is warranted the results of such exploration should be conclusive.

Referral of the application to the Field Team for appropriate action is recommended.

N. E. Nelson

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

November 23, 1956

Kittimac Mining Company
c/o Mr. Walter W. Bentley
P. O. Box 541
Silverton, Colorado

Subject: DMEA-4549

Gentlemen

Your application for exploration assistance, dated November 17, 1956 submitted to our office at Denver, has been assigned Docket Number DMEA-4549 and referred to the Base Metals Division in the Washington office.

Kindly identify all future correspondence relating to your application by this Docket Number.

Sincerely yours,

(Sgd) Allen S. Dakan

Allen S. Dakan, Director
Operations Control and
Statistics Division

Copy to:

Region III. Denver 2, Colorado

Code 500

5416

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

RECEIVED
NOV 23 1956
D.M.E.A.

224 New Customhouse
Denver 2, Colorado

November 20, 1956

Memorandum

To: Secretary of the Operating Committee

From: Executive Officer, DMEA Field Team, Region III

Subject: Application for DMEA Aid (Lead-Zinc-Copper), Walter W. Bentley, d/b/a Kittimac Mining Company (Kittimac mine) San Juan County, Colorado

Enclosed are three copies of the subject application in the amount of $50,381.22 delivered to this office November 19, 1956 by Mr. Bentley in person.

Mr. Bentley's attention was called to his answer to 1 (d) and requested to furnish a copy of the partnership agreement. He states the partners are brothers and at the moment the agreement is verbal. However, he is having a written agreement prepared, signed, and delivered to this office by November 26. Copies will be forwarded to you immediately upon their receipt. He should probably also assign the lease to the partnership.

The applicant's proposed project has merit, if as he states, core drilling is out of question. He is an experienced operator in the San Juan Region and cost estimates appear reasonable.

If the lease requires legal review, it can be deferred until it is determined whether a project is to be recommended.

Processing of the application through Washington to the field should be expedited if an examination is to be made before winter sets in. Bentley expects the mine road will be kept open by the County about to January 1 due to operation of the adjoining Caledonian mine.

W. M. Traver

Enclosures

W. M. Traver

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

224 New Customhouse
Denver 2, Colorado

November 20, 1956

Walter W. Bentley
P. O. Box 541
Silverton, Colorado

Dear Mr. Bentley:

In reviewing the application on the Kittimac mine which you delivered to this office yesterday, I find the lease is made out to you as an individual, whereas the application is in the name of a partnership.

Besides the partnership agreement you are furnishing, you should also provide four copies of an assignment of the lease from you to the partnership.

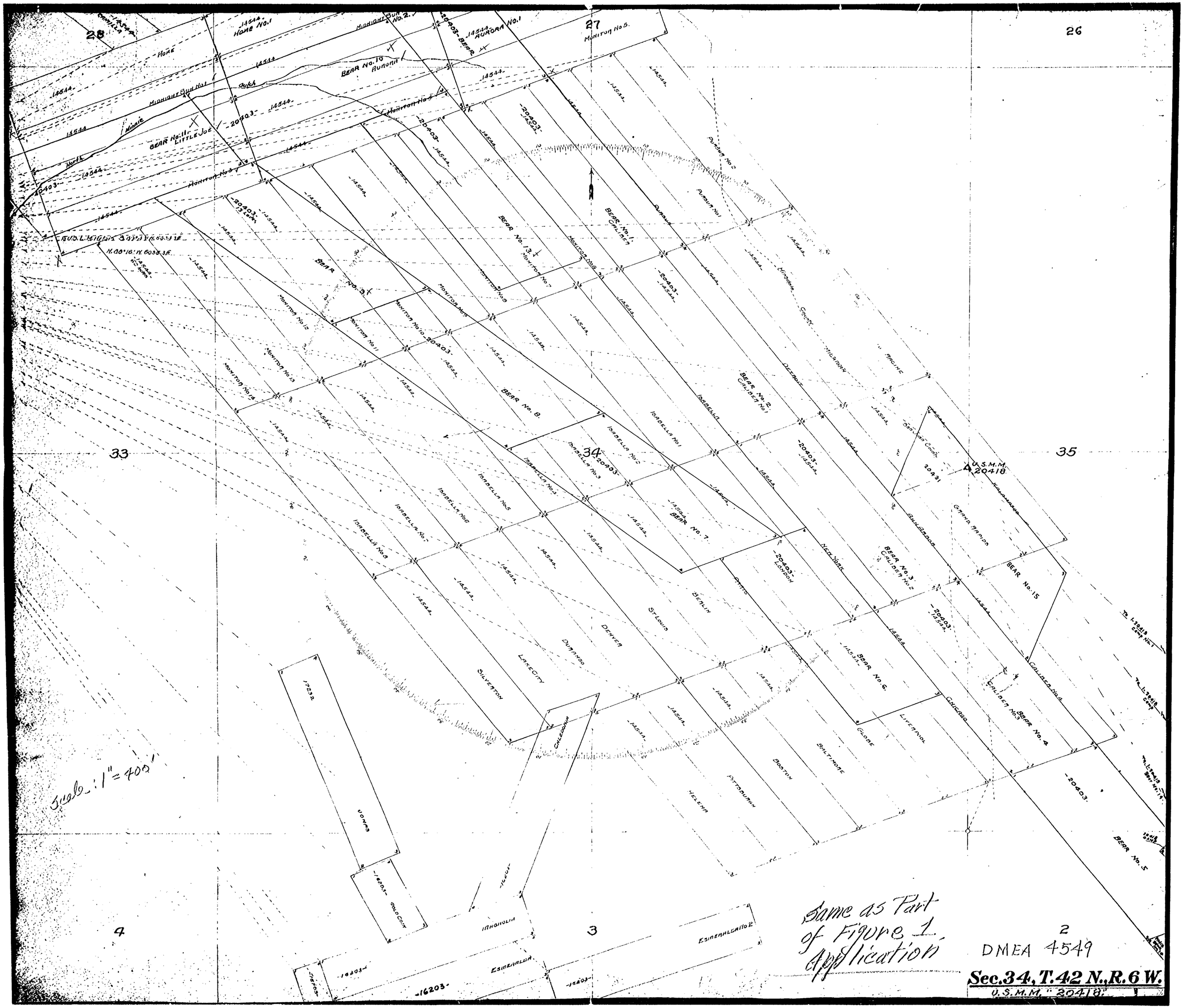
Very truly yours,

Original signed by
W. M. TRAVER

W. M. Traver
Executive Officer, DMEA
Field Team, Region III

WMT/pw

cc: Sec.Op.Comm. (2)
Shaw (2)
Harshman
Subject
Chron


Sec.34, T.42 N., R.6 W.
U.S.M.M. "20418"
DMEA 4549
Same as Part of Figure 1 Application
Scale 1" = 400'
BEAR No. 8.
BEAR No. 7.
BEAR No. 6.
BEAR No. 5.
BEAR No. 4.
BEAR No. 3.
BEAR No. 2.
BEAR No. 1.
BEAR No. 10
BEAR No. 11
BEAR No. 13
BEAR No. 15
HOME No. 1
AURORA No. 1
MONITOR No. 5
MONITOR No. 3
MONITOR No. 7
MONITOR No. 9
MONITOR No. 10
MONITOR No. 11
MONITOR No. 12
MONITOR No. 13
MONITOR No. 14
ISABELLA No. 1
ISABELLA No. 2
ISABELLA No. 3
ISABELLA No. 4
ISABELLA No. 5
ISABELLA No. 6
ISABELLA No. 7
ISABELLA No. 8
PUNSUN No. 1
PUNSUN No. 2
CALIBER No. 1
CALIBER No. 2
CALIBER No. 3
CALIBER No. 4
CALIBER No. 5
MIDNIGHT SUN No. 1
MIDNIGHT SUN No. 2
LITTLE JOE
MINNIE
NORTH
CAMILLA
DENVER
ST LOUIS
BERLIN
PITTS
LONDON
NEW YORK
CHICAGO
LIVERPOOL
GLOBE
BALTIMORE
BOSTON
PITTSBURGH
HELENA
LAKE CITY
SILVERTON
DURANGO
CALEDONIA
DETROIT
GRAND RAPIDS
SAN DIEGO
ESMERALDA
SOLO COIN
IDAHOLIN
U.S.M.M. 20418
U.S.M.M. 20421
Gilpin County
Clear Creek County
Arapahoe County
Douglas County
Jefferson County
Park County
Lincoln County
Elbert County
Pueblo County
Custer County
Fremont County
Chaffee County
T. 1 S., R. 69 W., 6th P.M.
T. 1 S., R. 70 W., 6th P.M.
T. 2 S., R. 69 W., 6th P.M.
T. 2 S., R. 70 W., 6th P.M.
20403
14544
16203
17232
N. 88° 16' W. 6033.3 ft.
S.U.S.L.M. 3937.3 N. 6033.3 ft.
26
27
28
33
34
35
4
3
2

Same as Fig. 5

Surface

11,850'

Section thru stope cut to surface

11,800'

(Altitudes are approximate.)

11,700'

Upper workings approximately located.

Stope fill (approximately located)

Stoped above

11,600'

H

375 61' 18.2'

376 24' 24.0'

377 57' 6.0'

G

Isabella vein

Tpa

N

Caledonia vein

Z

85°

E

85°

pillar

D

C

Caved stope fill

Still timber down

Estimating 20' depth of shrunk stope material resting on timbers

B

Sampled under track

Stoped above

NORTH

Main Little Joe adit

To portal

Altitude about 11,560'

Heads of Cumberland & Gallinipper

"Powder house"

EXPLANATION

Silverton volcanic series — TERTIARY

Tpa

Pyroxene quartz latite after Larsen and Cross U.S.G.S. P.P. - 258

Quartz vein contains copper, lead, and zinc sulfides

80°

Strike and dip of vein parentheses denote approximate dip

Ore chute

Ladder

ASR-36

Location of sample cut by American Smelting and Refining Co.

USBM - 8

Location of sample cut by U.S. Bureau of Mines

401

Location of sample cut by W. W. Bentley.

Recommended location of winze

W ea.

401	1.5'	8.16	48.144	3.1'
402	1.6'	17.66	9.50	
391				
403	2.1'	23.56		
404	1.1'	24.56		
405	1.0'	25.80		
406	0.8'	26.60		
407	0.5'	28.15		
408	1.6'	43.60		
409	1.0'	46.10		
410	1.0'	41.10		
411	1.2'	31.85		
412	1.7'	32.50		
413	1.0'	38.80		
414	0.8'	23.35		
416	4.8'	0.55		

Section thru Stope

421 420 419 418 417

Fill

Stoped above

416

Tpa

84°

80°

10°

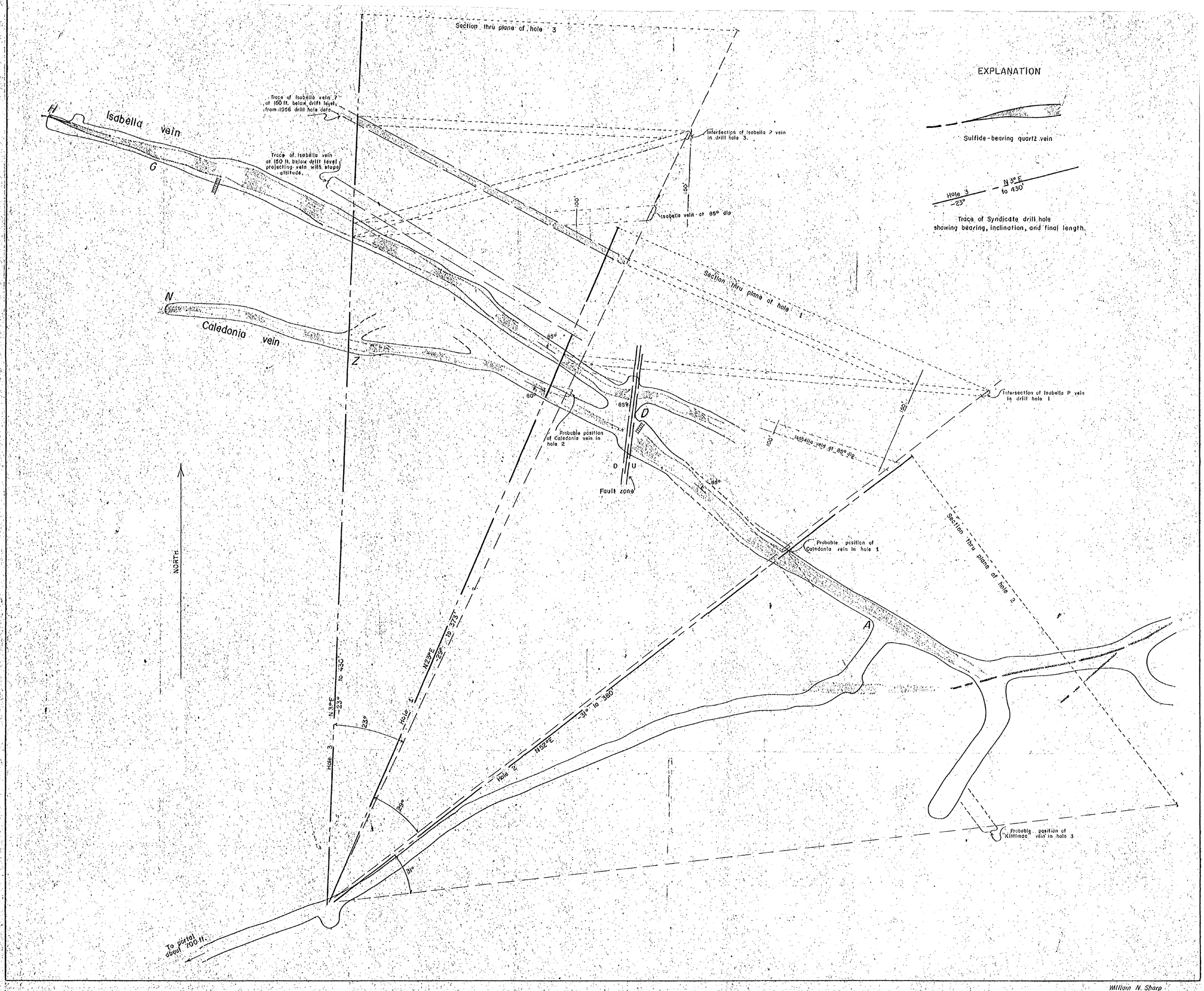
Mine map taken from Brunton and tape survey by W. Bentley, and other sources.

William M. Sharp
August 1957

Figure 3. KITTIMAC MINE, SAN JUAN CO., COLORADO
SHOWING ASPECTS OF SAMPLING 1946 - 1949, AND PROPOSED EXPLORATION PROGRAM - 1957

Scale 1" = 20'
0 20 40 60 80 100 ft.

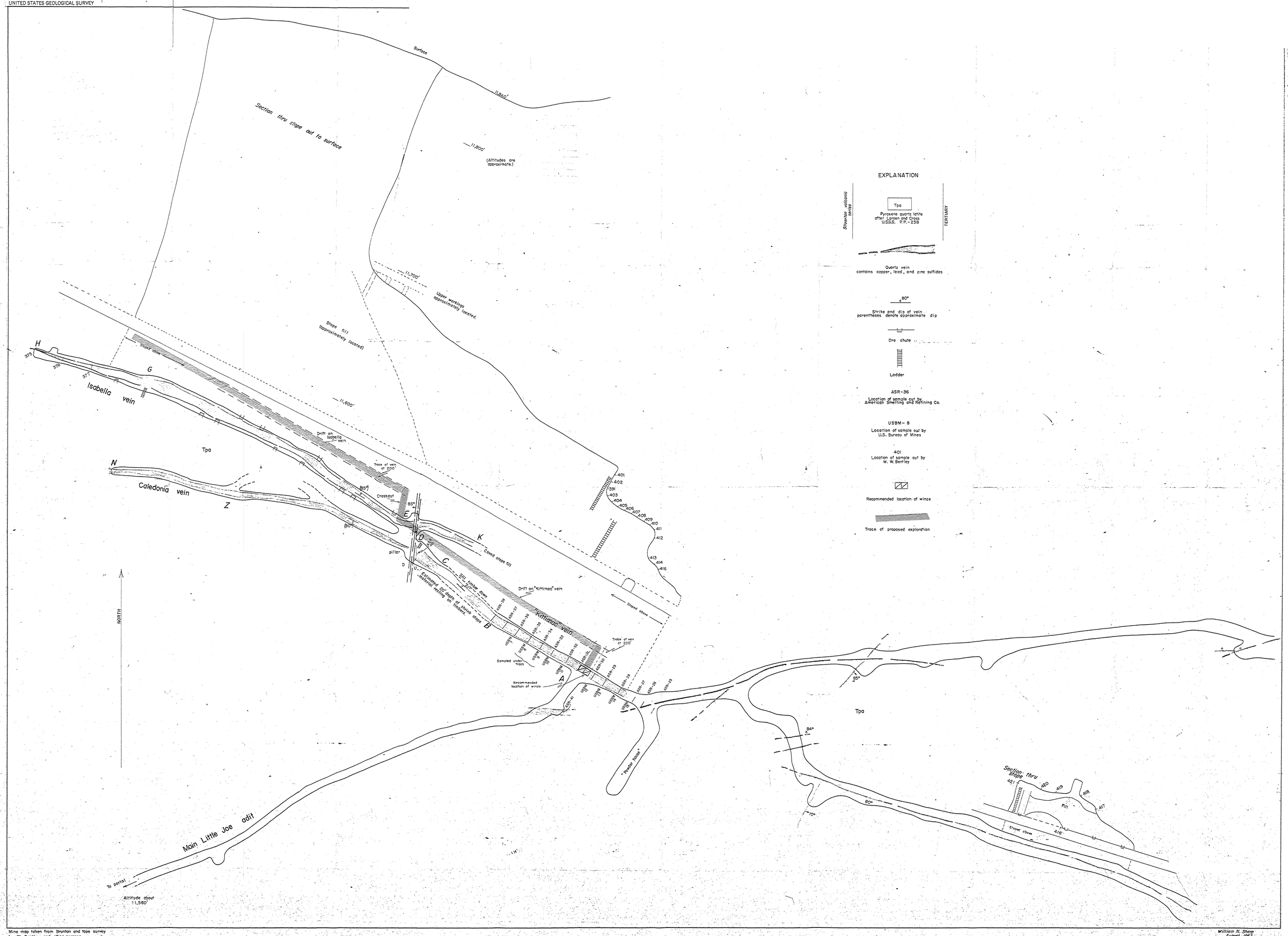
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY



William N. Sharp
August 1957

Figure 4. KITTIMAC MINE, SAN JUAN CO., COLORADO
SHOWING ASPECTS OF EXPLORATORY HOLES DRILLED 1956

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY



Mine map taken from Brunton and tape survey by W. Bentley, and other sources.

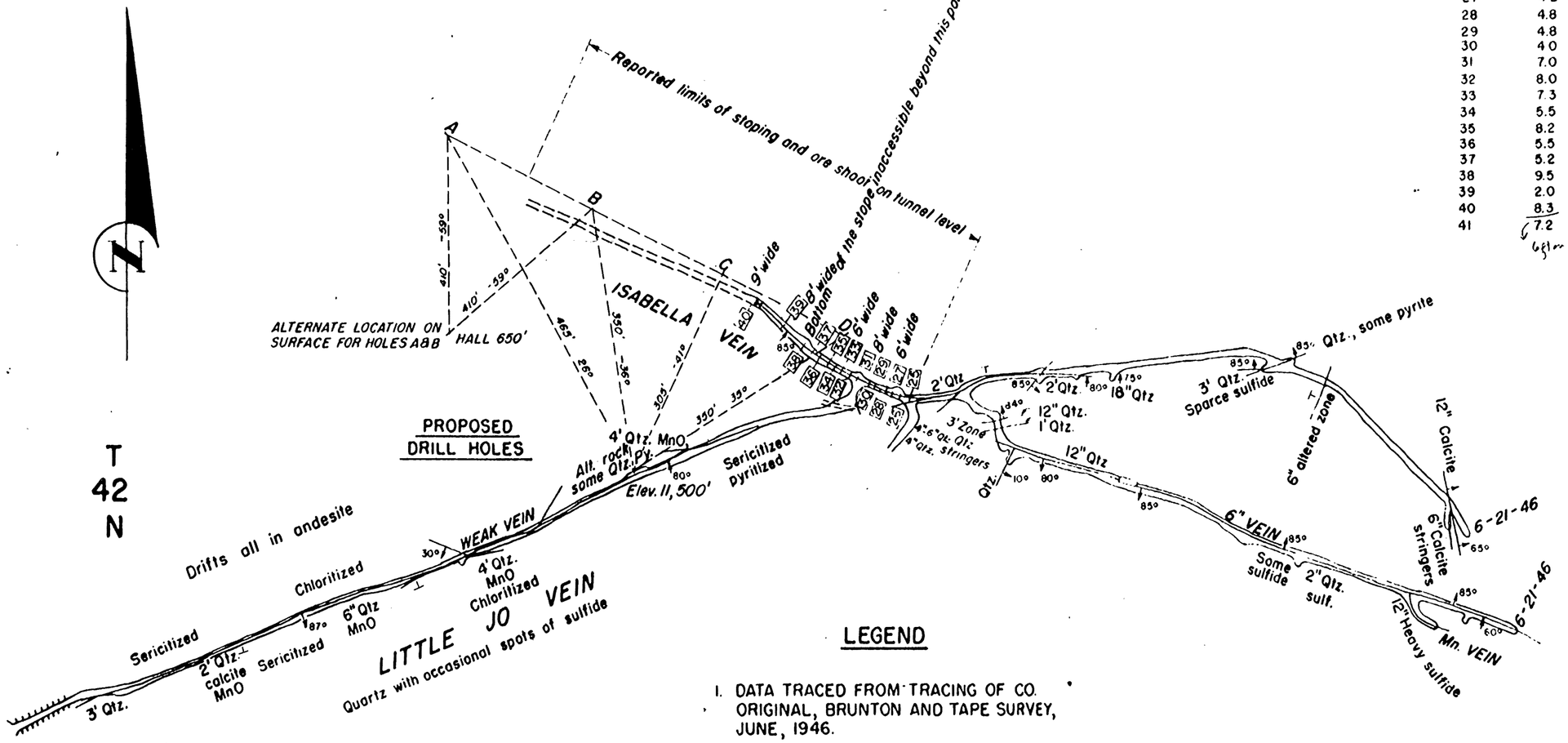
William N. Sharp
August 1957

Figure 3a. KITTIMAC MINE, SAN JUAN CO., COLORADO
SHOWING ASPECTS OF SAMPLING 1946-1949, AND PROPOSED EXPLORATION PROGRAM - 1957

Scale 1" = 20'
0 20 40 60 80 100 ft.

R 6 W

T 42 N



Portal, Elev. 11,500'
(Assumed Moritz & Hall, 6-21-46)

ASSAYS

SAMPLE NO.	WIDTH FT.	Au oz	Ag oz	Pb %	Cu %	Zn %	Combined Soft ore
25	6.0	Tr	.8	.3	.05	.7	1.05
26	4.0	"	1.6	1.4	1.22	2.5	5.12
27	4.2	"	2.0	2.7	1.78	4.3	8.78
28	4.8	"	3.1	7.8	7.34	5.9	21.08
29	4.8	"	3.0	1.8	2.75	7.5	12.05
30	4.0	"	2.2	1.9	1.78	4.9	8.58
31	7.0	.07	3.8	2.2	2.04	4.9	9.14
32	8.0	.29	3.1	2.2	2.98	6.9	12.08
33	7.3	.05	3.6	2.9	1.88	3.9	8.68
34	5.5	Tr.	2.3	2.4	1.17	4.1	7.67
35	8.2	"	1.4	.4	.91	.8	2.11
36	5.5	"	1.6	1.4	.91	2.3	4.61
37	5.2	.01	6.4	3.7	3.16	4.1	10.96
38	9.5	Tr.	5.6	5.0	3.46	8.2	16.66
39	2.0	"	7.0	5.2	1.17	2.6	8.97
40	8.3	.03	20.4	6.5	1.70	1.7	9.9
41	7.2	.17					9.28

LEGEND

1. DATA TRACED FROM TRACING OF CO. ORIGINAL, BRUNTON AND TAPE SURVEY, JUNE, 1946.
2. ASSAYS BY: E. W. NEWMAN, JULY, 1946.

0 100 200 300 400
SCALE OF FEET

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

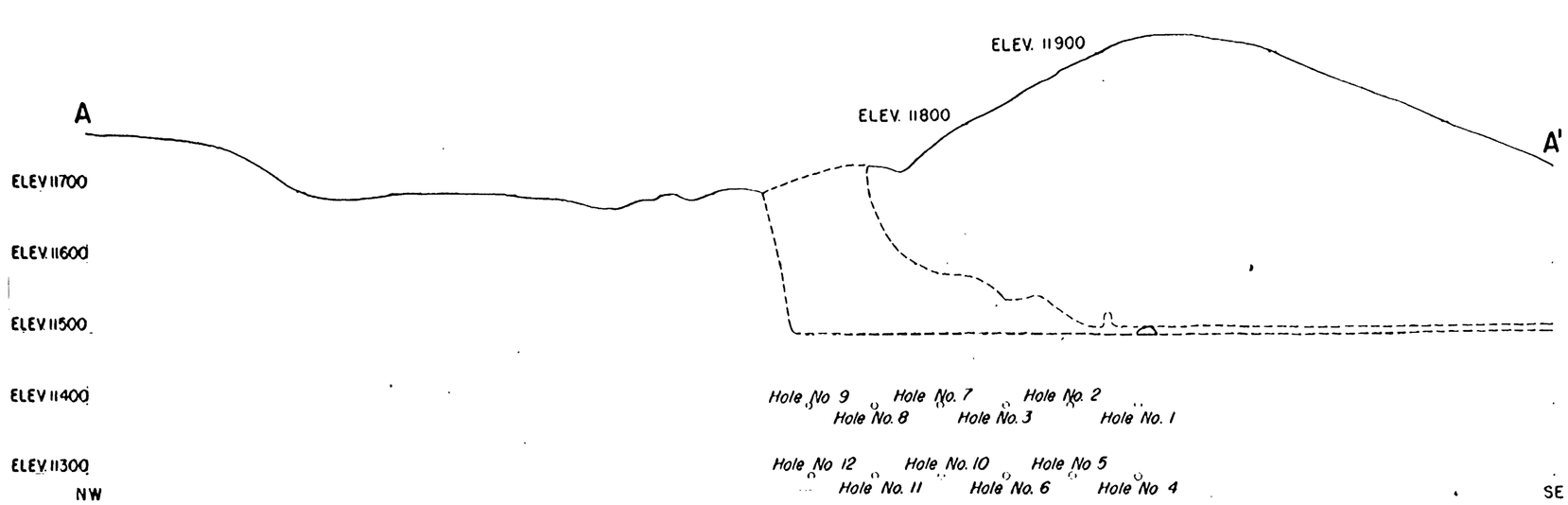
Fig. 3 Proj. No.

Geologic and Assay Plan of Tunnel Level

KITTIMAC MINE

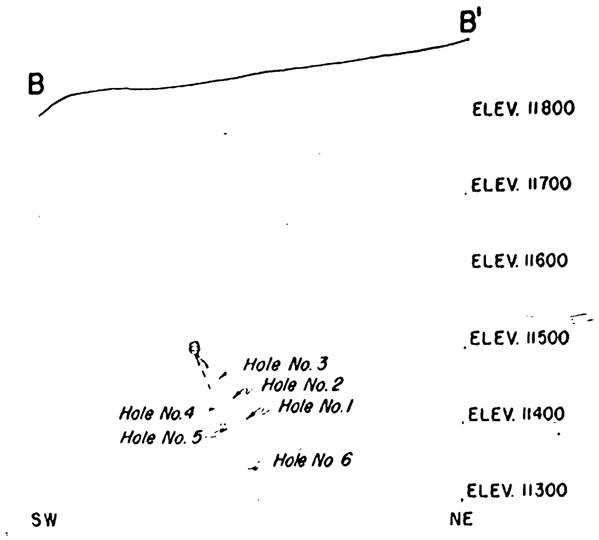
EUREKA MINING DISTRICT
SAN JUAN COUNTY, COLORADO

ENGINEER:	DATE: Sept. 12, 1949
TRACED: SEPT., 1949, BY: A.P.T.S.	1500-799-D
CHECKED:	



Section A-A'

along Isabella Vein

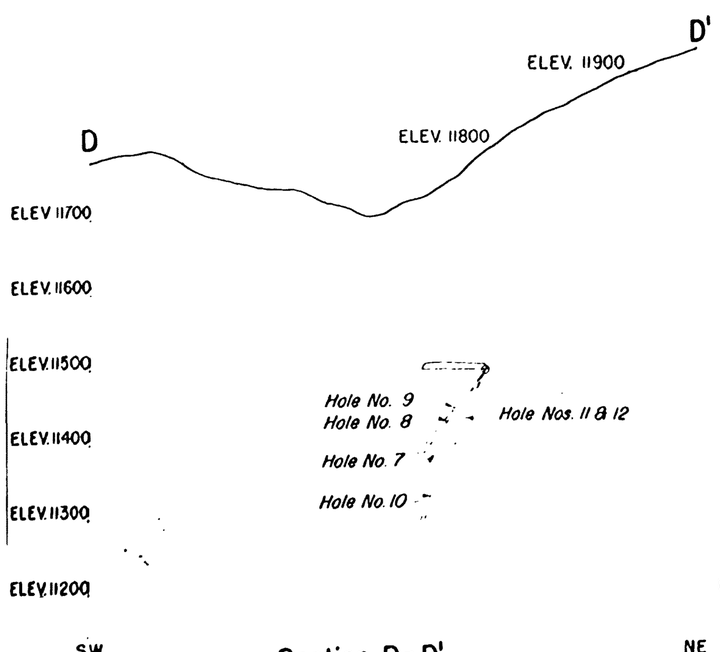


Section B-B'

Bearing N 18° E

HOLE DISCRIPTION:

HOLE NO.	DIP	DEPTH	BEARING
1	37°	190'	N70°E
2	48°	150'	N38°E
3	41°30'	170'	N30°W
4	56°30'	260'	N70°E
5	65°30'	240'	N38°E
6	60°	250'	N30°W

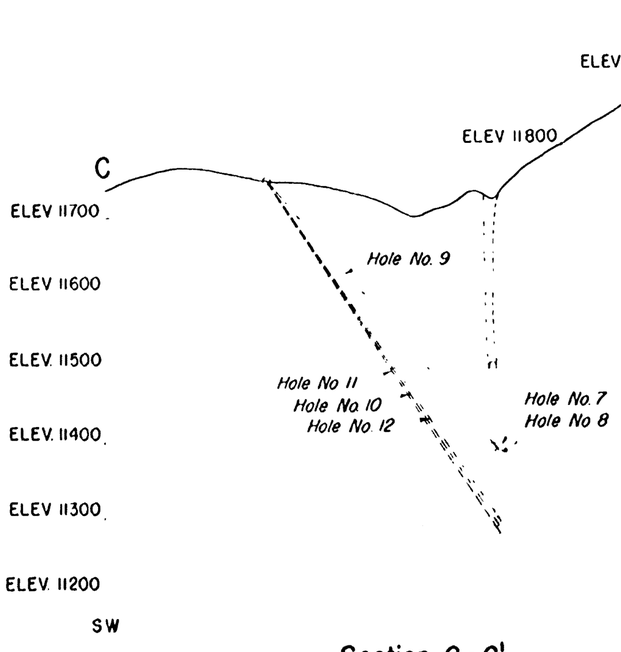


Section D-D'

Bearing N 18° E

HOLE DISCRIPTION:

HOLE NO	DIP	DEPTH	BEARING
7	36°	190'	S32°E
8	48°35'	145'	S15°W
9	37°30'	180'	S65°W
10	55°10'	260'	S32°E
11	66°	225'	S15°W
12	57°05'	250'	S65°W

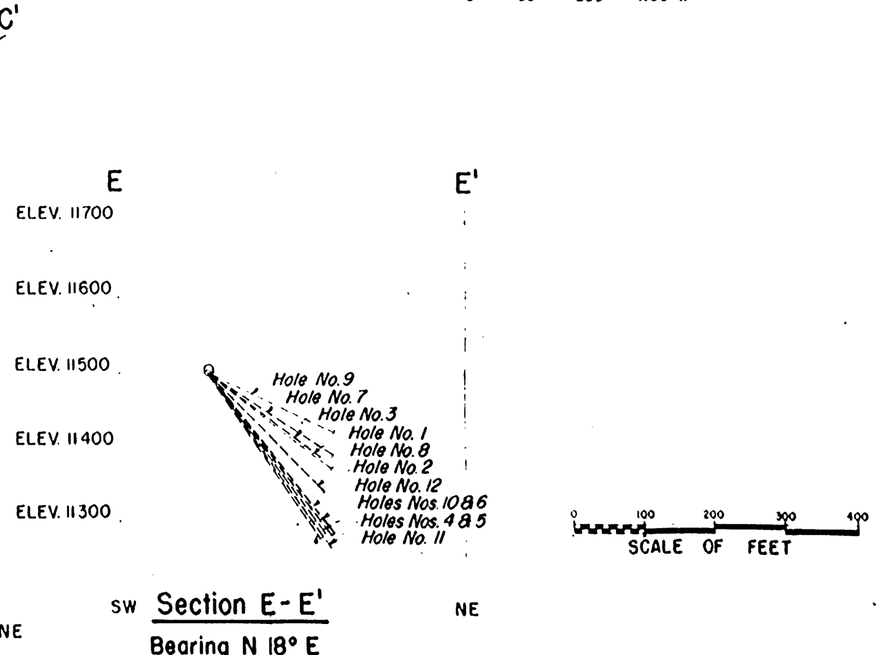


Section C-C'

Bearing N 18° E

HOLE DISCRIPTION:

HOLE NO.	DIP	DEPTH	BEARING
7	46°10'	500'	N38°E
8	47°30'	490'	N21°E
9	47°	490'	N04°E
10	53°10'	580'	N38°E
11	55°	570'	N21°E
12	54°	580'	N04°E



Section E-E'

Bearing N 18° E

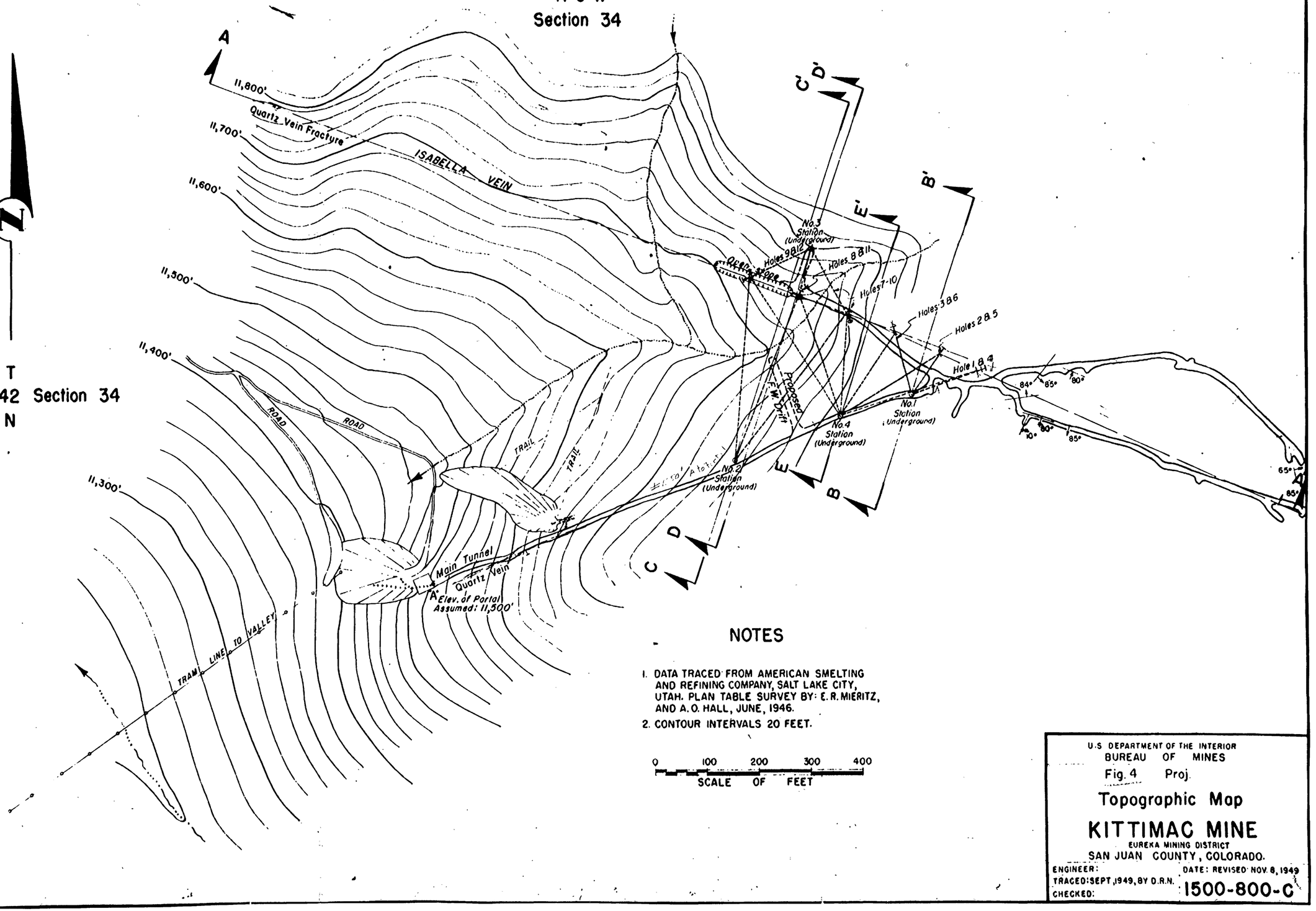
HOLE DISCRIPTION:

HOLE NO.	DIP	DEPTH	BEARING
1	19°40'	320'	N72°E
2	24°	270'	N59°E
3	29°	225'	N35°E
4	35°20'	360'	N72°E
5	41°30'	320'	N59°E
6	47°50'	285'	N35°E
7	28°40'	225'	N04°E
8	23°30'	280'	N21°E
9	13°30'	345'	N35°30W
10	47°10'	290'	N04°E
11	41°	330'	N21°W
12	33°35'	390'	N35°30W

K. H. M. A. C. Mine
San Juan Co., Colo.
Fig. 2

R 6 W
Section 34

T
42 N
Section 34



NOTES

1. DATA TRACED FROM AMERICAN SMELTING AND REFINING COMPANY, SALT LAKE CITY, UTAH. PLAN TABLE SURVEY BY: E. R. MIERITZ, AND A. O. HALL, JUNE, 1946.
2. CONTOUR INTERVALS 20 FEET.

0 100 200 300 400
SCALE OF FEET

U.S DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
Fig. 4 Proj.

Topographic Map

KITTIMAC MINE

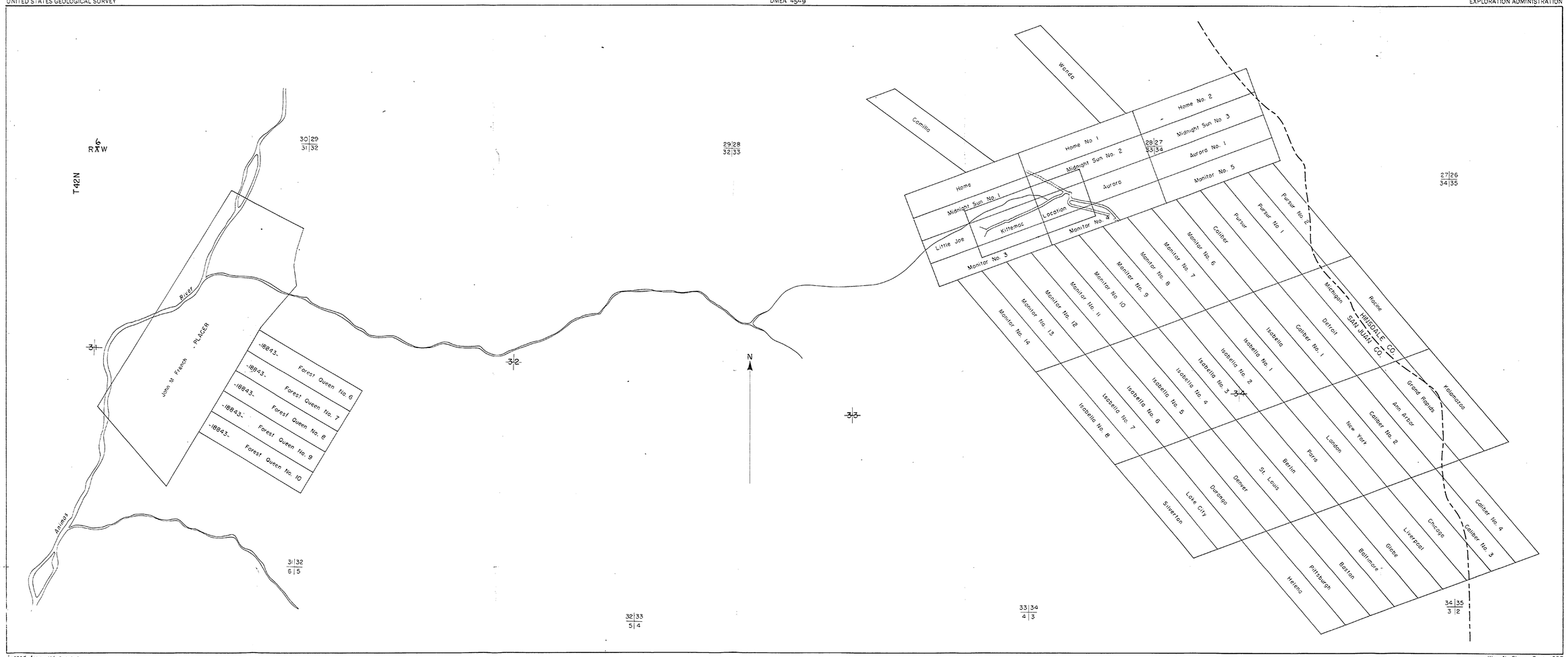
EUREKA MINING DISTRICT
SAN JUAN COUNTY, COLORADO.

ENGINEER:
TRACED: SEPT. 1949, BY O.R.N.
CHECKED:
DATE: REVISED NOV. 8, 1949
1500-800-C

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

EXAMINATION REPORT
DMEA 4549

PREPARED FOR
DEFENSE MINERALS
EXPLORATION ADMINISTRATION



Traced from old surveys

Wm. N. Sharp, Sept., 1957

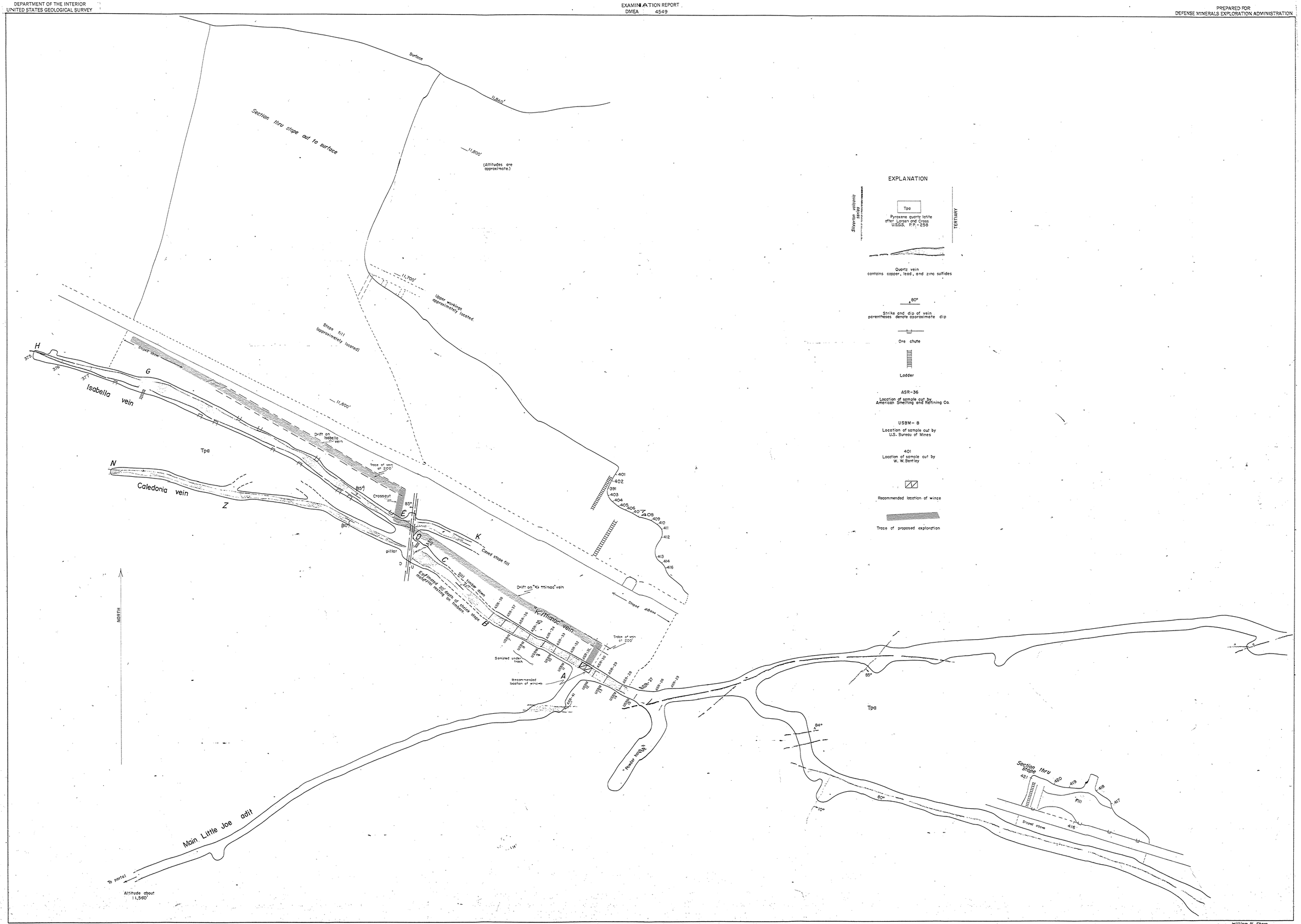
Figure 4 - KITTIMAC MINING COMPANY PROPERTY, EUREKA MINING DISTRICT, SAN JUAN COUNTY, COLORADO

500 0 500 1000 1500 Feet

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

EXAMINATION REPORT
DMEA 4549

PREPARED FOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION



EXPLANATION

Silverton volcanic series — TERTIARY

Tpa
Pyroxene quartz latite
after Larsen and Cross
U.S.G.S. P.P.- 258

Quartz vein
contains copper, lead, and zinc sulfides

80°
Strike and dip of vein
parentheses denote approximate dip

Ore chute

Ladder

ASR-36
Location of sample cut by
American Smelting and Refining Co.

USBM- 8
Location of sample cut by
U.S. Bureau of Mines

401
Location of sample cut by
W. W. Bentley

Recommended location of winze

Trace of proposed exploration

Mine map taken from Brunton and tape survey by W. Bentley, and other sources.

William N. Sharp
August 1957

Figure 3d. KITTIMAC MINE, SAN JUAN CO., COLORADO
SHOWING ASPECTS OF SAMPLING 1946-1949, AND PROPOSED EXPLORATION PROGRAM - 1957

Scale 1" = 20'
0 20 40 60 80 100 ft.

Mine Inventory and Compilation of Mine-Adit Chemistry Data

By Stanley E. Church, M. Alisa Mast, E. Paul Martin, and Carl L. Rich

Chapter E5 of
Integrated Investigations of Environmental Effects of Historical Mining in the Animas River Watershed, San Juan County, Colorado
Edited by Stanley E. Church, Paul von Guerard, and Susan E. Finger

Professional Paper 1651

U.S. Department of the Interior
U.S. Geological Survey

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Chapter E5
Mine Inventory and Compilation of Mine-Adit Chemistry Data

By Stanley E. Church, M. Alisa Mast, E. Paul Martin, and Carl L. Rich

Abstract

An inventory of inactive mines and mine-related sites in the Animas River watershed study area was compiled from published and unpublished State and Federal sources. Site locations were spatially verified using digital orthophoto quadrangles to ensure an accurate, geographically referenced inventory. The inventory provides, where available, descriptive information for mine-related sites, the estimated volume of mine-waste piles and mill-tailings deposits, and the discharge and pH of mine adits with flowing water. Water-quality and discharge data for 232 samples collected at 110 mine sites during low-flow conditions in 1995–99 have been compiled. In addition, time-series data are presented for water quality at seven adits sampled over the annual hydrologic cycle. These data provide site-specific information about potential sources of deposit-related acidity and trace elements that can be used to support an environmental evaluation of the effect of historical mining in the study area.

Analysis of the spatial variation in water-quality data from mine adits at low flow shows considerable variability. Mine-adit water chemistry is controlled by the degree of hydrothermal alteration in the surrounding bedrock and the type and extent of base-metal sulfides in the mine workings. Time-series data collected from seven draining adits show that increases in discharge generally are not associated with spring runoff and that concentrations of many metals remain very nearly constant or show a slight increase during this seasonal event. Increases in discharge from a few mines during spring runoff may be controlled by surface water that infiltrates into the mine, forcing mine-pool water out at the adit. Mine-adit flow may represent a long-term source of metals that affect surface water quality.

Introduction

This chapter describes the mine inventory compiled for the Animas River watershed study area. One of the most important facets of a complete characterization of watersheds affected by historical mines is to determine the location of, as well as gather and report information about, the mines, mills, and other mine-related sites. Within the Animas River watershed, data on mine and mine-related sites were available from several previous investigations. However, these data had not previously been compiled into one database, and many of the sites identified in these investigations had only approximate locations.

Every mine, mill, or smelter site in a watershed represents a potential source of deposit-related acidity and trace metals that could affect water quality and ecosystem health through direct drainage, seepage, erosion, or runoff. Although more than 5,300 mining-related features have been mapped in the study area (fig. 1), the vast majority of these sites were small prospect pits, many of which were located along the large and extensively exposed quartz veins described in the area by Purington (1905). (See the account of the discovery of the Sunnyside mine in Bird, 1999.) Other prospects were located on iron-rich springs, or in areas covered with oxidized iron deposits where there might have been other interesting features potentially indicative of sulfide mineralization at depth (Verplanck and others, this volume, Chapter E15; Yager and Bove, this volume, Chapter E1, pl. 2).

Four mining districts lie within the Animas River watershed study area. Raymond (1877, p. 324) reported that the San Juan area was initially divided into two mining districts:

> The Animas district includes all locations made on the Animas River and its tributaries to a point two miles above Howardsville.
>
> The Eureka district joins the Animas at this point and extends to the divide between the waters of the Animas and those of the Gunnison and the Uncompahgre.

The Red Mountain district originally was defined by the basin of Red Mountain Creek north of Red Mountain Pass in Ouray County, but Schwarz (1888) suggested that it be expanded

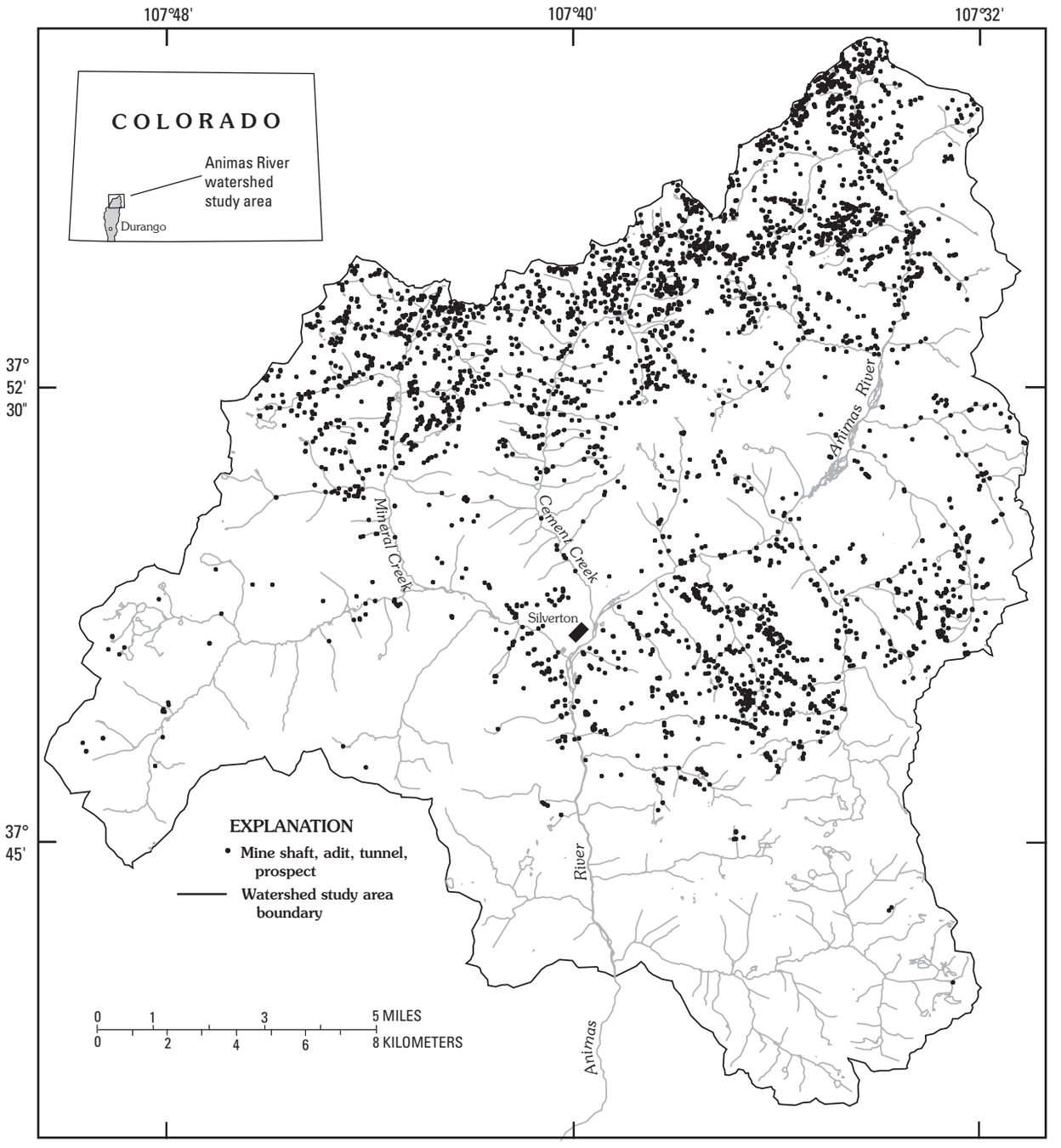

Figure 1. Locations of 5,397 mine shafts, adits, tunnels, and prospects from U.S. Geological Survey 1:24,000 scale topographic maps (Handies Peak, 1955; Howardsville, 1955; Ironton, 1955; Ophir, 1955; Silverton, 1955) and 373 AMLI_MINE_ID locations in Animas River watershed study area.

southward to include ores in chimney deposits associated with Red Mountain. Ransome (1901, p. 104) described the Red Mountain district as follows:

> ***bounded on the northeast by Grey Copper Creek, on the northwest by Red Creek, on the west and south by Mineral Creek, and on the east, with one or two exceptions near Red Mountain, by the ridge crest extending from Anvil Mountain northward to Red Mountain and thence northeast to the saddle at the head of Grey Copper Gulch.***

The Ice Lakes district in the headwaters of South Fork Mineral Creek was mentioned by Hodges (1899) in the report of precious-metal production by the U.S. Bureau of the Mint. Boundaries are not defined in the literature we examined, but the district includes the mines and mills in the headwaters of South Fork Mineral Creek. Approximate boundaries of the four mining districts are in figure 2.

Varnes (1963) described the mines and ores from the area of the Animas district south and east of Silverton, which he referred to as the "south Silverton mining area." Ores from this area are hosted in Paleozoic and Precambrian rocks and have different water chemistry than those from within the Silverton caldera (Bove and others, this volume, Chapter E3).

Purpose and Scope

This inventory focused on creation of a database of mine-related sites that have the potential for significant environmental effect to streams. The Animas River watershed study area contains numerous prospects and inactive mines. Although the potential exists for any one of these sites to adversely affect the environment, only a small fraction of them were considered likely to cause significant effects. Mine sites with draining adits, large workings, large mills, mine-waste dumps or rail loading zones were the primary focus of the mine inventory. Thus, prospects and smaller mine sites in the Animas River watershed study area were not inventoried in this study, and our survey is thereby not an exhaustive one (fig. 2). The primary objectives for this mine inventory were

- To create a modern digital database with accurate location data of mine and mill sites, large mill-tailings deposits, and smelter sites that have significant potential to cause environmental effects in streams
- To provide information, such as the size of mine-waste piles and mill-tailings deposits, ground- and surface-water quality, and numbers of mine features, that may be needed to assess site remediation and stream restoration activities
- To tabulate water-quality data collected over the 1995–99 period of study and provide a temporal and geologic framework for interpreting these data.

The mine inventory for the Animas River watershed study area was compiled from a variety of published references and maps of the districts. The inventory combines geographically referenced locations and descriptive information in a format that lays the foundation for answering environmental and remediation questions. The inventory includes inactive mines and mine-related sites in the upper Animas River basin, Cement Creek and Mineral Creek basins, and South Fork Mineral Creek subbasin in the vicinity of Silverton, Colo. (von Guerard and others, this volume, Chapter B, fig. 2).

Acknowledgments

We thank the following local residents, all familiar with historical mining in the watershed, for their assistance in locating and verifying mine sites: Steve Fearn, Larry Perino, William Simon, and especially Bill Jones, who provided extensive reviews of our mine location maps. We thank Jerry Hassemer for compiling unpublished data (table 5) from the Animas River Stakeholders Group, the Colorado Geological Survey, and the Colorado Division of Mines and Geology.

Methodology

The process used to compile the mine inventory included the following steps. First, data from previous investigations were assembled. We reduced the number of sites to be included in the inventory considerably by eliminating sites that likely had no environmental effect. Factors for inclusion or exclusion in the mine-site inventory focused on a site's contribution to environmental degradation, the physical hazard risk, and past production. Sites excluded from the inventory included numerous small prospects, sites located some distance from watercourses, and sites for which evidence of any environmental effect was lacking. For the remaining sites, representative locations were determined and features considered important relative to environmental effects were tabulated from existing sources. Published data, primarily from Ransome (1901), Henderson (1926), Burbank (1933), Varnes (1963), and Burbank and Luedke (1969), and unpublished data as well as our field investigations suggest that the inventory presented in this chapter is comprehensive in terms of identifying the larger and more environmentally significant historical mines and mine-related sites.

Determination of the representative location for a mine-related site involved review of public records and data obtained from the State of Colorado, United States Department of Agriculture (USDA) Forest Service, U.S. Bureau of Land Management (BLM), and U.S. Geological Survey (USGS) databases and published studies cited in the references. These location data then were combined into a single digital layer,

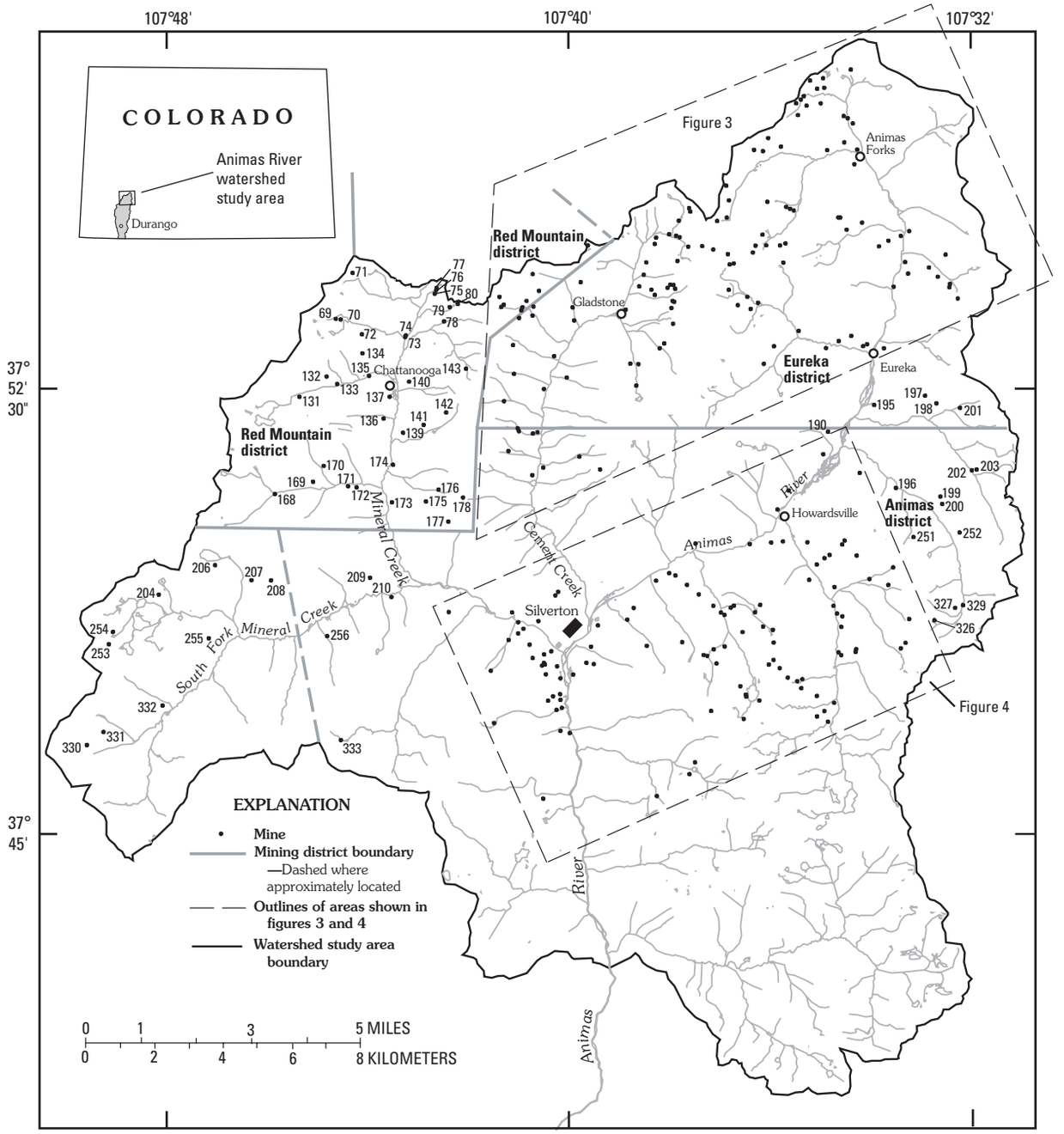

Figure 2. Approximate mining district boundaries and mine locations in Animas River watershed study area and vicinity; mine names are listed in tables 1 and 2. Extensions of boundaries of Red Mountain district to north into Ouray County, as described by Ransome (1901), are indicated by dashed lines.

and each site location was resolved to one representative point based on 1998 digital orthophoto quadrangles (DOQ). In some cases, the site location had to be determined strictly from a written description. Using DOQ image plots containing the resolved mine locations, USGS personnel and local residents familiar with the mines of the study area verified and revised the locations of the mine-related sites based on site visits, survey plats, and local knowledge of the area. Unpublished field inventories were used extensively to develop the final location data, as follows:

- U.S. Bureau of Mines (Barbara Hite, Unpublished mine land inventory report for the U.S. Bureau of Land Management, 1995)
- Colorado Geological Survey (Jonathan Lovekin, Michael Satre, William Sheriff, and Matthew Sares, Unpublished abandoned mine land inventory report for San Juan Forest, Columbine Ranger District, Colorado Geological Survey, 1997)
- Colorado Division of Minerals and Geology (Jim Herron, Bruce Stover, Paul Krabacher, and Dave Bucknam, Unpublished Mineral Creek feasibility investigations report, Upper Animas River Basin, Colorado Division of Minerals and Geology, 1997; Jim Herron, Bruce Stover, and Paul Krabacher, Unpublished Cement Creek reclamation feasibility report, Upper Animas River Basin, Colorado Division of Minerals and Geology, 1998; Jim Herron, Bruce Stover, and Paul Krabacher, Unpublished Upper Animas River reclamation feasibility report, Upper Animas River Basin, Colorado Division of Minerals and Geology, 1999; Jim Herron, Bruce Stover, and Paul Krabacher, Unpublished Lower Animas River reclamation feasibility report, Upper Animas River Basin, Colorado Division of Minerals and Geology, 2000)
- Local citizens who collectively make up the Animas River Stakeholders Group, ARSG (Peter Butler, Robert Owen, and William Simon, Unpublished report to Colorado Water Quality Control Commission, Animas River Stakeholders Group, 2001).

Data

The mine inventory for the Animas River watershed study area contains locations, site characteristics and features, and water-quality data for inactive mines and mine-related sites in a single data layer in the project database. (See Sole and others, this volume, Chapter G, for a complete explanation of how to access the mine inventory and project database.) Each of the 373 sites in the mine inventory has been assigned a site number called the AMLI_MINE_ID. This site number is a unique identifier and allows each site to be associated with scientific data and selected field sampling sites contained in the study database. Some historical mine sites contain extensive underground workings or have multiple shafts and adits within a small area. In some cases, these sites are represented in the mine inventory by a single site number. In other cases, particularly at complex sites where mines were consolidated or have been referred to by different names in the published literature, different mine levels were assigned different site names and numbers.

Table 1 lists the 373 mines, mills, large mill-tailings deposits, and smelter sites included in the inventory, and provides the geographic coordinates for each site. The location status field provides a relative measure of how accurately the site has been located. The decision to encode the location status field in table 1 with “verified” or “approximate” was determined by our comparison of the source description and field diagrams with the DOQ and locations symbolized on existing maps. A verified value means that USDA Forest Service, BLM, or USGS personnel, or local residents involved in the mining industry checked the mine-related location and agreed on its position with a high degree of confidence. Table 2 contains just the mine sites in the inventory and lists these sites alphabetically by name to facilitate cross-referencing of mine names with locations. Although we have not made an exhaustive search of the literature for synonyms, we have included them, where we have that information, in table 2. Table 3 provides an alphabetical list of the locations of mills, large mill-tailings deposits, and smelters in the study area. Figures 2–5 show locations of the inventoried sites. Locations of mines are shown in figures 2–4. Figures 3 and 4 provide more detailed maps of the upper Animas River basin near Eureka and the south Silverton mining area. Locations of mills, large mill-tailings deposits, and smelters are shown in figure 5. Together, these illustrations and tables should facilitate location of any of the mines, mills, large mill-tailings deposits, or smelter sites referred to in this volume and provide the identifier which can be used to find additional data from the database for each of these sites.

Production records for most mines in the watershed are largely proprietary. Jones (this volume, Chapter C) gives the total production for the entire watershed for various commodities by year. He also lists the sizes of the mills and dates of expansion, gives information on mining and milling technology, and provides a link between mineral production and the transportation network in the watershed.

The mine names in the inventory are those generally referred to in the published references, the most thorough of these early reports being that of Ransome (1901). Mine

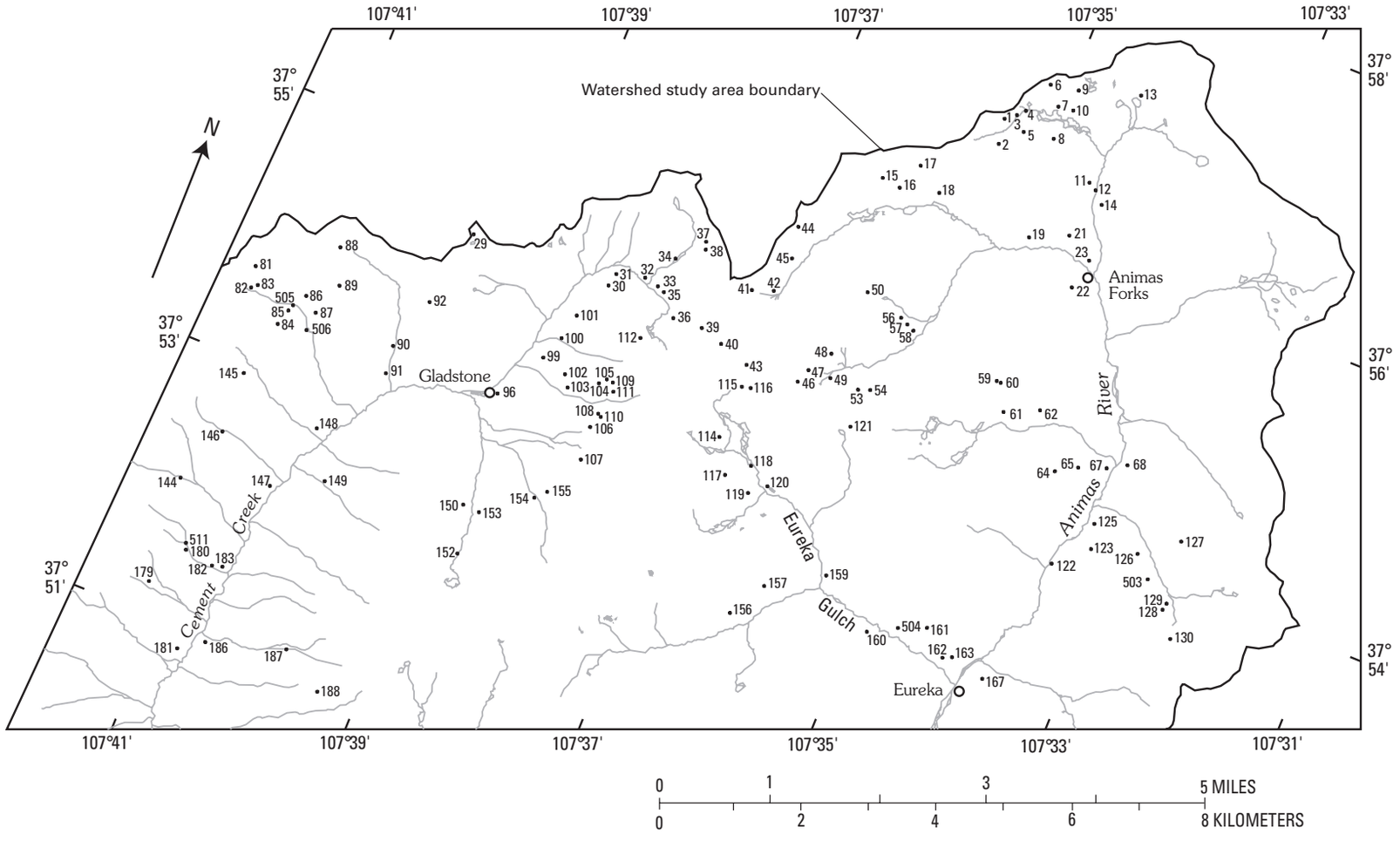

Figure 3. Eureka area showing mine locations; mine names are listed in tables 1 and 2.

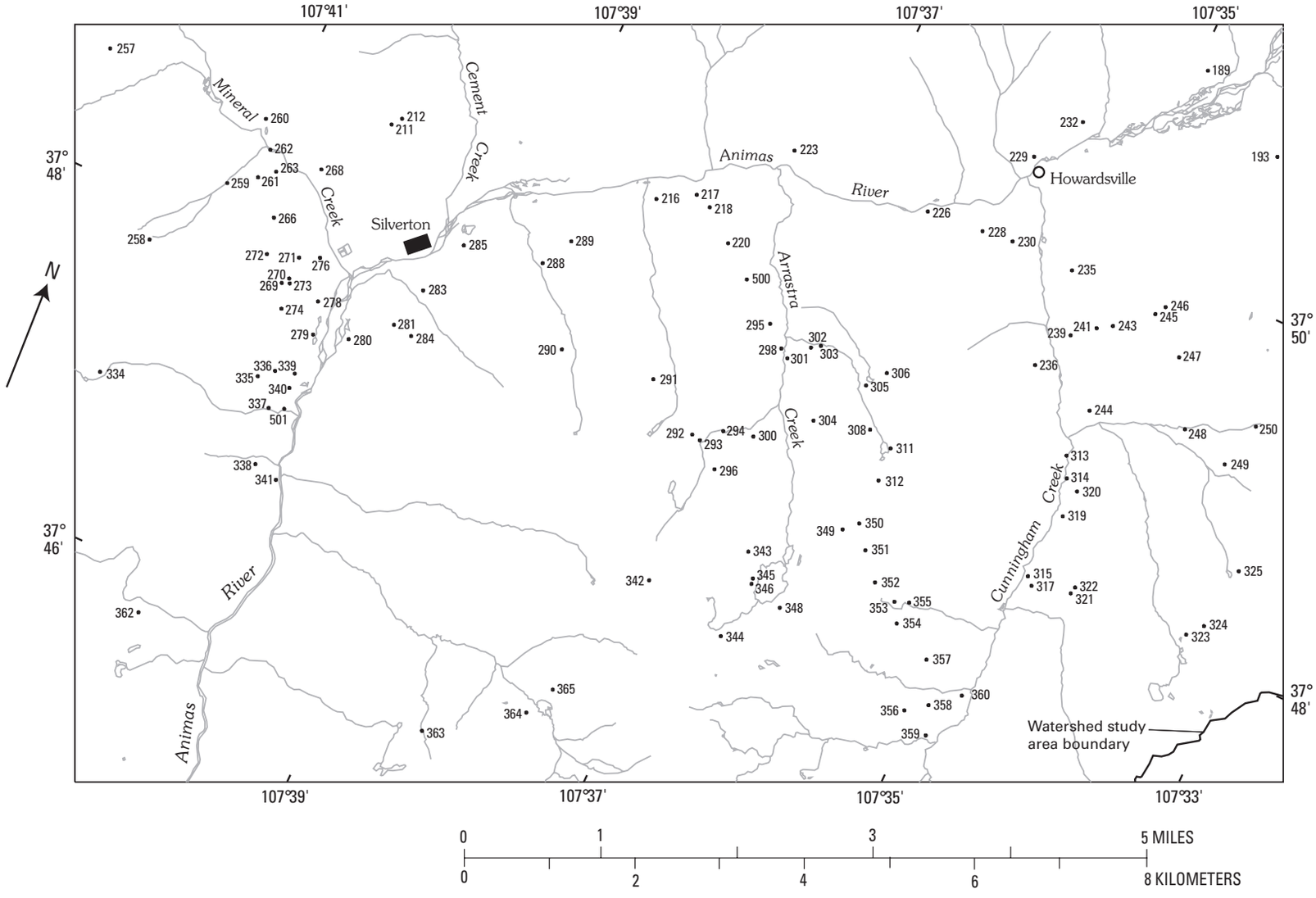

Figure 4. South Silverton area showing mine locations; mine names are listed in tables 1 and 2.

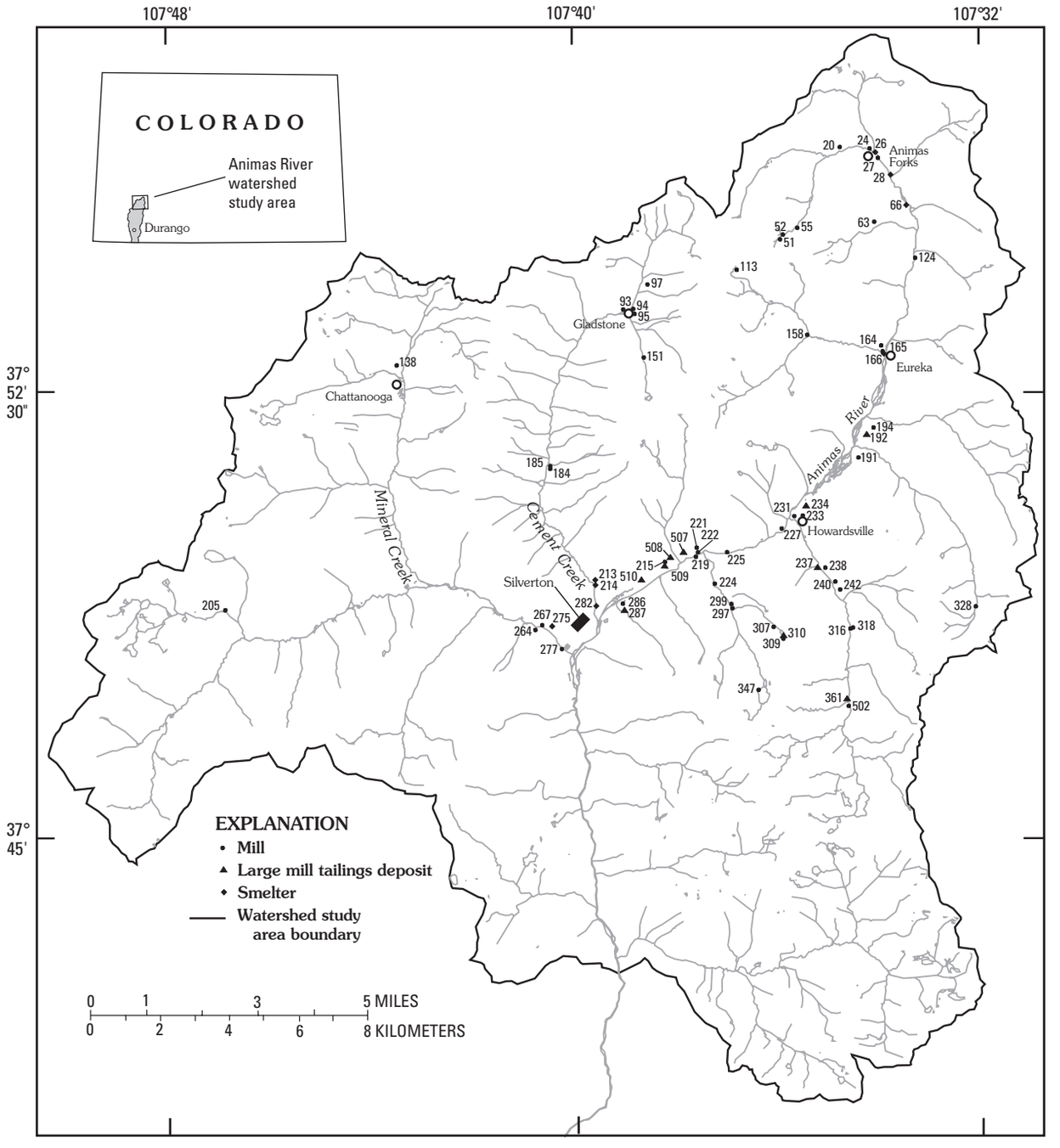

Figure 5. Locations of mill sites, large mill-tailings deposits, and smelter sites; site names are in table 3.

names or spellings often change with ownership during the development of a mining district. Furthermore, during times of economic downturn, consolidation of properties often occurred. For example, of the 110 mines listed as silver producers in the commodity report of the study area by the U.S. Bureau of the Mint (Munson, 1889), 68 mines that had previously reported silver production did not produce silver during 1889. Only 49 of 110 mines listed in Munson (1889) are in the mine inventory. Also, we have not attempted to document the many changes in mine names due to change in ownership or by consolidation of claims throughout the history of mining. As a result, not all mine names used in the literature or on claims records may be included in this mine inventory. One can conclude from this brief summary that mine names as well as mine features are transitory, especially in the early history of mining in the study area.

Table 4 presents descriptive information for many of the inventoried sites related to the potential for environmental effects. Sites that had only a single adit or shaft generally were associated with smaller disturbances, and these sites typically constitute only a physical hazard. They were not generally included in table 4. The shafts and adits columns give an indication of the extent of the surface workings at that site. Important point-source information typically used to evaluate sites for remediation included (1) number of flowing adits, (2) whether or not the adit drainage flowed over the mine waste, (3) whether the vegetation surrounding the outflow has died, or has a kill zone, (4) volume of the mine waste, (5) size of the area disturbed, and (6) distance to the receiving stream. Flow rates from the mine adits were highly variable throughout the year; discharge values are given at low flow in tables 5 and 6.

Results from the survey of mine sites conducted by the Animas River Stakeholders Group, the Colorado Geological Survey, and the Colorado Division of Mines and Geology are summarized in table 5. These data complement the work done by the USGS in that they include data from properties held privately to which USGS personnel did not have access. Analytical results from flowing adits sampled at low flow were done by contract EPA laboratories. These data supplement the low-flow adit water chemistry data collected by Mast and others (2000) and data of Nash and Fey (this volume, Chapter E6). Adit water chemistry data were used in the evaluation and ranking of mine and mill sites for remediation by the ARSG (Unpub. report to Colorado Water Quality Control Commission, ARSG, 2001). In a somewhat different approach, ratings of the mine waste, water quality and adit flow, and distance from the stream are factors that were considered in ranking the mine sites on public land for possible remediation (Nash and Fey, this volume).

Adit Flow and Chemistry

A primary focus of studies of abandoned historical mines in a watershed often has been to locate flowing adits. These adits represent point sources that discharge variable amounts of acid and potentially toxic trace elements, in many cases directly into streams. Identification of mine sites that have large discharges of acidic, metal-rich water is clearly an important goal for watershed remediation. We have compiled water-quality and discharge data for 232 samples collected at 110 mine sites during low-flow conditions in 1995–99. Mine-water data for 76 samples collected by the ARSG, Colorado Geological Survey, and Colorado Division of Mines and Geology are in table 5; data for 156 samples collected by the USGS are in table 6. These data were compiled to provide information on the spatial variability of mine-water chemistry in the basin and to estimate metal loads from mining-related sources. In table 7, we present time-series data from Mast and others (2000) for selected mine sites in the study area sampled for 1–3 years. Characterization of seasonal patterns in metal concentrations and discharge for mines is often lacking in mine remediation studies but is important for estimating annual metal loads from mining-related sources. In addition, this information provides an important seasonal context for interpretation of mine-water chemistry at sites where time-series data are not available.

Flow from mines in the watershed exhibited a wide range in discharge and chemistry (tables 5 and 6 and fig. 6). Adit discharge during the low-flow sampling period ranged from <0.002 at several small mine workings to as much as 1.2 ft^3/s (cubic feet per second) at the Yukon tunnel adit (mine # 186). The pH of adit water ranged from 2.3 at the Hercules mine (mine # 83) to as high as 8.6 at Pride of the West (mine # 319). Specific conductance ranged from 32 µS/cm (microsiemens per centimeter) at the Bandora mine (mine # 332) to 3,520 µS/cm at the Koehler tunnel (mine # 75). Mine drainage was dominantly a calcium-sulfate type water with sulfate ranging from 6.6 to 2,720 mg/L (milligrams per liter) and calcium ranging from 1.6 to 580 mg/L. The dominant base metals in mine drainage were copper and zinc. Copper concentrations ranged from the limit of detection (0.5) to 98,600 µg/L, although only 25 percent of samples had concentrations above 280 µg/L. Zinc concentrations ranged from 5 to 250,000 µg/L, but only 25 percent of samples had concentrations above 3,900 µg/L. The wide range in the chemical composition of mine water is primarily due to the variability in degree of hydrothermal alteration in the surrounding bedrock and the type and extent of base-metal sulfides in the mine workings. In general, acid-sulfate and quartz-sericite-pyrite altered rock produced mine water with low pH and high metal concentrations, whereas propylitically altered rock produced mine water with neutral pH and high calcium concentrations (fig. 6; Bove and others, this

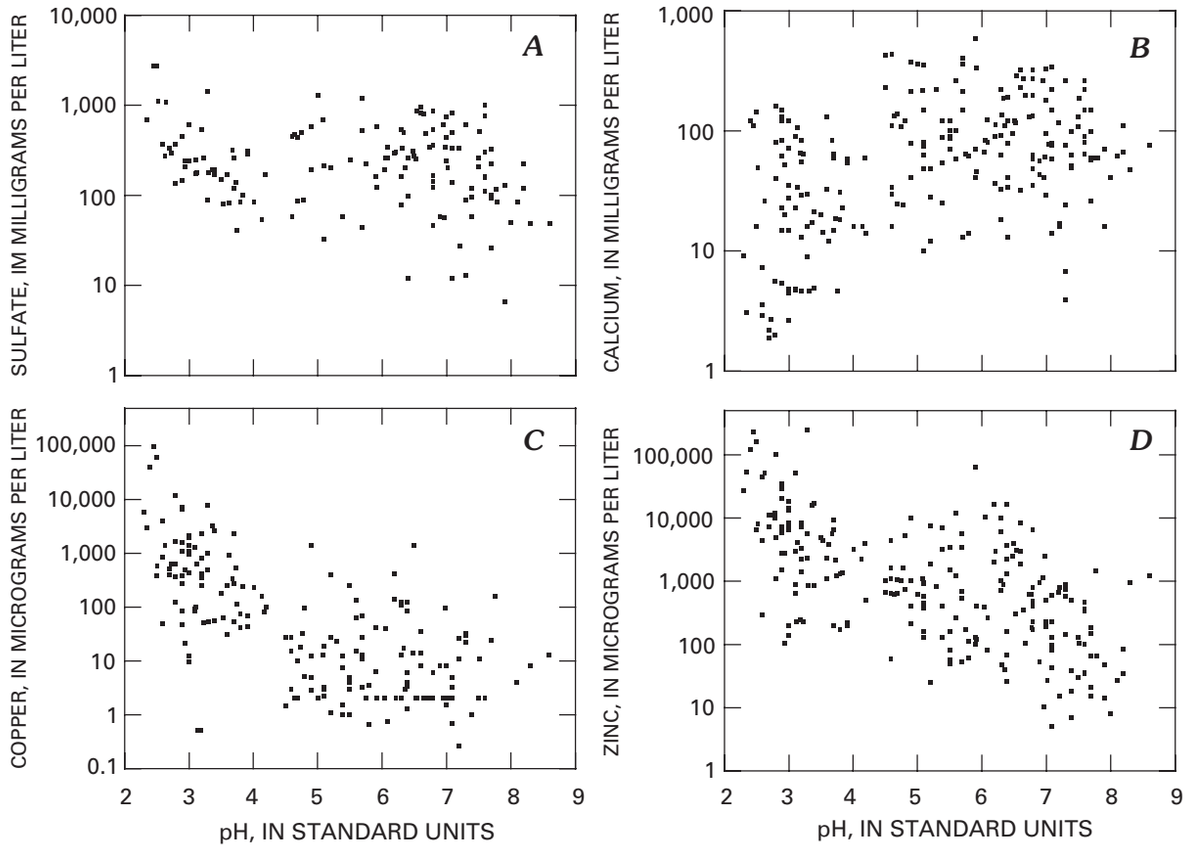

Figure 6. Dissolved concentrations of *A*, sulfate; *B*, calcium; *C*, copper; and *D*, zinc concentrations versus pH for mine-water samples collected in the Animas River watershed from 1995 to 1999. See tables 5 and 6 for complete tabulation of the data. Limit of detection, DL, for copper is 2 µg/L.

volume). Base-metal concentrations were highest in mines that had some historical production. A more detailed discussion of the relation between mine-water chemistry and hydrothermal alteration appears in Bove and others (this volume).

Temporal variations in mine-water discharge and chemistry are illustrated in figures 7–15 for seven mines sampled approximately monthly over the snowmelt hydrograph in 1995–2000 (von Guerard and others, this volume, fig. 3). Discharge at the adits did not show a pronounced increase during snowmelt, except for a slight increase at the Forest Queen (mine # 195) in 1997, and the Avalanche (mine # 149) in 1998 (fig. 7). These results contrast markedly with streams and rivers in the watershed, which show large increases in flow during the snowmelt period. For example, flow in the Animas River downstream from Silverton increased by as much as 30-fold between winter base flow and peak snowmelt in 1997–99, whereas adit discharge varied by only 3- to 5-fold over the same period. Similar to discharge, the chemistry of water at the sampled mines also remained relatively constant throughout the year as illustrated by the time-series plot of mine-water pH in figure 8 and chemical constituent plots in figures 9–15. One possible hydrologic explanation for the lack of seasonality in mine discharge is that adits are primarily fed by ground water that discharges from fracture networks in the bedrock. The relatively constant chemistry even during snowmelt could be explained by a piston flow mechanism whereby chemically mature water at the bottom of the ground-water reservoir is pushed into the mine pool as snowmelt recharges the top of the ground-water system. These time-series data from different mines are important because they show that concentrations of metals from adit discharge may be relatively constant through the year and, without intervention, may represent a long-term source of metals to the watershed. In addition, these data provide an indication that low-flow sampling of adits may be sufficient to characterize annual metal concentrations and loads from most mines.

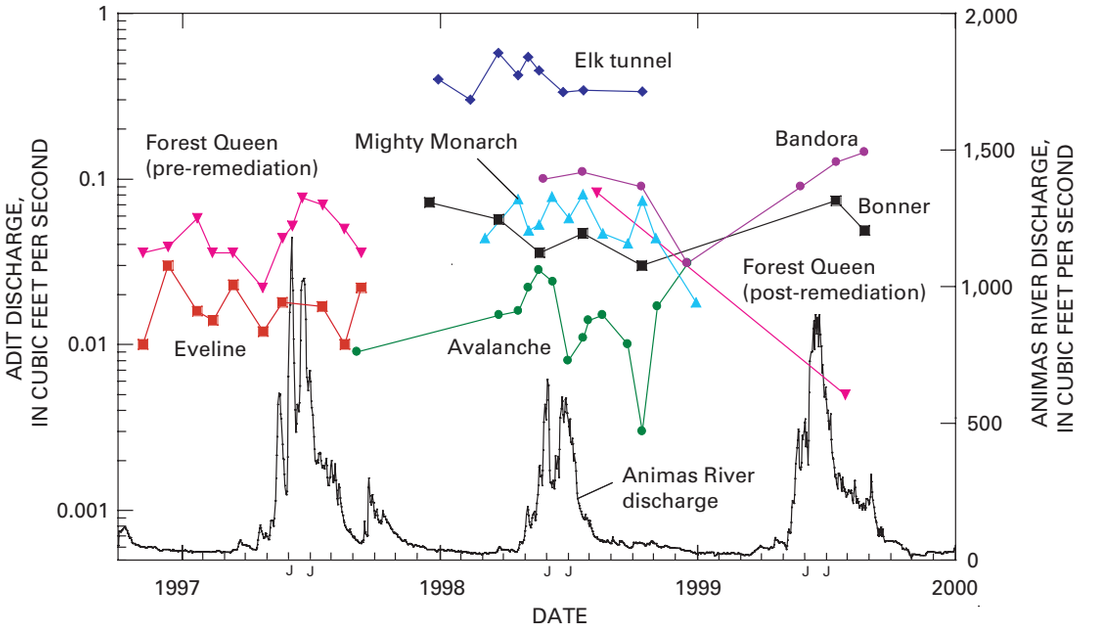

Figure 7. Graph of adit discharge versus date (beginning with January 1) from seven mines (Mast and others, 2000). The hydrograph determined at the Animas River gauge downstream from Silverton (USGS gauge 09359020) indicates periods of spring runoff, primarily during June and July where flow exceeds 150 ft^3/s (von Guerard and others, this volume). During summer 1999, the Animas River was at high flow through October because of abundant summer rains.

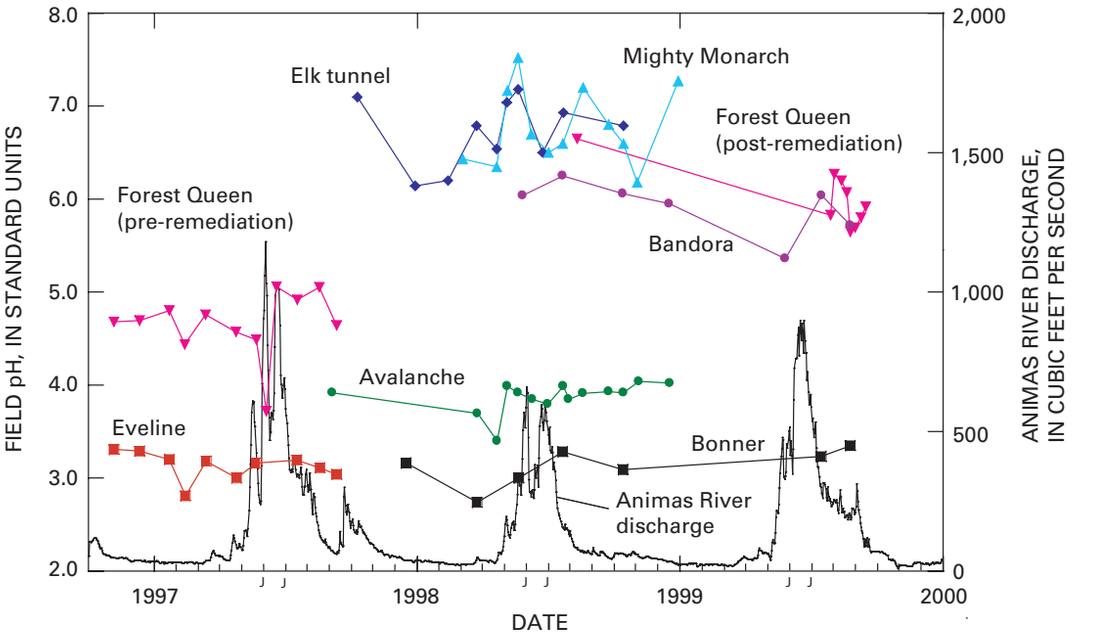

Figure 8. Graph of field pH versus time for mine adit water (Mast and others, 2000). The hydrograph determined at the Animas River gauge downstream from Silverton (USGS gauge 09359020) indicates periods of spring runoff, primarily during June and July where flow exceeds 150 ft^3/s (von Guerard and others, this volume). The Forest Queen mine data are labeled pre- and post-remediation.

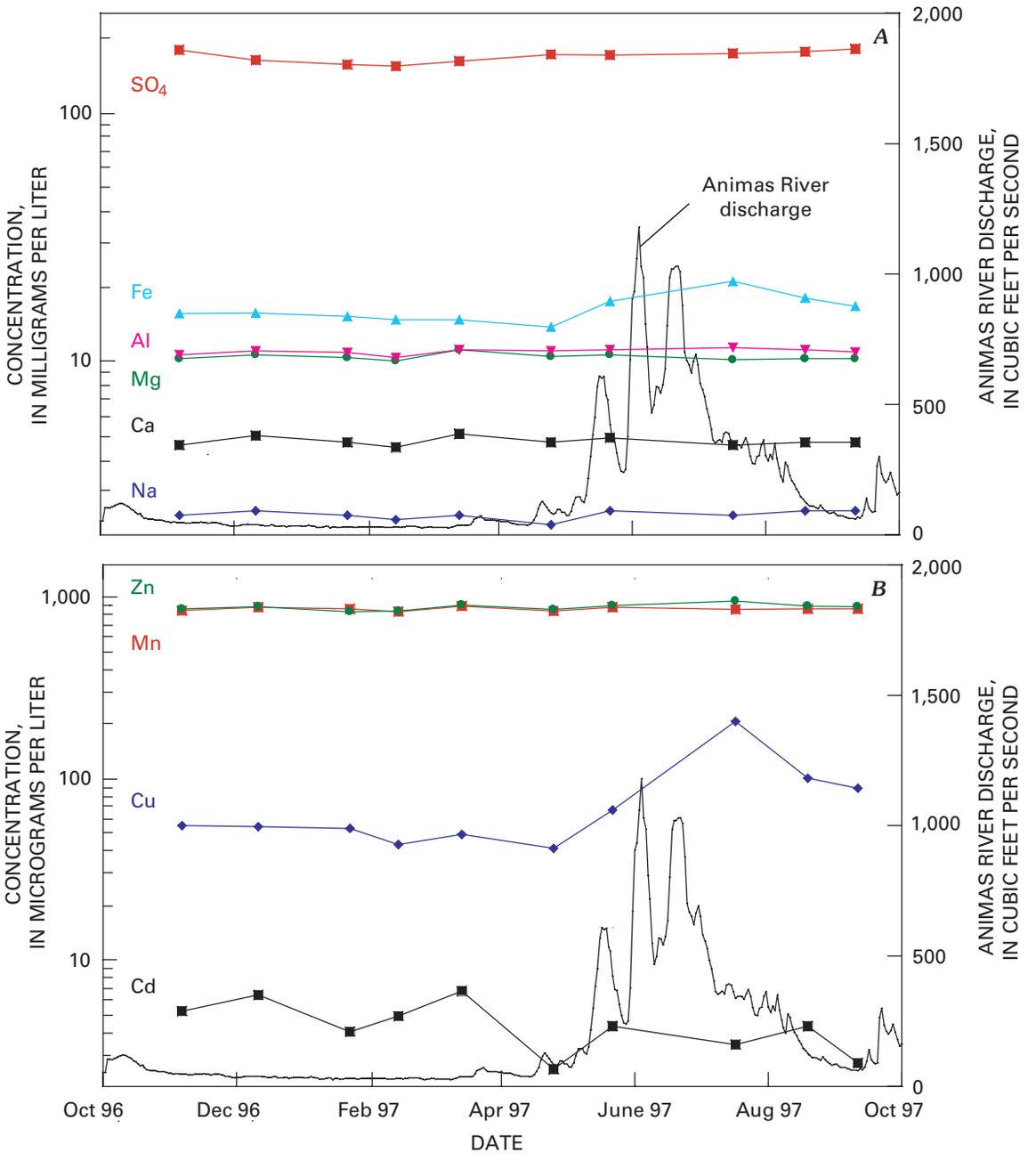

Figure 9. Concentrations of *A*, major, and *B*, trace elements in adit discharge from Eveline mine (site # 91; data from table 7). No lead was detected in the adit discharge (DL, detection limit=30 µg/L).

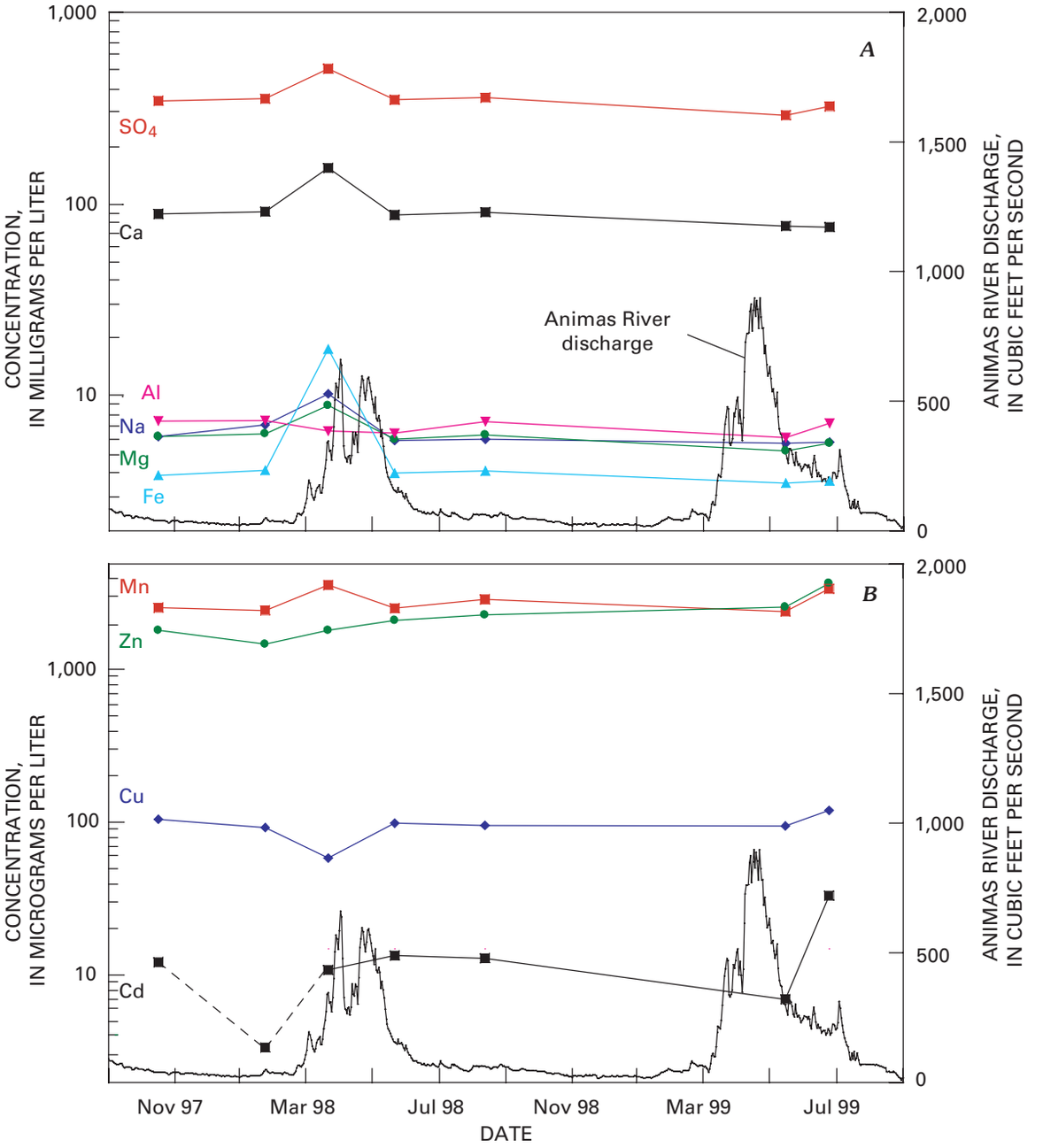

Figure 10. Concentrations of *A*, major, and *B*, trace elements in adit discharge from Bonner mine (site # 172; data from table 7). No lead was detected in the adit discharge (DL, detection limit=30 µg/L); cadmium was detected in some adit discharge samples (DL, detection limit=2 µg/L; connected using a dashed line).

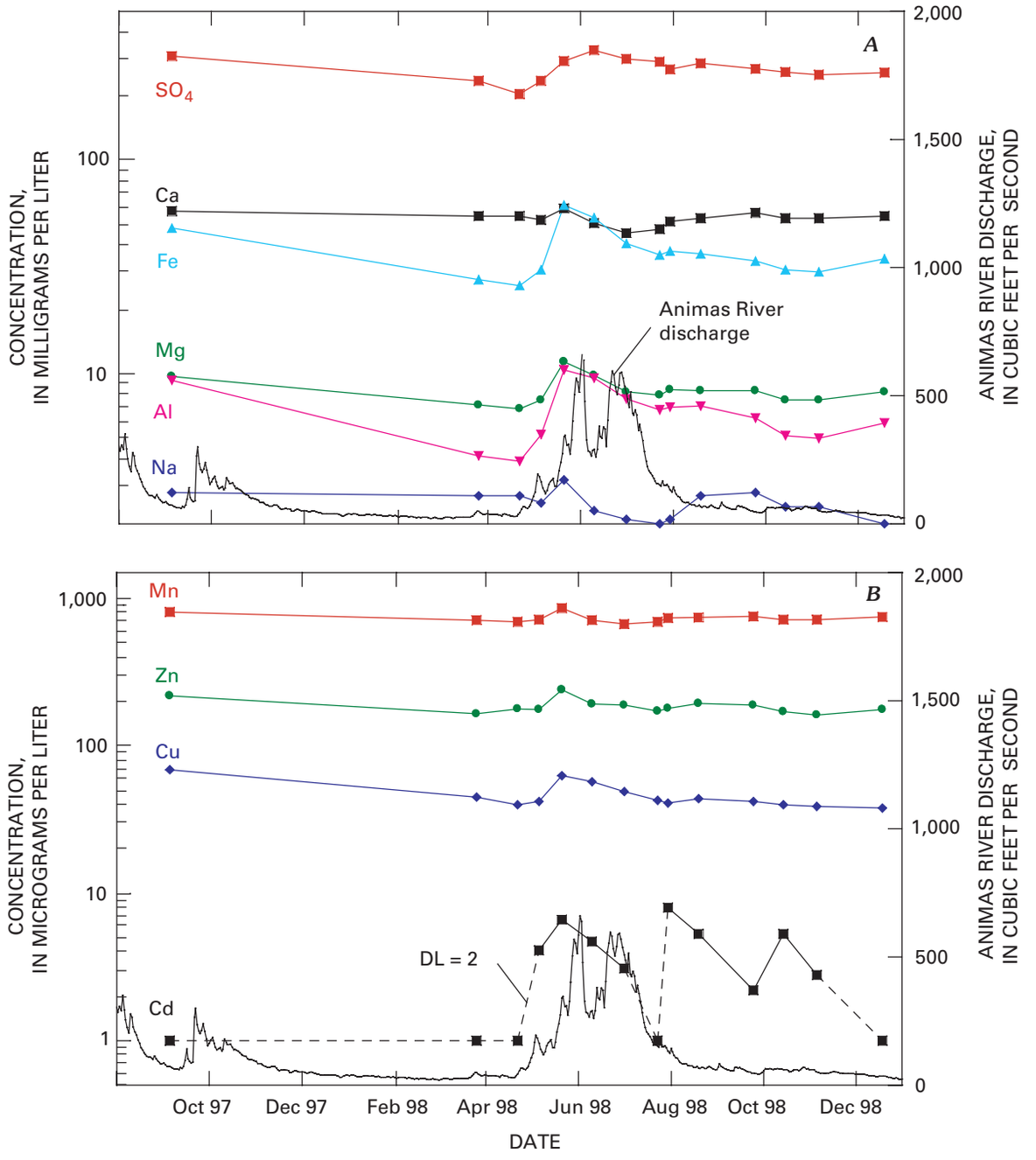

Figure 11. Concentrations of *A*, major, and *B*, trace elements in adit discharge from Avalanche mine (site # 149; data from table 7). No lead was detected in the adit discharge (DL, detection limit=30 µg/L); cadmium was detected in some adit discharge samples (DL, detection limit=2 µg/L; data points connected using a dashed line).

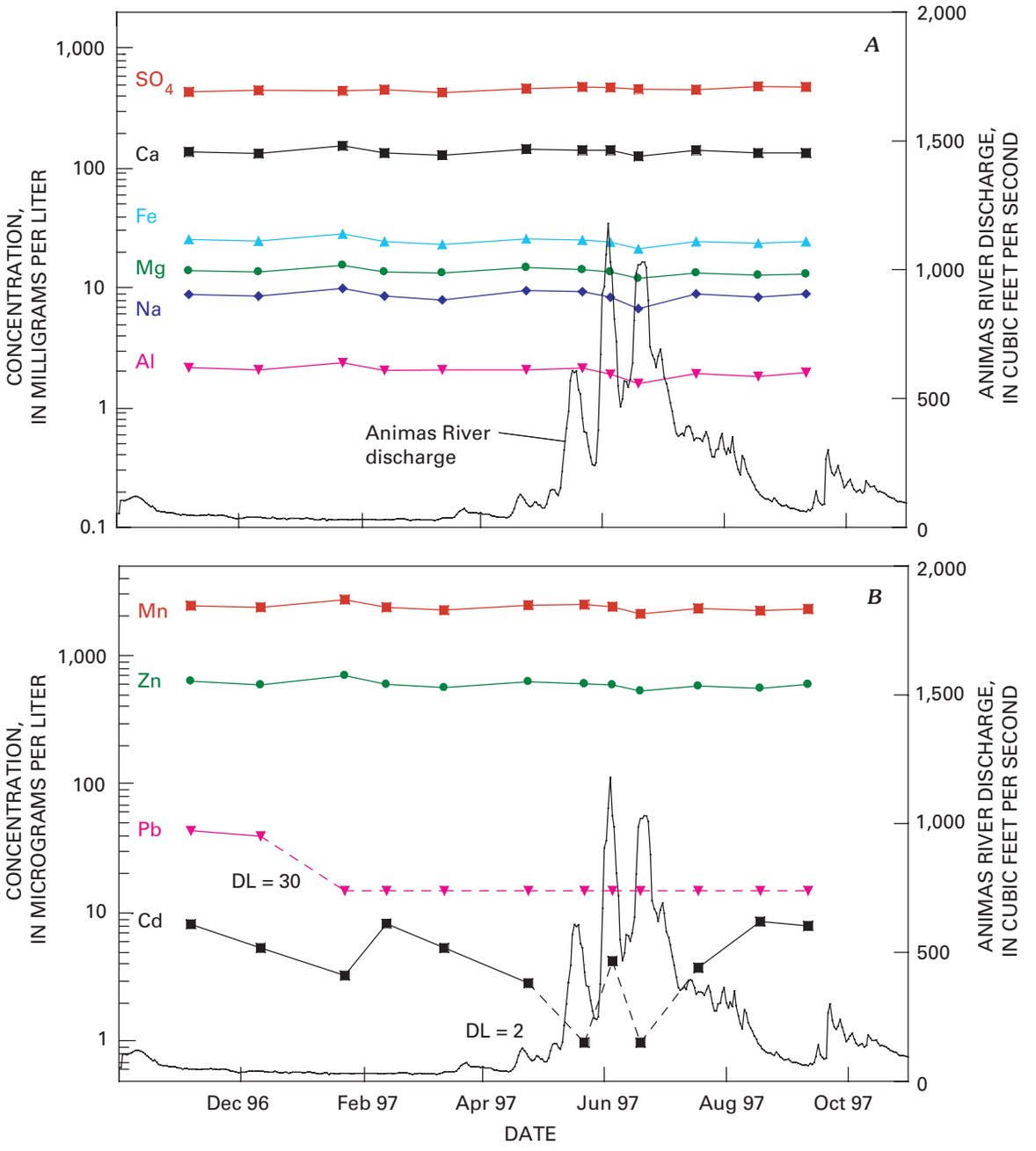

Figure 12. Concentrations of *A*, major, and *B*, trace elements in adit discharge from Forest Queen mine (site # 195; pre-remediation data from table 7). No copper was detected in the adit discharge (DL, detection limit=4 µg/L); cadmium and lead were detected in some adit discharge samples (DL, detection limit=2 µg/L and 30 µg/L, respectively; data points connected using a dashed line).

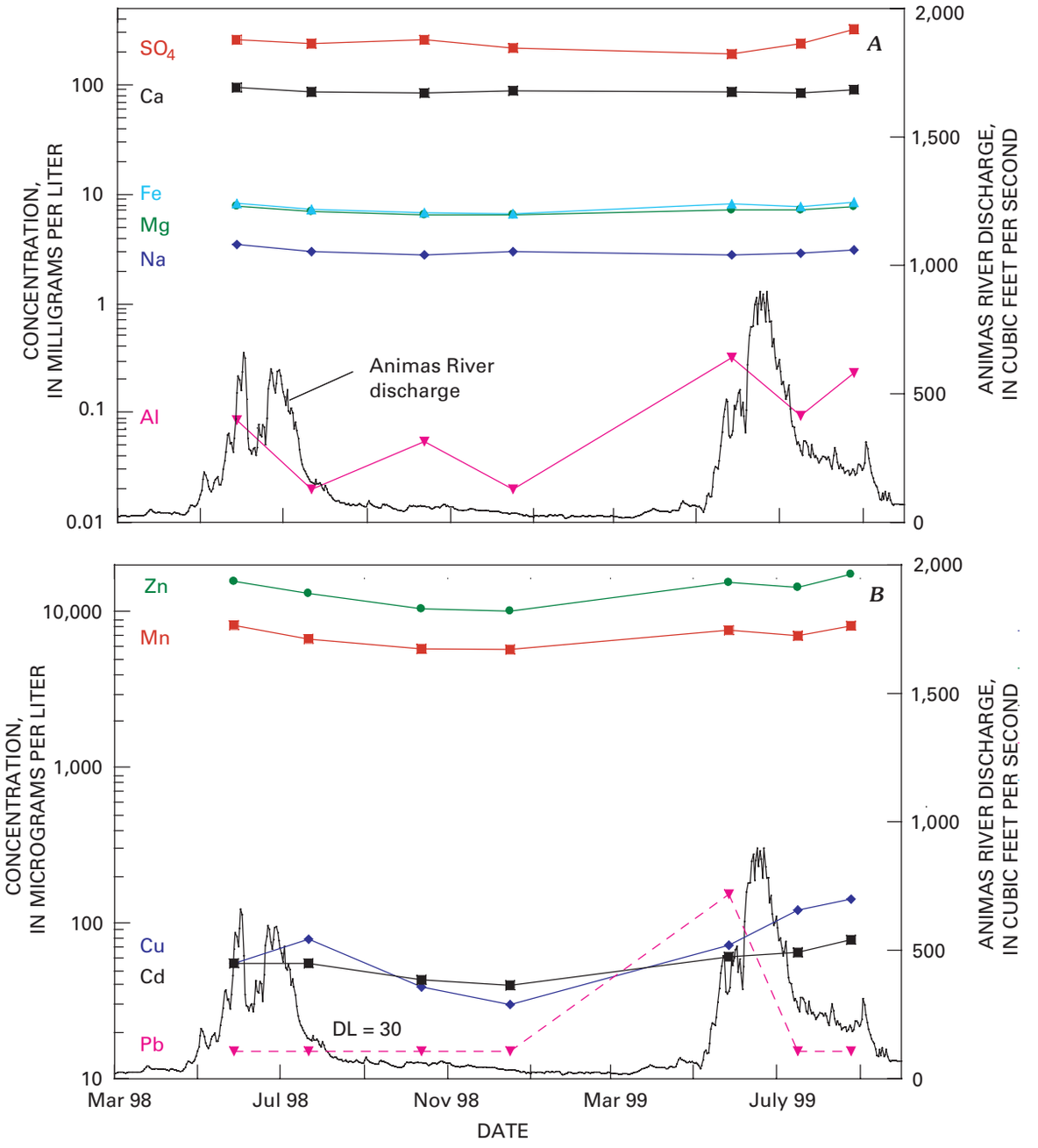

Figure 13. Concentrations of *A*, major, and *B*, trace elements in adit discharge from Bandora mine (site # 332; data from table 7). Lead was detected in only one sample (DL, detection limit=30 µg/L; data points connected using a dashed line).

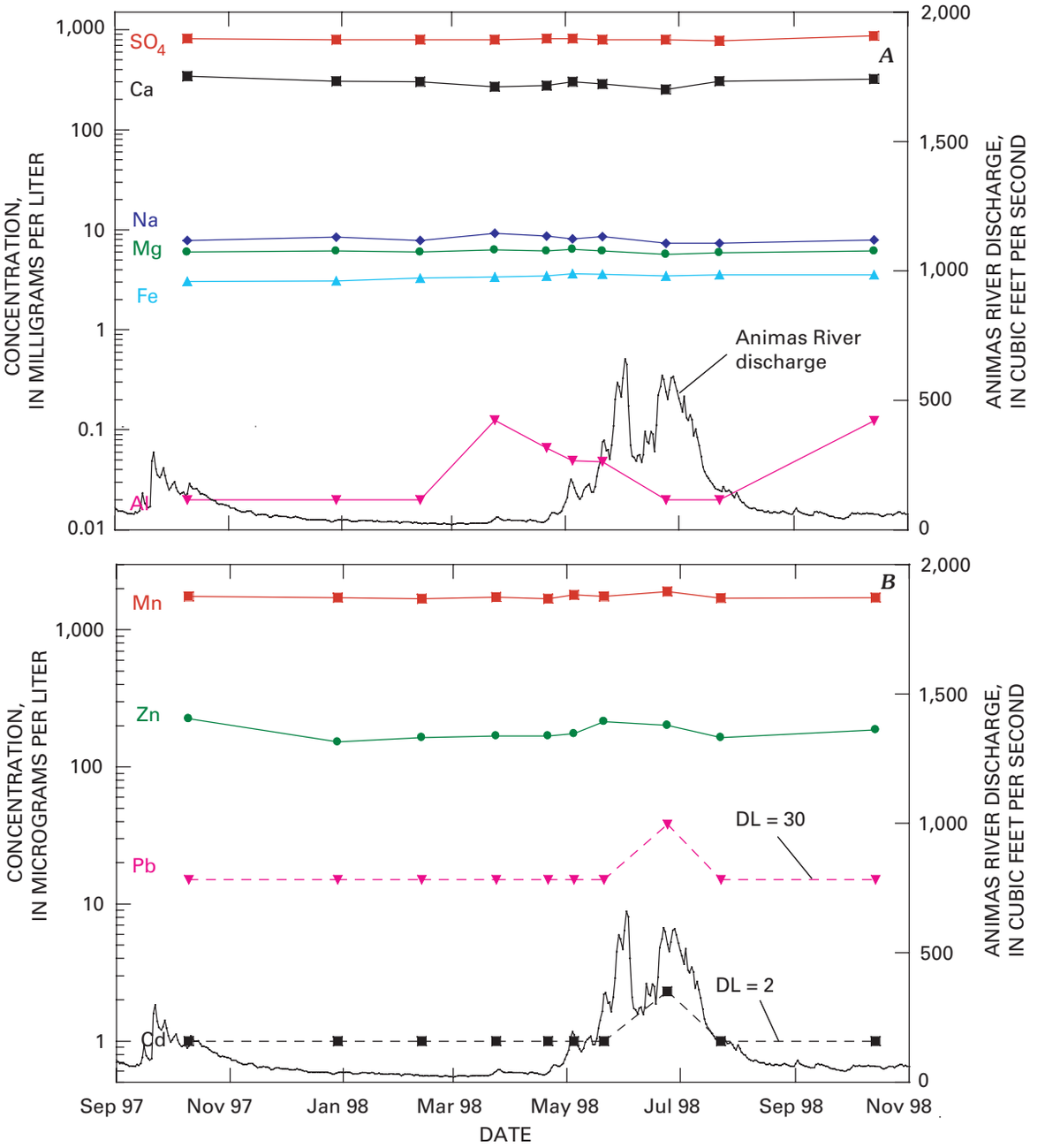

Figure 14. Concentrations of *A*, major, and *B*, trace elements in adit discharge from Elk tunnel (site # 147; data from table 7). No copper was detected in the adit discharge (DL, detection limit=4 µg/L, table 7); cadmium and lead were detected in some adit discharge samples (DL, detection limit=2 µg/L and 30 µg/L, respectively; data points connected using a dashed line).

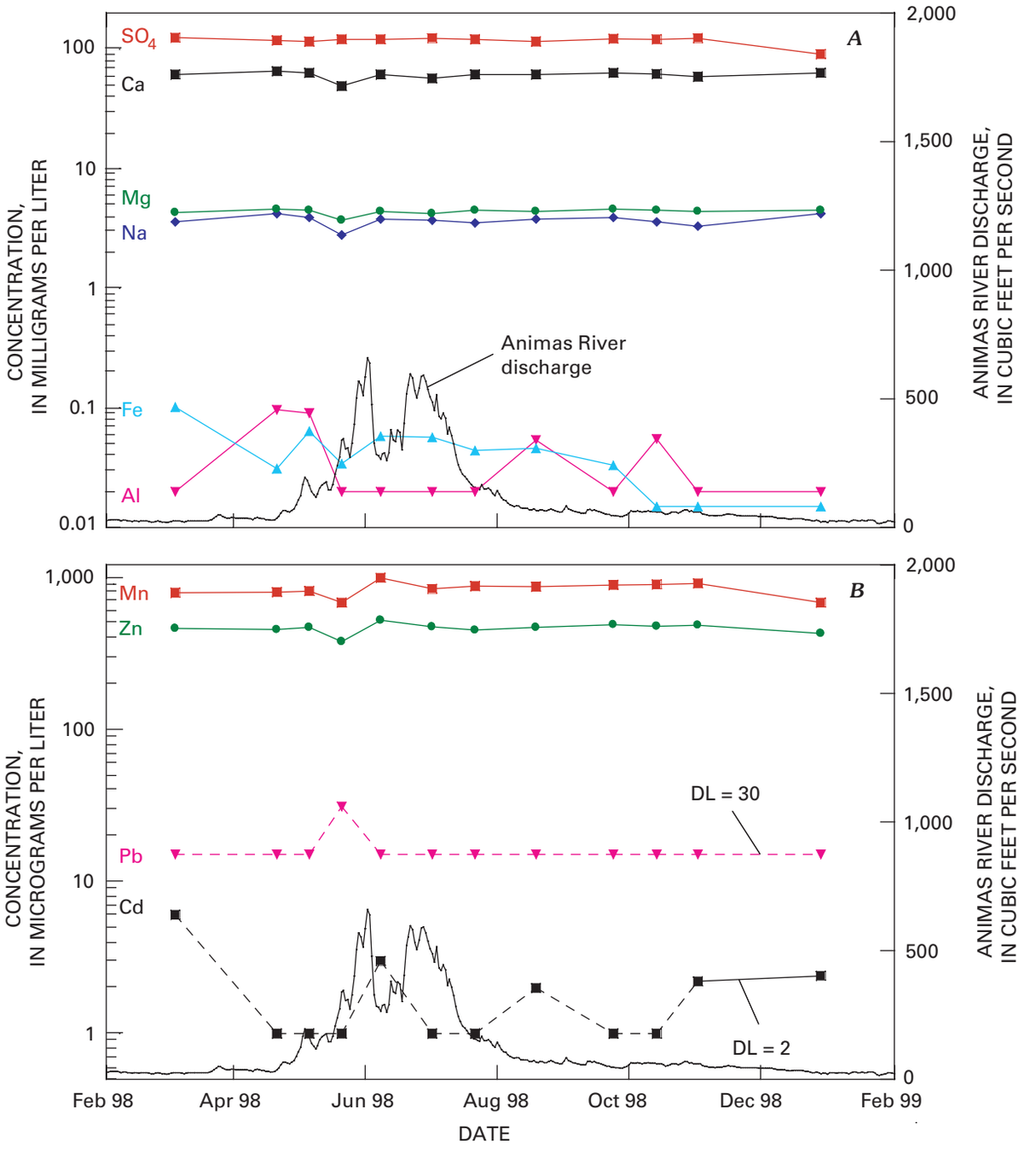

Figure 15. Concentrations of *A*, major, and *B*, trace elements in adit discharge from Mighty Monarch mine (site # 285; data from table 7). No copper was detected in the adit discharge (DL, detection limit=4 µg/L); cadmium and lead were detected in some adit discharge samples (DL, detection limit=2 µg/L and 30 µg/L, respectively; data points connected using a dashed line).

Figures 9–15, in which data are ordered by increasing values of pH of the adit drainage, show the variations of major- and trace-element concentrations for each suite of mine-water samples with time. The Eveline (mine # 91) and Bonner (mine # 172) are located on the margins of some of the most intensely altered areas of the watershed. The Eveline mine, which drains a localized area of quartz-sericite-pyrite altered rock, has the most acidic mine water (fig. 8) and was characterized by high concentrations of sulfate, zinc, and manganese with low concentrations of calcium (fig. 9). Discharge from the Eveline mine varied between 0.01 and 0.03 ft^3/s and did not appear to increase during spring snowmelt (fig. 7). For the dissolved constituent concentrations, iron and copper increased slightly following peak flow in 1997, although the other constituents remained remarkably constant during snowmelt. The Bonner mine is on the margins of an area of pervasive quartz-sericite-pyrite altered rock, and drainage is characterized by low pH (fig. 8), and high concentrations of sulfate, zinc, and manganese (fig. 10). Discharge from the Bonner mine varied between 0.03 and 0.07 ft^3/s and did not appear to increase during spring snowmelt (fig. 7). A slight increase evident in the concentration of some constituents at the adit in the May sample in 1998 may reflect flushing of solutes from the adit pool and waste materials at the onset of snowmelt. Constituent concentrations through the remainder of the sampling period remained relatively constant.

The Avalanche (mine # 149) and Forest Queen (mine # 195) drain areas of propylitically altered rock with zones of quartz-sericite-pyrite alteration localized along vein margins. Mine adit drainage from the Avalanche mine was acidic and was similar in composition to that of the Bonner mine (fig. 11). Discharge at the Avalanche mine varied from 0.003 to 0.031 ft^3/s and showed a distinct increase during snowmelt in 1998 (fig. 7). Concentrations of most dissolved constituents at the Avalanche mine also increased during spring runoff in 1998, although concentrations of aluminum and iron appeared to increase much more dramatically than other dissolved constituents. Discharge at the Forest Queen mine (pre-remediation) ranged from 0.022 to 0.077 ft^3/s during 1997 and was highest in June and July following peak snowmelt (fig. 7). Although most mine adits were monitored for a period of about a year, the Forest Queen mine was monitored for a longer period because it was opened and the discharge routed to a constructed passive treatment wetlands system in the summer of 1998 to remediate the water quality of drainage from this adit (data labeled pre- and post-remediation, fig. 7). Studies of the Forest Queen wetlands are in Stanton, Fey, and others (this volume, Chapter E25). Mine water from the Forest Queen mine was less acidic than at the Avalanche mine but had significantly higher concentrations of sulfate, manganese, and zinc (fig. 12). Despite the 3-fold increase in discharge observed in 1997, concentrations of dissolved constituents (except for cadmium) were remarkably constant throughout 1997.

The Bandora (mine # 332) is in the Precambrian and Paleozoic sedimentary rocks outside the Silverton caldera margin in weak sericite-pyrite altered rock. Mine drainage from the Bandora is characterized by neutral pH (fig. 8), low concentrations of sulfate, and high concentrations of zinc and manganese relative to the other mines (fig. 13). Discharge from the Bandora mine varied from 0.03 to 0.14 ft^3/s and was lowest during base flow in December 1998 (fig. 7). Dissolved constituent concentrations were relatively constant in 1998–99, although some metals, particularly zinc and manganese, appeared to be slightly higher during snowmelt than during base flow.

The Elk tunnel (mine # 147) and Mighty Monarch (mine # 285) drain areas of propylitically altered rock and have the highest pH values of the seven mines (fig. 8). Although field pH values and metal concentrations at the two mines were similar, sulfate and calcium concentrations were much lower at the Mighty Monarch mine (fig. 15) than at the Elk tunnel (fig. 14). Seasonal variations in discharge, which ranged from 0.041 to .081 ft^3/s at the Mighty Monarch mine and 0.30 to 0.57 ft^3/s at the Elk tunnel, did not appear to be related to snowmelt (fig. 7). Concentrations of major and trace elements in adit water at the two mines also showed little variation during 1998 except for aluminum at the Elk tunnel and aluminum, cadmium, and iron at the Mighty Monarch mine.

Concentrations of both the major and the trace elements vary between mines and reflect the alteration and sulfide mineralogy (Bove and others, this volume). Concentrations of dissolved iron, aluminum, copper, and lead are clearly functions of both the alteration suite and the pH of the mine water (table 7 and figs. 9–15; dissolved lead concentrations are often below the limit of detection). Concentrations of magnesium and calcium, which provide acid neutralization, are a function of the geologic setting and the alteration. Loads (concentrations of dissolved constituent times the discharge) calculated for sulfate, calcium, copper, and zinc increase directly with discharge (fig. 16). Calculated loads for some other metals, such as iron and aluminum, do not show these same simple relationships because of solubility changes caused by differences in pH of the adit discharge. The preceding relationships indicate that the mine pool water is being forced out of the mine adits as the hydrologic head increases due to infiltration during spring runoff. Identification of those mine sites that have large discharges of acidic, metal-laden water is clearly an important goal for watershed remediation.

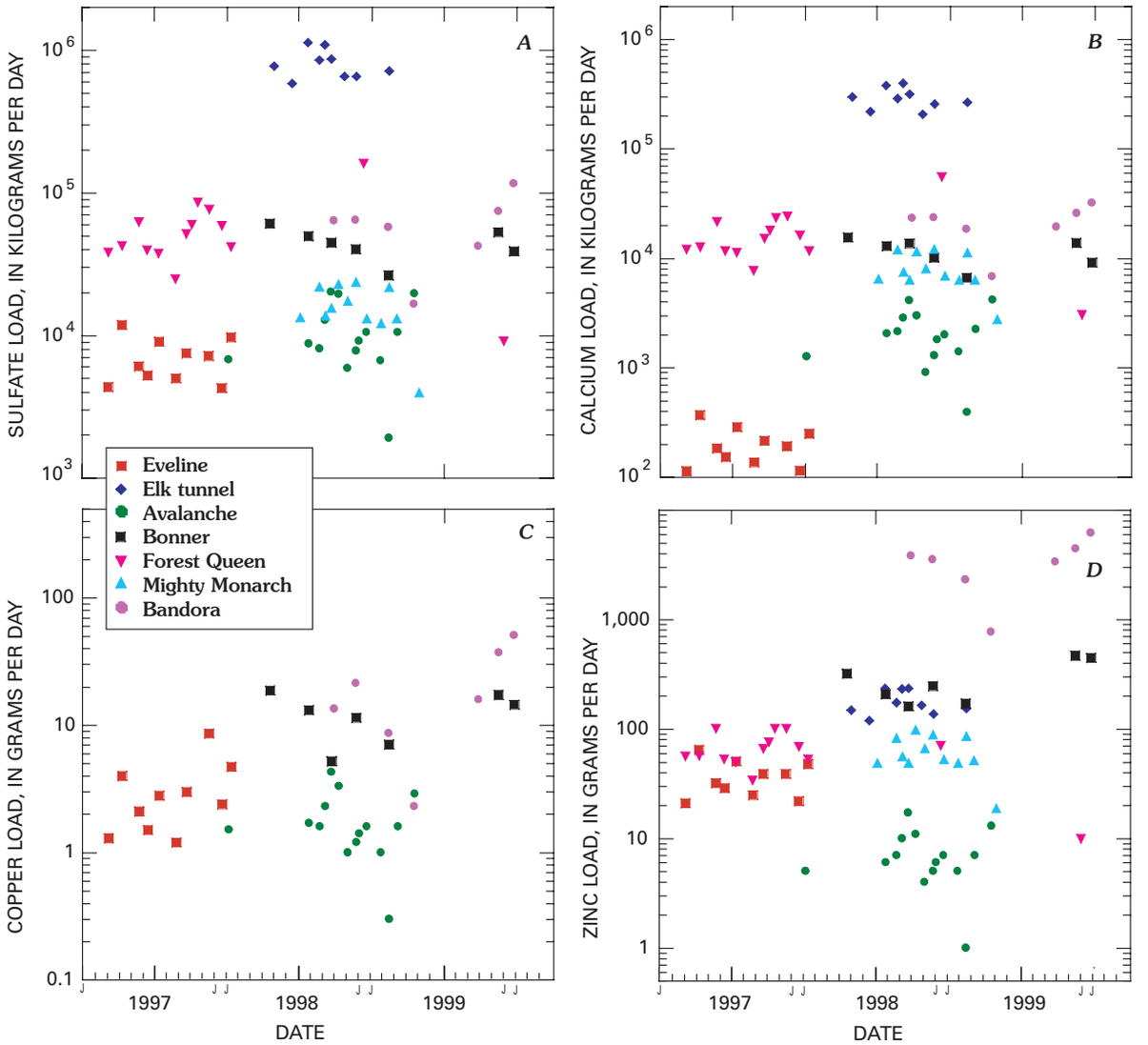

Figure 16. Loads of *A*, sulfate; *B*, calcium; *C*, copper; and *D*, zinc from the time-series adit discharge data from seven mine sites. The hydrograph determined at the Animas River gauge downstream from Silverton (USGS gauge 09359020) indicates periods of spring runoff, primarily during June and July where flow exceeds 150 ft^3/s (von Guerard and others, this volume).

Summary

Research of the historical record combined with modern digital mapping methods using digital orthophoto quadrangles (DOQ) and GIS technology has resulted in a new and more accurate inventory of the important past-producing mines, mills, and smelters in the Animas River watershed study area. Mine locations have been verified by project personnel or by local residents of Silverton and the surrounding area who have a working knowledge of the mining industry in the region. Compilations of new and existing data on the number of flowing adits, range of pH and dissolved metal concentrations, size of mine-waste piles and affected areas at these mine sites are summarized so that the data are available for use in potential remediation activity. Analysis of time-series data from seven mine sites (Mast and others, 2000) shows that the chemistry of the adit discharge from individual mines does not vary much of the year, but that the discharge at some sites shows a seasonal effect. Acidic mine drainage from historical mines represents a long-term source of contamination that affects surface water quality in the Animas River watershed study area.

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Tables 1–7

Table 1. Mines, mills, large mill-tailings deposits, and smelter sites listed by AML_MINE_ID number.

[Numbers refer to locations in figures 2–5 and in the Animas River watershed database; locations are either verified or approx. (approximate) on the basis of site visits or knowledge of resident experts; S-D, Shenandoah-Dives. Some mills located at the same sites were not originally numbered; we have added numbers in brackets for clarity]

Name	AMLI_MINE_ID	Latitude	Longitude	Location verified
Red Cloud mine	1	37.94532	107.59085	verified
Sewell mine	2	37.94221	107.59024	verified
Boston mine	3	37.94630	107.58929	verified
Dewitt mine	4	37.94720	107.58826	verified
Little Chief mine	5	37.94470	107.58737	verified
Uncompahgre Chief mine	6	37.95128	107.58621	verified
London mine	7	37.94914	107.58385	verified
Early Bird crosscut	8	37.94528	107.58268	verified
Ben Butler mine	9	37.95190	107.58187	verified
Prairie mine	10	37.94938	107.58150	verified
Hermes group	11	37.94194	107.57503	verified
Riverside mine	12	37.94136	107.57370	verified
Lucky Jack mine	13	37.95416	107.57264	verified
Eagle Chief mine	14	37.93998	107.57201	verified
Little Ida mine	15	37.93307	107.60487	verified
Burrows mine	16	37.93273	107.60190	verified
Vermillion mine	17	37.93617	107.60016	verified
Vermillion tunnel	18	37.93395	107.59594	verified
Frisco tunnel	19	37.93299	107.58053	verified
Bagley Mill (Frisco)	20	37.93287	107.58024	verified
Adit with unknown name	21	37.93503	107.57487	verified
Silver Coin mine	22	37.92926	107.57153	verified
Columbus mine	23	37.93308	107.57061	verified
Columbus Mill	24	37.93249	107.57045	verified
Animas Forks Smelter	26	37.93153	107.56856	verified
Gold Prince Mill	27	37.93007	107.56772	verified
Brown, Epley & Co. Smelter	28	37.92567	107.56361	verified
Corkscrew Pass mine	29	37.90803	107.66011	verified
Mogul South mine	30	37.90838	107.63789	verified
Mogul mine	31	37.91003	107.63744	verified
Mogul North mine	32	37.91092	107.63309	verified
Grand Mogul stope complex	33	37.91053	107.63079	verified
Queen Anne mine	34	37.91448	107.62986	verified
Grand Mogul	35	37.91014	107.62961	verified
Lower Ross Basin mine	36	37.90763	107.62676	verified
Columbia mine	37	37.91778	107.62645	verified
Upper Queen Anne mine	38	37.91687	107.62607	verified
Brenneman mine	39	37.90780	107.62212	verified
George Washington mine	40	37.90689	107.61843	verified
Mountain Queen mine	41	37.91439	107.61714	verified
Mountain Queen tunnel	42	37.91529	107.61396	verified
Lake mine	43	37.90567	107.61359	verified
Silver Chord mine	44	37.92367	107.61413	verified

Table 1. Mines, mills, large mill-tailings deposits, and smelter sites listed by AML_MINE_ID number.—Continued

Name	AMLI_MINE_ID	Latitude	Longitude	Location verified
Indian Chief mine	45	37.91981	107.61321	verified
Sunnyside Extension	46	37.90610	107.60532	verified
Mastodon mine (Handies Peak quadrangle)	47	37.90789	107.60442	verified
Independence mine (Handies Peak quadrangle)	48	37.91079	107.60209	verified
Gold Prince mine	49	37.90798	107.60085	verified
Custer mine	50	37.91941	107.60046	verified
Hanson Mill (Sunnyside Extension Mill)	51	37.90887	107.59989	verified
Mastodon Mill	52	37.91013	107.59899	verified
Silver Queen mine	53	37.90794	107.59624	verified
Sound Democrat mine	54	37.90845	107.59447	verified
Sound Democrat Mill	55	37.91188	107.59423	verified
Sunbank group, upper level	56	37.91805	107.59420	verified
Sunbank group, lower level	57	37.91757	107.59292	verified
Evening Star mine	58	37.91714	107.59171	verified
Scotia mine	59	37.91525	107.57688	verified
Golden Fleece mine	60	37.91522	107.57622	verified
San Juan Queen mine	61	37.91204	107.57415	verified
Sandiago tunnel	62	37.91388	107.56902	verified
Treasure Mountain Mill	63	37.91342	107.56898	verified
Toltec mine, upper level	64	37.90765	107.56339	verified
Toltec mine, middle level	65	37.90912	107.56027	verified
Eclipse Smelter	66	37.91776	107.55841	verified
Toltec mine, lower level	67	37.91035	107.55617	verified
Adit with unknown name	68	37.91163	107.55335	verified
Upper Bullion King	69	37.88872	107.74383	verified
Lower Bullion King mine	70	37.88856	107.74219	verified
Mineral Basin mine	71	37.90081	107.73827	verified
Lower Porphyry Gulch mine	72	37.88465	107.73515	verified
Silver Ledge mine	73	37.88394	107.72082	verified
Bradley Pit	74	37.88436	107.72059	verified
Koehler tunnel	75	37.89531	107.71101	verified
Junction mine	76	37.89627	107.71050	verified
Longfellow mine	77	37.89685	107.71036	verified
St. Paul mine	78	37.88806	107.70787	verified
Congress mine	79	37.89179	107.70601	verified
Carbon Lake mine	80	37.89263	107.70330	verified
JSP mine	81	37.89446	107.68946	verified
Galena Queen mine	82	37.89184	107.68887	verified
Hercules mine	83	37.89242	107.68806	verified
Henrietta mine, #3 level	84	37.88892	107.68295	verified
Henrietta mine, #7 level	85	37.89093	107.68222	verified
Lark mine	86	37.89341	107.68050	verified
Joe and Johns mine	87	37.89192	107.67819	verified
Webster mine	88	37.90046	107.67844	verified
Joe and Johns mine, upper level	89	37.89607	107.67635	verified
Galty Boy mine	90	37.89169	107.66520	verified
Eveline mine	91	37.88826	107.66467	verified

Table 1. Mines, mills, large mill-tailings deposits, and smelter sites listed by AML_MINE_ID number.—Continued

Name	AMLI_MINE_ID	Latitude	Longitude	Location verified
Burns group	92	37.89833	107.66251	verified
Mogul Mill	93	37.89067	107.65146	verified
Gold King Mill	94	37.89079	107.64814	verified
Lead Carbonate Mill	95	37.88953	107.64773	verified
American tunnel, Sunnyside mine	96	37.89106	107.64755	verified
Red and Bonita Mill	97	37.89716	107.64349	verified
Red and Bonita mine	99	37.89723	107.64308	verified
Adams mine	100	37.90026	107.64157	verified
Pride of Bonita mine	101	37.90352	107.64072	verified
Salomon group	102	37.89633	107.63902	verified
Gold King mine, #7 level	103	37.89494	107.63788	verified
Gold King mine, Sampson level	104	37.89685	107.63364	verified
Gold King mine, upper Sampson level	105	37.89765	107.63273	verified
Lead Carbonate mine	106	37.89150	107.63237	verified
Minnehaha mine	107	37.88738	107.63185	verified
Mocking Bird mine	108	37.89336	107.63198	verified
Gold King mine, Paul level	109	37.89757	107.63169	verified
Benitoite mine	110	37.89312	107.63145	verified
Gold King mine, #1 level	111	37.89655	107.63111	verified
Adelphin mine	112	37.90388	107.63031	verified
Sunnyside-Thompson Mill	113	37.90097	107.61417	verified
Clipper mine	114	37.89626	107.61332	verified
Belle Creole mine	115	37.90298	107.61301	verified
Sunnyside mine	116	37.90322	107.61168	verified
Ben Franklin prospect	117	37.89222	107.61034	verified
Ben Franklin mine	118	37.89442	107.60714	verified
Bavarian mine	119	37.89122	107.60602	verified
Terry tunnel of Sunnyside mine, F level	120	37.89286	107.60362	verified
Lake Parson mine	121	37.90340	107.59519	verified
Tom Moore tunnel	122	37.89702	107.55855	verified
Tom Moore mine	123	37.90048	107.55376	approx.
Silver Wing Mill	124	37.90403	107.55555	verified
Silver Wing mine	125	37.90348	107.55473	verified
Silver Bell mine	126	37.90205	107.54681	verified
Fredericka group	127	37.90543	107.54129	verified
Great Eastern	128	37.89685	107.54004	verified
Lower Great Eastern	129	37.89772	107.53982	verified
Klondyke mine	130	37.89388	107.53726	verified
Upper Mill Creek mine	131	37.86820	107.75593	verified
Silver Cloud mine	132	37.87354	107.74688	verified
Silver Crown mine	133	37.87158	107.74339	verified
Silver King mine	134	37.87966	107.73501	verified
Chattanooga Curve mine	135	37.87373	107.73281	verified
Imogene mine	136	37.86248	107.72797	verified
Ferricrete mine	137	37.86823	107.72598	verified
Silver Ledge Mill	138	37.87615	107.72586	verified
Lower Browns Gulch mine	139	37.85875	107.72151	verified

Table 1. Mines, mills, large mill-tailings deposits, and smelter sites listed by AML_MINE_ID number.—Continued

Name	AMLI_MINE_ID	Latitude	Longitude	Location verified
Gold Finch group	140	37.87220	107.71951	verified
Brooklyn mine	141	37.86083	107.71468	verified
Upper Browns Gulch	142	37.86407	107.70719	verified
U.S. Basin mine	143	37.87561	107.70060	verified
Minnesota Gulch mine	144	37.86706	107.68800	verified
Kansas City mine, #1 level	145	37.88181	107.68498	verified
Hoosier Boy mine	146	37.87421	107.68466	verified
Elk tunnel	147	37.87021	107.67475	verified
Mammoth tunnel	148	37.87887	107.67137	verified
Avalanche mine	149	37.87325	107.66717	verified
Big Colorado mine	150	37.87691	107.64606	verified
King mine	152	37.87111	107.64408	verified
Natalie/Occidental mine	153	37.87676	107.64336	verified
Occidental mine	154	37.88094	107.63630	verified
Black Hawk mine	155	37.88220	107.63478	verified
South Fork mine #16	156	37.87679	107.60172	verified
South Fork mine #17	157	37.88140	107.59836	verified
Sunnyside Mill #1	158	37.88401	107.59107	verified
Midway tunnel	159	37.88543	107.59010	verified
Moonbeam mine	160	37.88090	107.58105	verified
Ransom mine, upper level	161	37.88409	107.57269	verified
Sunnyside “Mill-level tunnel” 1937-38	162	37.88140	107.56875	verified
Senator mine	163	37.88189	107.56742	verified
Sunnyside Eureka Mill	164	37.88123	107.56677	verified
Sunnyside Mill #2	165	37.87974	107.56627	verified
Winspear Smelter	166	37.87907	107.56586	verified
Protection mine	167	37.88082	107.56184	verified
Paradise mine	168	37.84263	107.76407	verified
Ruby Trust	169	37.84585	107.75141	verified
Freda mine	170	37.85004	107.74789	verified
Independence mine (Silverton quadrangle)	171	37.84469	107.73976	verified
Bonner mine	172	37.84437	107.73694	verified
Molly Gulch mine	173	37.84045	107.72521	verified
Magnet mine	174	37.85032	107.72485	verified
Liberty Bond Creek mine	175	37.84066	107.71395	verified
Brobdignad mine	176	37.84379	107.70975	verified
Zuni mine	177	37.83537	107.70652	verified
Irene mine	178	37.84170	107.70164	verified
Omaha mine	179	37.85391	107.68654	verified
Monarch	180	37.85914	107.68306	verified
May Day mine (synonym: Mayday)	181	37.84758	107.67863	verified
Anglo Saxon mine, upper level	182	37.85855	107.67843	verified
Anglo Saxon mine	183	37.85888	107.67687	verified
Yukon Mill	184	37.84923	107.67544	verified
Boston & Silverton Mill	185	37.84990	107.67545	verified
Yukon tunnel (Gold Hub)	186	37.84957	107.67499	verified
Lamont mine	187	37.85244	107.66298	verified

Table 1. Mines, mills, large mill-tailings deposits, and smelter sites listed by AML_MINE_ID number.—Continued

Name	AMLI_MINE_ID	Latitude	Longitude	Location verified
Uncle Sam mine	188	37.84905	107.65613	verified
Legal Tender mine (Howardsville quadrangle)	189	37.85299	107.58202	verified
Auburn tunnel	190	37.85891	107.58043	verified
Hamlet Mill	191	37.85206	107.57429	verified
Kittimack tailings	192	37.85822	107.57155	verified
Hamlet mine	193	37.84805	107.56993	verified
Kittimack Mill	194	37.85987	107.56930	verified
Forest Queen mine	195	37.86593	107.56509	verified
Ruby mine	196	37.84408	107.55797	verified
Occident tunnel	197	37.86834	107.54820	verified
Caledonia mine	198	37.86630	107.54443	verified
Gold Nugget mine	199	37.84178	107.54319	verified
Dewey mine	200	37.83983	107.54259	verified
Kittimack mine	201	37.86512	107.53659	verified
Esmeralda mine, lower level	202	37.84867	107.53273	verified
Esmeralda mine, upper level	203	37.84887	107.53113	verified
Golden Gate mine	204	37.81614	107.80257	verified
Ice Lake Mill	205	37.81240	107.78206	verified
Waco mine	206	37.82392	107.78391	verified
Burbank mine	207	37.81996	107.77184	verified
Ensle tunnel	208	37.81992	107.76531	verified
Black Diamond mine	209	37.82061	107.73250	verified
Molly group	210	37.81554	107.72538	verified
Coming Wonder	211	37.81595	107.67100	verified
Little Casino mine	212	37.81687	107.67011	verified
Kendrick-Gelder Smelter (Ross)	213	37.82024	107.66069	verified
Greene Smelter	214	37.81894	107.66061	verified
William Crooke Mill	215	37.82496	107.63784	verified
Blair Mountain tunnel	216	37.81978	107.63758	verified
Amy tunnel	217	37.82175	107.63323	verified
Aspen mine	218	37.82115	107.63117	verified
Silver Lake Mill #2	219	37.82629	107.62765	verified
Legal Tender mine (Silverton quadrangle)	220	37.81867	107.62731	verified
Mayflower Mill (S-D Mill)	221	37.82865	107.62743	verified
MearsWilfley Mill	222	37.82743	107.62699	verified
Valley Forge mine	223	37.82954	107.62447	verified
Ward and Shepard Mill	224	37.81927	107.62150	verified
Contention Mill	225	37.82748	107.61742	verified
Joseph Neff mine	226	37.82939	107.60647	verified
Pride of the West Mill [#2]	227	37.83362	107.59950	verified
Little Nation mine	228	37.82979	107.59935	verified
Union tunnel (Silver Star)	229	37.83847	107.59726	verified
Hidden Treasure mine	230	37.83007	107.59547	verified
Little Nation Mill	231	37.83684	107.59537	verified
Progressive mine	232	37.84348	107.59351	verified
Pride of the West Mill [#4] (Dixilyn, P&G, Howardsville, Silver Wing)	233	37.83698	107.59259	verified

Table 1. Mines, mills, large mill-tailings deposits, and smelter sites listed by AML_MINE_ID number.—Continued

Name	AMLI_MINE_ID	Latitude	Longitude	Location verified
Pride of the West Mill tailings	234	37.83966	107.59151	verified
Hemetite mine	235	37.82983	107.58736	verified
Smuggler mine	236	37.81994	107.58678	verified
Old Hundred Mill tailings	237	37.82357	107.58655	verified
Old Hundred Mill	238	37.82342	107.58522	verified
Old Hundred mine, Mill-level tunnel (3200 level)	239	37.82399	107.58427	verified
Green Mountain Mill	240	37.81978	107.58193	verified
Old Hundred mine, #2 level	241	37.82565	107.58171	verified
Vertex Mill	242	37.81775	107.58036	verified
Old Hundred mine, #5 level	243	37.82649	107.57999	verified
Emma mine	244	37.81803	107.57840	verified
Old Hundred mine, #7 level (new)	245	37.82923	107.57581	verified
Old Hundred mine, #7 level (old)	246	37.83025	107.57502	verified
Veta Madre tunnel	247	37.82631	107.57101	approx.
Gary Owen mine	248	37.82014	107.56677	verified
Antiperiodic mine	249	37.81857	107.56055	verified
Big Ten mine	250	37.82317	107.55893	verified
Ridgeway mine	251	37.83115	107.55216	verified
Little Maud mine	252	37.83234	107.53684	verified
Diamond mine (Ophir quadrangle)	253	37.80311	107.81913	verified
Lucy mine	254	37.80636	107.81780	verified
Kinney tunnel	255	37.80466	107.78597	verified
Copper Gulch mine	256	37.80528	107.74674	verified
Silverheel mine	257	37.81159	107.70637	verified
Belcher mine	258	37.79613	107.69243	verified
North Star (Sultan), #4 level	259	37.80423	107.68652	verified
Columbine mine	260	37.81148	107.68538	verified
North Star (Sultan), #6 level	261	37.80596	107.68335	verified
Blanchard placer	262	37.80891	107.68334	verified
North Star (Sultan), #7 level	263	37.80718	107.68160	approx.
North Star (Sultan) Mill	264	37.80729	107.68037	verified
Sultan tunnel	266	37.80299	107.67956	verified
Victoria Mill	267	37.80853	107.67810	verified
Victoria mine	268	37.80917	107.67664	verified
Blue Jay mine	269	37.79749	107.67542	verified
Ricker tunnel	270	37.79817	107.67482	verified
Ajax tunnel	271	37.80043	107.67475	verified
Gladstone mine	272	37.79947	107.67853	verified
Little Dora mine	273	37.79777	107.67451	verified
Jenny Parker mine	274	37.79519	107.67418	verified
Martha Rose Smelter	275	37.80822	107.67485	verified
Empire tunnel	276	37.80124	107.67238	verified
Hercules Mill (Empire)	277	37.80231	107.67167	verified
Diamond mine (Silverton quadrangle)	278	37.79727	107.67044	verified
Ideal placer	279	37.79413	107.66934	verified
Marcella mine	280	37.79513	107.66512	verified
Kendall Lode	281	37.79820	107.66075	verified

Table 1. Mines, mills, large mill-tailings deposits, and smelter sites listed by AML_MINE_ID number.—Continued

Name	AMLI_MINE_ID	Latitude	Longitude	Location verified
Rough & Ready Smelter	282	37.81347	107.66039	verified
Idaho mine	283	37.80241	107.65918	approx.
Clara mine	284	37.79788	107.65827	verified
Mighty Monarch mine	285	37.80804	107.65687	verified
Lackawanna tailings (removed)	286	37.81447	107.65173	verified
Lackawanna Mill	287	37.81409	107.65163	verified
Lackawanna mine	288	37.80956	107.64713	approx.
Last Chance mine	289	37.81265	107.64501	verified
Scranton City mine	290	37.80265	107.64069	verified
Happy Jack mine	291	37.80361	107.62894	verified
Nevada mine, upper level	292	37.80021	107.62182	verified
Nevada mine, lower level	293	37.80000	107.62067	verified
Unity tunnel level of Silver Lake mine	294	37.80174	107.61850	verified
Grey Eagle mine	295	37.81315	107.61859	verified
New York mine	296	37.79800	107.61758	verified
Iowa Mill	297	37.81289	107.61569	verified
Ezra R mine	298	37.81140	107.61610	verified
Little Giant Mill	299	37.81399	107.61605	verified
Last Chance tunnel	300	37.80245	107.61486	verified
Argentine tunnel	301	37.81076	107.61493	verified
Jess mine	302	37.81265	107.61282	verified
Little Giant mine	303	37.81319	107.61178	approx.
Mayflower mine (S-D mine, main level)	304	37.80624	107.60891	verified
Black Prince tunnel	305	37.81145	107.60475	verified
King Solomon mine	306	37.81338	107.60303	verified
Big Giant Mill	307	37.80802	107.60219	verified
Big Giant mine	308	37.80767	107.60209	verified
North Star Mill [#1]	309	37.80492	107.59899	verified
North Star Mill tailings	310	37.80587	107.59897	verified
Gold Lake mine	311	37.80681	107.59886	verified
Potomac mine	312	37.80347	107.59861	verified
Galena Mountain group	313	37.81312	107.57875	verified
Lawrence tunnel (Osceola mine)	314	37.81109	107.57758	verified
Green Mountain mine, lower level	315	37.80084	107.57709	verified
Pride of the West Mill [#3]	316	37.80754	107.57700	verified
Green Mountain mine, middle level	317	37.80014	107.57621	verified
Pride of the West Mill [#1]	318	37.80782	107.57617	verified
Pride of the West mine, #1 level	319	37.80755	107.57616	verified
Compromise tunnel	320	37.81033	107.57578	verified
Green Mountain mine, upper level	321	37.80101	107.57143	approx.
Little Fanney mine	322	37.80170	107.57123	verified
Oyama tunnel	323	37.80189	107.55642	verified
Old Abe mine	324	37.80334	107.55484	verified
Buffalo Boy mine	325	37.80960	107.55366	verified
Mastodon mine (Howardsville quadrangle)	326	37.80925	107.54527	verified
Queen of Maggie mine	327	37.81251	107.53838	verified
Intersection Mill	328	37.81326	107.53584	verified

Table 1. Mines, mills, large mill-tailings deposits, and smelter sites listed by AML_MINE_ID number.—Continued

Name	AMLI_MINE_ID	Latitude	Longitude	Location verified
Iron Mask mine	329	37.81321	107.53572	verified
Rolling Mountain mine	330	37.77659	107.82640	verified
Big Three mine	331	37.77999	107.82088	verified
Bandora mine	332	37.78699	107.80130	verified
Putnam Basin mine	333	37.77791	107.74216	verified
Deadwood Gulch mine	334	37.78238	107.69139	verified
Champion mine, #3 level	335	37.78824	107.67347	verified
Champion mine, #4 level	336	37.78940	107.67179	verified
Alletha mine	337	37.78584	107.67067	verified
Turk tunnel	338	37.78031	107.66935	verified
Pittsburg tunnel, Champion mine	339	37.78993	107.66945	verified
Fairview mine	340	37.78844	107.66935	verified
King tunnel	341	37.77972	107.66627	verified
Titusville mine	342	37.78552	107.61939	verified
Silver Lake mine, #1 level	343	37.79200	107.60969	verified
Buckeye mine	344	37.78338	107.60857	verified
Iowa mine	345	37.78979	107.60784	verified
Melville mine	346	37.78925	107.60772	verified
Silver Lake Mill #1	347	37.79164	107.60714	verified
Royal Tiger mine	348	37.78824	107.60337	verified
Terrible mine	349	37.79769	107.60021	verified
North Star (Solomon) mine, #4 level (S-D 1700 level)	350	37.79888	107.59865	verified
North Star (Solomon) mine, #5 level	351	37.79674	107.59661	verified
Dives mine	352	37.79426	107.59394	verified
Spotted Pup tunnel	353	37.79330	107.59080	verified
Shenandoah tunnel	354	37.79144	107.58945	verified
Shenandoah-Dives mine, 900 level	355	37.79381	107.58910	verified
Mountaineer mine (Highland Mary, #1 level)	356	37.78402	107.58428	verified
Trilby tunnel	357	37.78940	107.58431	verified
Bradley tunnel	358	37.78543	107.58182	verified
Highland Mary, #7 level	359	37.78263	107.58064	verified
Innis tunnel (Highland Mary, #8 level)	360	37.78759	107.57857	verified
Highland Mary Mill tailings	361	37.78940	107.57813	verified
Molas group	362	37.76248	107.67508	verified
Mabel group	363	37.76313	107.63738	verified
Montana mine	364	37.76889	107.62659	verified
Little Ray mine	365	37.77198	107.62476	verified
Upper Aspen mine	500	37.81618	107.62341	verified
Thunder tunnel	501	37.78637	107.66888	verified
Highland Mary Mill	502	37.78740	107.57761	verified
Sioux City	503	37.89963	107.54390	verified
Ransom mine	504	37.88275	107.57682	verified
Henrietta mine, #8 level	505	37.89174	107.68185	verified
Henrietta mine, #9 level	506	37.88954	107.67850	verified

Table 1. Mines, mills, large mill-tailings deposits, and smelter sites listed by AML_MINE_ID number.—Continued

Name	AMLI_MINE_ID	Latitude	Longitude	Location verified
Mayflower Mill tailings repository # 1	507	37.82761	107.63177	verified
Mayflower Mill tailings repository # 2	508	37.82624	107.63609	verified
Mayflower Mill tailings repository # 3	509	37.82400	107.63794	verified
Mayflower Mill tailings repository # 4	510	37.82040	107.64553	verified
Mine with unknown name	511	37.85992	107.68346	verified

Table 2. Mine sites listed alphabetically.

[Numbers refer to locations in figures 2–4; synonyms where referenced are from the data tables in Wilson (2003), MAS data from the former U.S. Bureau of Mines, and MRDS data from the U.S. Geological Survey (McFaul and others, 2000); S-D, Shenandoah-Dives]

Name	AMLI_MINE_ID	Synonyms	Reference
Adams mine	100		
Adelphin mine	112		
Adit with unknown name	21		
Adit with unknown name	68		
Ajax tunnel	271	Montezuma, Boston tunnel	
Alletha mine	337	Alethea group	MAS
American tunnel, Sunnyside mine	96	Gold King Mill-level tunnel	
Amy tunnel	217		
Anglo Saxon mine	183		
Anglo Saxon mine, upper level	182		
Antiperiodic mine	249		
Argentine tunnel	301	Iowa tunnel	
Aspen mine	218		
Auburn tunnel	190	Auburn group	MAS
Avalanche mine	149		
Bandora mine	332		
Bavarian mine	119		
Belcher mine	258		
Belle Creole mine	115		
Ben Butler mine	9		
Ben Franklin mine	118		
Ben Franklin prospect	117		
Benitoite mine	110		
Big Colorado mine	150		
Big Giant mine	308		
Big Ten mine	250		
Big Three mine	331		
Black Diamond mine	209		
Black Hawk mine	155		
Black Prince tunnel	305		
Blair Mountain tunnel	216		
Blanchard placer	262		
Blue Jay mine	269		
Bonner mine	172		
Boston mine	3		
Bradley Pit	74		
Bradley tunnel	358		
Brenneman mine	39		

Table 2. Mine sites listed alphabetically.—Continued

Name	AMLI_MINE_ID	Synonyms	Reference
Brobdignad mine	176	Bobdignad mine	Munson (1889)
Brooklyn mine	141		
Buckeye mine	344		
Buffalo Boy mine	325		
Burbank mine	207		
Burns group	92		
Burrows mine	16		
Caledonia mine	198	Caldonian mine	MAS
Carbon Lake mine	80		
Champion mine, #3 level	335	Mystery Gold group	
Champion mine, #4 level	336		
Chattanooga Curve mine	135		
Clara mine	284		
Clipper mine	114		
Columbia mine	37		
Columbine mine	260		
Columbus mine	23		
Coming Wonder	211	Emerald mine	
Compromise tunnel	320		
Congress mine	79		
Copper Gulch mine	256		
Corkscrew Pass mine	29		
Custer mine	50		
Deadwood Gulch mine	334		
Dewey mine	200		
Dewitt mine	4		
Diamond mine (Ophir quadrangle)	253		
Diamond mine (Silverton quadrangle)	278		
Dives mine	352		
Eagle Chief mine	14		
Early Bird crosscut	8	Paris mine	
Elk tunnel	147		
Emma mine	244	Oregon and Galena mine	MAS
Empire tunnel	276	Little Dora, Hercules mine	
Ensle tunnel	208		
Esmeralda mine, lower level	202		
Esmeralda mine, upper level	203		
Eveline mine	91		
Evening Star mine	58		
Ezra R mine	298		
Fairview mine	340		
Ferricrete mine	137		
Forest Queen mine	195		
Freda mine	170		
Fredericka group	127		
Frisco tunnel	19		
Galena Mountain group	313		
Galena Queen mine	82		
Galty Boy mine	90	Galtie Boy, Hercules mine	MAS and MRDS
Gary Owen mine	248	Gary Owens mine	MAS
George Washington mine	40		

Table 2. Mine sites listed alphabetically.—Continued

Name	AMLI_MINE_ID	Synonyms	Reference
Gladstone mine	272		
Gold Finch group	140		
Gold King mine, #1 level	111		
Gold King mine, #7 level	103		
Gold King mine, Paul level	109		
Gold King mine, Sampson level	104		
Gold King mine, upper Sampson level	105		
Gold Lake mine	311	McMillan mine	
Gold Nugget mine	199		
Gold Prince mine	49	Sunnyside Extension, Mastedon mine	MRDS
Golden Fleece mine	60		
Golden Gate mine	204		
Grand Mogul	35		
Grand Mogul Stope Complex	33		
Grey Eagle mine	295		
Great Eastern	128	Sioux City	MRDS
Green Mountain mine, lower level	315		
Green Mountain mine, middle level	317		
Green Mountain mine, upper level	321	Philadelphia mine	
Hamlet mine	193		
Happy Jack mine	291		
Hemetite mine	235		
Henrietta mine, #3 level	84		
Henrietta mine, #7 level	85	Mineral King	
Henrietta mine, #8 level	505		
Henrietta mine, #9 level	506		
Hercules mine	83		
Hermes group	11		
Hidden Treasure mine	230		
Highland Mary, #7 level	359		
Hoosier Boy mine	146		
Idaho mine	283		
Ideal placer	279		
Imogene mine	136		
Independence mine (Handies Peak quadrangle)	48		
Independence mine (Silverton quadrangle)	171		
Indian Chief mine	45		
Innis tunnel	360	Highland Mary, #8 level	
Iowa mine	345		
Irene mine	178		
Iron Mask mine	329		
Jenny Parker mine	274	Jennie Parker mine	MAS
Jess mine	302	Peerless mine	
Joe and Johns mine	87		
Joseph Neff mine	226		
JSP mine	81		
Junction mine	76		
Kansas City mine, #1 level	145		
Kendall Lode	281		
King mine	152		

Table 2. Mine sites listed alphabetically.—Continued

Name	AMLI_MINE_ID	Synonyms	Reference
King Solomon mine	306		
King tunnel	341		
Kinney tunnel	255		
Kittimack mine	201	Kittimac mine	MRDS
Klondyke mine	130		
Koehler tunnel	75		
Lackawanna mine	288		
Lake mine	43		
Lake Parson mine	121		
Lamont mine	187		
Lark mine	86		
Last Chance mine	289		
Last Chance tunnel	300		
Lawrence tunnel	314	Osceola mine	
Lead Carbonate mine	106		
Legal Tender mine (Howardsville quadrangle)	189		
Legal Tender mine (Silverton quadrangle)	220		
Liberty Bond Creek mine	175		
Little Casino mine	212		
Little Chief mine	5		
Little Dora mine	273		
Little Fanney mine	322		
Little Giant mine	303		
Little Ida mine	15		
Little Maud mine	252	Little Maude mine	MAS
Little Nation mine	228	Royal Charter mine	MRDS
Little Ray mine	365		
London mine	7		
Longfellow mine	77		
Lower Browns Gulch mine	139		
Lower Bullion King mine	70		
Lower Great Eastern	129		
Lower Porphyry Gulch mine	72		
Lower Ross Basin mine	36		
Lucky Jack mine	13		
Lucy mine	254	Last Hope mine	MRDS
Mabel group	363	Maybell	Munson (1889)
Magnet mine	174		
Mammoth tunnel	148		
Marcella mine	280	Marcello mine	MRDS
Mastodon mine (Handies Peak quadrangle)	47		
Mastodon mine (Howardsville quadrangle)	326		
May Day mine	181	Mayday	
Mayflower mine	304	S-D mine, main level	
Melville mine	346		
Midway tunnel	159		
Mighty Monarch mine	285		
Mine with unknown name (Silverton quadrangle)	511		
Mineral Basin mine	71		
Minnehaha mine	107		

Table 2. Mine sites listed alphabetically.—Continued

Name	AMLI_MINE_ID	Synonyms	Reference
Minnesota Gulch mine	144		
Mocking Bird mine	108		
Mogul mine	31		
Mogul North mine	32		
Mogul South mine	30		
Molas group	362	Ione mine, Molas mine	MRDS
Molly group	210		
Molly Gulch mine	173		
Monarch	180		
Montana mine	364		
Moonbeam mine	160		
Mountain Queen mine	41		
Mountain Queen tunnel	42		
Mountaineer mine	356	Lookout mine, Old Highland Mary mine, #1 level	
Natalie/Occidental mine	153	Silver Ledge mine	
Nevada mine, lower level	293		
Nevada mine, upper level	292		
New York mine	296		
North Star (Solomon) mine, #4 level (S-D 1700 level)	350	King Soloman mine	
North Star (Solomon) mine, #5 level	351	King Soloman mine	
North Star (Sultan), #4 level	259	Sultan mine	
North Star (Sultan), #6 level	261	Sultan mine	
North Star (Sultan), #7 level	263	Sultan mine	
Occident tunnel	197		
Occidental mine	154		
Old Abe mine	324		
Old Hundred mine, #2 level	241		
Old Hundred mine, #5 level	243	Old Hundred mine, 2600 level	
Old Hundred mine, #7 level (new)	245		
Old Hundred mine, #7 level (old)	246		
Old Hundred mine, Mill-level tunnel (3200 level)	239		
Omaha mine	179		
Oyama tunnel	323		
Paradise mine	168	Governor mine, Paradise portal	
Pittsburg tunnel, Champion mine	339		
Potomac mine	312		
Prairie mine	10		
Pride of Bonita mine	101		
Pride of the West mine (#1 level)	319		
Progressive mine	232		
Protection mine	167		
Putnam Basin mine	333		
Queen Anne mine	34		
Queen of Maggie mine	327		
Ransom mine	504		
Ransom mine, upper level	161		
Red and Bonita mine	99		
Red Cloud mine	1		
Ricker tunnel	270		
Ridgeway mine	251		

Table 2. Mine sites listed alphabetically.—Continued

Name	AMLI_MINE_ID	Synonyms	Reference
Riverside mine	12		
Rolling Mountain mine	330		
Royal Tiger mine	348		
Ruby mine	196		
Ruby Trust	169		
Salomon group	102		
San Juan Queen mine	61		
Sandiago tunnel	62		
Scotia mine	59		
Scranton City mine	290		
Senator mine	163		
Sewell mine	2		
Shenandoah tunnel	354		
Shenandoah-Dives mine, 900 level	355		
Silver Bell mine	126		
Silver Chord mine	44		
Silver Cloud mine	132		
Silver Coin mine	22		
Silver Crown mine	133		
Silver King mine	134		
Silver Lake mine, #1 level	343		
Silver Ledge mine	73		
Silver Queen mine	53		
Silver Wing mine	125		
Silverheel mine	257		
Sioux City	503		
Smuggler mine	236		
Sound Democrat mine	54		
South Fork mine #16	156		
South Fork mine #17	157		
Spotted Pup tunnel	353	S-D mine, 1100 level, Dives-Shenandoah mine	
St. Paul mine	78		
Sultan tunnel	266		
Sunbank group, lower level	57		
Sunbank group, upper level	56		
Sunnyside “Mill-level tunnel”	162		
Sunnyside Extension	46		
Sunnyside mine	116		
Terrible mine	349		
Terry tunnel of Sunnyside mine, F level	120		
Thunder tunnel	501		
Titusville mine	342		
Toltec mine, lower level	67		
Toltec mine, middle level	65		
Toltec mine, upper level	64		
Tom Moore #1, 2	123		
Tom Moore tunnel	122		
Trilby tunnel	357		
Turk tunnel	338	King mine	
U.S. Basin mine	143		

Table 2. Mine sites listed alphabetically.—Continued

Name	AMLI_MINE_ID	Synonyms	Reference
Uncle Sam mine	188		
Uncompahgre Chief mine	6		
Union tunnel	229	Silver Star mine	
Unity tunnel level of Silver Lake mine	294		
Upper Aspen mine	500		
Upper Browns Gulch	142		
Upper Bullion King	69		
Upper Joe and Johns mine	89		
Upper Mill Creek mine	131		
Upper Queen Anne mine	38		
Valley Forge mine	223		
Vermillion mine	17		
Vermillion tunnel	18		
Veta Madre tunnel	247	Neigold mine	
Victoria mine	268		
Waco mine	206		
Webster mine	88		
Yukon tunnel	186	Gold Hub, Ariadne	MRDS
Zuni mine	177		

Table 3. Mills, large mill-tailings deposits, and smelter sites[1].

[Numbers refer to locations in figure 5; some mills located at the same sites were not originally numbered; we have added numbers in brackets for clarity]

Name	AMLI_MINE_ID
Mills	
Bagley Mill (Frisco)	20
Big Giant Mill	307
Boston & Silverton Mill	185
Columbus Mill	24
Contention Mill (Arpad/North Star [#2])	225
Gold King Mill	94
Gold Prince Mill	27
Green Mountain Mill	240
Hamlet Mill	191
Hanson Mill (Sunnyside Extension Mill)	51
Hercules Mill (Empire)	277
Highland Mary Mill	502
Ice Lake Mill	205
Intersection Mill	328
Iowa Mill	297
Kittimack Mill	194
Lackawanna Mill	287
Lead Carbonate Mill	95
Little Giant Mill	299
Little Nation Mill	231
Mastodon Mill	52
Mayflower Mill (Shenandoah Dives Mill)	221

Table 3. Mills, large mill-tailings deposits, and smelter sites[1].—Continued

Name	AMLI_MINE_ID
Mills—Continued	
Mears-Wilfley Mill	222
Mogul Mill	93
Natalie/Occidental Mill	151
North Star (Sultan) Mill	264
North Star Mill #1	309
Old Hundred Mill	238
Pride of the West Mill [#1]	318
Pride of the West Mill [#2]	227
Pride of the West Mill [#3]	316
Pride of the West Mill [#4] (Dixilyn, P&G, Howardsville, Silver Wing)	233
Red and Bonita Mill	97
Silver Lake Mill #1	347
Silver Lake Mill #2	219
Silver Ledge Mill	138
Silver Wing Mill	124
Sound Democrat Mill	55
Sunnyside Eureka Mill	164
Sunnyside Mill #1	158
Sunnyside Mill #2	165
Sunnyside-Thompson Mill	113
Treasure Mountain Mill	63
Vertex Mill	242
Victoria Mill	267
Ward and Shepard Mill	224
William Crooke Mill	215
Yukon Mill	184
Mill-tailings deposits	
Highland Mary Mill tailings	361
Kittimack tailings	192
Lackawanna tailings (removed)	286
Mayflower Mill tailings repository # 1	507
Mayflower Mill tailings repository # 2	508
Mayflower Mill tailings repository # 3	509
Mayflower Mill tailings repository # 4	510
North Star Mill tailings	310
Old Hundred Mill tailings	237
Pride of the West Mill tailings	234
Smelters	
Animas Forks Smelter	26
Brown, Epley & Co. Smelter	28
Eclipse Smelter	66
Greene Smelter	214
Kendrick-Gelder Smelter (Ross)	213
Martha Rose Smelter	275
Rough & Ready Smelter	282
Winspear Smelter	166

[1]Additional data on mills and smelters are in Jones (this volume).

Table 4. Physical parameters that may contribute to the environmental effect of historical mines.

[Volume of mine waste estimated in cubic yards, yd^3; size, distance originally in feet, converted to meters, m, or square meters, m^2; Ref.=footnote; blank, no data]

AMLI_MINE_ID	NAME	Ref.	No. shafts	No. adits	No. of flowing adits	Adit drainage flows over mine waste dump	Kill zone	Volume of mine waste yd^3	Size of disturbed area m^2	Distance to stream m
100	Adams mine	2	0	1	0	no	yes	800	1,000	320
271	Ajax tunnel	5				yes	no			
217	Amy tunnel	4	0	1	1	yes	no	20,000		
183	Anglo Saxon mine	2	0	1	1	yes	no	2,200	870	50
249	Antiperiodic mine	4	0	2	0	no	no		2,900	in stream
301	Argentine tunnel	4	0	1	1					
218	Aspen mine	4	0	5?	1				2,700	
190	Auburn tunnel	4	0	1	1	yes	no	3,100	1,100	340
332	Bandora mine	1		9	4	yes	yes	5,500	5,700	97
119	Bavarian mine	4	0	1	1	yes	no	2,100	300	180
9	Ben Butler mine	3	2	0	0	no	yes	400–600	1,400	410
118	Ben Franklin mine	4	1	1	0	no	yes	500	1,500	in stream
117	Ben Franklin prospect	4	0	1	1	yes	no	250	290	140
150	Big Colorado mine	2	0	1	1	no	no	27,000	2,100	45
155	Black Hawk mine	2	0	2	2	yes	no	12,000	610	67
305	Black Prince tunnel	4	0	1	1	yes	no		770	42
216	Blair Mountain tunnel	4	0	1	1					
172	Bonner mine	1		5	2	yes	yes	24,500	3,300	in stream
3	Boston mine	3	1	1	0	yes	yes	900	2,700	180
358	Bradley tunnel	4	0	1	1	yes	yes		3,900	in stream
39	Brenneman mine	2	2	0	0	no	yes	1,800		
141	Brooklyn mine	1		1	1	yes	yes		15,000	50 260
325	Buffalo Boy mine	4	0	1	1	yes	yes	7,000	2,400	in stream
207	Burbank mine	5				yes	yes		2,200	in stream
16	Burrows mine	3	1	2	2	yes	yes	3,400	850	
198	Caledonia mine	4	0	3	0	no	no		2,300	480
80	Carbon Lake mine	1	3	0		no	yes	4,000		
335	Champion mine, #3 level	4	0	1	1					
336	Champion mine	4	0	1	1				1,500	270
114	Clipper mine	4	1	1	0	no	yes	1,100	370	190
37	Columbia mine	2	5	1	0	yes	yes	6,500		
24	Columbus Mill	3								
23	Columbus mine	3	0	1	1	yes	yes	24,000	2,500	39
320	Compromise tunnel	5	0	1	0	no	no		3,900	28
79	Congress mine	5	1			no	yes		1,400	19
29	Corkscrew Pass mine	2	0	1	0	no	no	1,300	100	
14	Eagle Chief mine	3	0	1	0	no	yes	1,500	280	100
8	Early Bird crosscut	3	0	2	1	yes		2,900	1,700	160
66	Eclipse Smelter	5	0	0	0	no		300		
147	Elk tunnel	2	0	1	1	yes	no	1,100	650	50
244	Emma mine	4	0	1	1					
276	Empire tunnel	5				yes	no			
202	Esmeralda mine, lower level	4	0	1	1					
203	Esmeralda mine, upper level	4	0	1	0					
91	Eveline mine	2	0	1	1	yes	no		250	215
298	Ezra R mine	4	0	1	1	yes				
137	Ferricrete mine	1	0	1	1					
19	Frisco tunnel	3	0	1	1	no	yes	20,500		
82	Galena Queen mine	2	1	0	0	no	yes	7,200	4,400	in stream
90	Galty Boy mine	2	0	1	0	no	no	1,000	680	566
248	Gary Owen mine	4	0	1	0	no	no			

Table 4. Physical parameters that may contribute to the environmental effect of historical mines.—Continued

AMLI_MINE_ID	NAME	Ref.	No. shafts	No. adits	No. of flowing adits	Adit drainage flows over mine waste dump	Kill zone	Volume of mine waste yd^3	Size of disturbed area m^2	Distance to stream m
272	Gladstone mine	5				no	yes		3,500	340
103	Gold King mine, #7 level	5				no	no		small	in stream
60	Golden Fleece mine	3	0	1	1	yes	yes	6,500	4,100	
35	Grand Mogul	2	0	1	1	yes	yes	9,000	2,200	45
33	Grand Mogul Stope Complex	2	0	1	0	no	yes	8,000	1,400	26
240	Green Mountain Mill (Buffalo Boy tailings)	4				no	no	400	1,500	71
315	Green Mountain mine, lower level	4	0	2	1	yes	no		3,300	115
193	Hamlet mine	4	0	6	1	yes	no	10,700	2,000	
84	Henrietta mine, #3 level	2	0	1	0	yes	yes	<2,000	3,500	500
85	Henrietta mine, #7 level	2	0	1	1	yes	yes	30,000	4,800	in stream
505	Henrietta mine, #8 level	2	0	1	1	no	yes		5,600	in stream
506	Henrietta mine, #9 level	2	0	1	0			700		
83	Hercules mine	2	1	0	0	no	yes	4,680	3,500	in stream
11	Hermes Group	5	0	2	0	no	yes	1,300		
230	Hidden Treasure mine	4	0	1	1	yes	no			
359	Highland Mary mine, #7 level	5				no	no		1,900	18
361	Highland Mary Mill tailings	4				no	no	35,000	5,800	in stream
283	Idaho mine	4	0	1	1	no	no		1,400	
136	Imogene mine	1		1	1	yes	yes		520	in stream
171	Independence mine (Silverton quadrangle)	5				yes	no		470	in stream
45	Indian Chief mine	3	0	2	1	yes	yes	400	860	
360	Innis tunnel	4	0	1	1	yes	no			
297	Iowa Mill	4				no	no	500		
345	Iowa mine, A-level	4	0	4	2	yes	no	27,000	18,000	70
329	Iron Mask mine	4	1	1	0				720	in stream
274	Jenny Parker mine	5				no	no		1,500	365
302	Jess mine	4	0	1	1					
87	Joe and Johns mine	2	0	1	1	no	yes		1,040	110
226	Joseph Neff mine	4	0	1	1					
81	JSP mine	2	0	1	0	no	yes	300		
145	Kansas City mine, # 1 level	2	0	5	2	yes	yes	8,500	2,000	180
306	King Solomon mine	4	0	1	1	no	no		950	130
201	Kittimack mine	4	0	many	1	yes	no	7,850	1,200	210
192	Kittimack tailings	4				no	no	23,000	35,000	67
75	Koehler tunnel	1	3	1		no, piped	yes	15,000 to repository		
86	Lark mine	2	0	1	1	no	no	3,500	2,660	216
289	Last Chance mine	4	0	1	1	yes	no		500	
106	Lead Carbonate mine	2	0	many	0	no	yes	3,500	2,500	in stream
189	Legal Tender mine (Howardsville quadrangle)	4	0	2	2	yes	no	1,700		
212	Little Casino mine	4	0	1	1	yes	no		430	>1,000
5	Little Chief mine	3	0	1	1	yes	yes	700		
15	Little Ida mine	3	0	6	4	yes	yes	1,100		
252	Little Maud mine	4	0	1	1					
228	Little Nation mine	4	0	3	1					

Table 4. Physical parameters that may contribute to the environmental effect of historical mines.—Continued

AMLI_MINE_ID	NAME	Ref.	No. shafts	No. adits	No. of flowing adits	Adit drainage flows over mine waste dump	Kill zone	Volume of mine waste yd^3	Size of disturbed area m^2	Distance to stream m
7	London mine	3	1	4	3	yes	yes	3,300	2,700	in stream
77	Longfellow mine	1	1	2		yes	yes	5,500		
70	Lower Bullion King	5				no	yes		3,500	in stream
129	Lower Great Eastern	5		3		no	no	5,000		
36	Lower Ross Basin mine	2	0	1	0	no	yes	900		
13	Lucky Jack mine	3	2	2	1	yes	yes	2,800	2,800	in stream
148	Mammoth tunnel	2	0	1	1	no	no	<100	590	100
280	Marcella mine	5		1	1					
221	Mayflower Mill (S-D Mill)	5				no	yes	750		
159	Midway mine	5	0	1	1	yes	no		5,900	40
285	Mighty Monarch mine	4	0	1	1					
31	Mogul mine	2	1	1	1	yes	yes	25,000	4,700	63
32	Mogul North mine	2	0	1	0	no	no	400	310	19
30	Mogul South mine	2	0	1	1	no	no	800	380	86
180	Monarch	2	0	1	1	yes	no		1,200	in stream
160	Moonbeam mine	4	0	1	1	yes	no	1,000	small	
41	Mountain Queen mine	3	1	0	0	no	yes	1,900	2,200	576
42	Mountain Queen tunnel	3	0	1	1	yes	yes	3,200	215	
153	Natalie/Occidental mine	2	0	1	1	yes	yes	6,800	1,500	in stream
310	North Star Mill tailings	5				no	no			
259	North Star mine, #4 level (Sultan)	1		4	0		no			
261	North Star mine, #6 level (Sultan)	1		1	0	no	no	3,500	7,100	237
263	North Star mine, #7 level (Sultan)	1		1	1	no	yes	40,000	15,000	in stream
154	Occidental mine	2	0	1	0	no	no	1,000	920	in stream
237	Old Hundred Mill tailings	5				no	no	400	2,000	in stream
239	Old Hundred mine, Mill-level tunnel	4		many	1			400		
323	Oyama tunnel	4	0	1	1	no	no			
168	Paradise mine	1		4	4	yes	yes	700		
182	Porcupine Gulch adit (sublevel, Anglo Saxon mine)	2	0	1	1	no	no	1,600		
10	Prairie mine	3	0	1	1			600		
227	Pride of the West Mill [#2]	4				no	no	1,200		
233	Pride of the West Mill [#4] (Dixilyn, P&G, Howardsville, Silver Wing)	4						large, permitted		
319	Pride of the West mine	4	0	1	1					
232	Progressive mine	4	0	1	1	yes	no		3,000	
167	Protection mine	3	0	1	0	no	no	20,000	2,200	210
34	Queen Anne mine	2	0	1	1	yes	no	5,000	380	86
327	Queen of Maggie mine	4	0	1	1					
504	Ransom mine	4		1	1					
99	Red and Bonita mine	2	0	2	1	no	yes	6,000	1,100	200
1	Red Cloud mine	3	4	1	0	no	yes	3,000	630	310
270	Ricker tunnel	5				no	yes		1,100	330
251	Ridgeway mine	5	0	1	1					
12	Riverside mine	3	0	1	1	yes	yes	<100		
348	Royal Tiger mine	4	0	3	1	yes	yes	18,000	7,300	in stream
169	Ruby Trust	1		1	1	yes	yes	5,000–6,000		
62	Sandiago tunnel	3	0	1	1	no	no	9,000	2,100	

Table 4. Physical parameters that may contribute to the environmental effect of historical mines.—Continued

AMLI_MINE_ID	NAME	Ref.	No. shafts	No. adits	No. of flowing adits	Adit drainage flows over mine waste dump	Kill zone	Volume of mine waste yd^3	Size of disturbed area m^2	Distance to stream m
163	Senator mine	3	0	1	1	yes	no	4,000	440	190
355	Shenandoah-Dives mine, 900 level	4	0	1	1			0		
126	Silver Bell mine	3	0	1	0	no	yes	1,900	250	80
133	Silver Crown mine	5				no	no			
347	Silver Lake Mill #1	4				no	no	50,000	11,000	
343	Silver Lake mine, #1 level	4	0	1	0					
53	Silver Queen mine	3	1	2	2	yes	yes	15,000		375
125	Silver Wing mine	3	0	1	1	no	yes	10,000	4,900	
503	Sioux City	3	0	4	0	no		5,000	1,600	122
236	Smuggler mine	4	0	1	1					
54	Sound Democrat mine	3	0	2	1	yes	yes	14,000	590	220
156	South Fork mine #16	5	0	1	1	yes	yes	2,000		
157	South Fork mine #17	5	0	1	1	yes	yes	400		
353	Spotted Pup tunnel	5				no	no		400	>1,000
164	Sunnyside Eureka Mill	4						12,000	3,500	in stream
165	Sunnyside Mill #2	5				no	yes			
116	Sunnyside mine	4	1	0	0	no	no	60,000	10,000	333
67	Toltec mine, lower level	3	0	1	1	yes	no	3,800	530	19
123	Tom Moore mine	3	0	1	1	yes	no	4,000	750	in stream
21	unnamed adit	3	1	2	0	no	yes	1,200		
229	Union tunnel	4	0	1	1					
294	Unity tunnel, Silver Lake mine	4	0	2	0	yes	no	35,000	900	in stream
142	Upper Browns Gulch	1		1	1	yes	yes			
69	Upper Bullion King	5				no	no		330	1
89	Upper Joe and Johns mine	2	0	1	0	no	yes		<100	470
38	Upper Queen Anne mine	2	0	1	0			900	500	560
223	Valley Forge mine	4	0	1	1					
17	Vermillion mine	3	0	1	1	yes	yes	5,100	1,100	in stream
18	Vermillion tunnel	3	0	1	1	yes	no	10,800	2,700	
186	Yukon tunnel	2	0	1	1	yes	yes	18,000	6,200	in stream

[1]Ref.: Unpub. Mineral Creek feasibility investigation report, (CDMG, 1997); Unpub. abandoned mine land inventory report, San Juan Forest, Columbine district, CGS, 1997.

[2]Ref.: Unpub. Cement Creek reclamation feasibility report, CDMG, 1998.

[3]Ref.: Unpub. Upper Animas River reclamation feasibility report, CDMG, 1999.

[4]Ref.: Unpub. Lower Animas River reclamation feasibility report, CDMG, 2000.

[5]Ref.: Unpub. report to Colorado Water Quality Control Commission, ARSG, 2001.

Table 5. Adit chemistry determined at low flow for selected sites sampled by State of Colorado.

[Adit flow in cubic feet/second, ft^3/s; all samples were filtered at 0.45 micrometers, concentrations expressed in milligrams per liter, mg/L; or in micrograms per liter, µg/L; n.d., not detected; all methods and data are in the database (Sole and others, this volume). "Reference" column refers to the footnote number]

AMLI_MINE_ID	Name	Date	Sample designation	Reference	Discharge ft^3/s	pH	Specific conductance µS/cm	Sulfate mg/L	Na mg/L	K mg/L	Mg mg/L	Ca mg/L	Al µg/L	Fe µg/L	Mn µg/L	Cu µg/L	Ni µg/L	Zn µg/L	Cd µg/L	Pb µg/L
5	Little Chief mine	9/1/97	DM3	3	0.005	3.5	330	150	0.30	n.d.	2.7	20	7,700	4,300	7,500	180	13	4,800	26	4.5
7	London mine, w	9/1/97	DM5	3	0.0003	6.4	67	12	0.69	n.d.	0.6	13	n.d.	8.0	1.0	4.0	n.d.	26	n.d.	n.d.
7	London mine, n	9/1/97	DM6	3	0.0003	6.3	640	78	1.2	n.d.	1.3	18	440	1,900	1,200	120	n.d.	6,000	26	120
7	London mine, main	9/1/97	DM7	3	0.002	6.3	460	160	5.6	n.d.	4.3	63	n.d.	740	1,700	13	n.d.	9,800	64	n.d.
8	Early Bird Crosscut (Paris)	9/1/97	DM4	3	0.0003	3.6	380	170	0.32	2.3	6.8	33	6,100	2,900	6,700	260	23	2,300	19	78
10	Prairie mine	9/1/97	DM8	3	0.001	6.9	270	57	2.8	n.d.	3.0	43	n.d.	6.0	87	n.d.	n.d.	950	4.5	n.d.
12	Riverside mine	9/1/97	DM9	3	0.0003	7.1	80	12	0.55	n.d.	1.7	14	n.d.	41	110	n.d.	n.d.	79	n.d.	13
13	Lucky Jack mine	9/1/97	DM2	3	0.101	5.1	81	32	0.84	n.d.	1.3	10	260	190	120	19	n.d.	920	3.8	230
15	Little Ida mine, s	9/1/97	DM14	3	0.004	7.2	99	27	0.78	n.d.	1.0	17	97	15	140	26	n.d.	780	3.9	36
16	Burrows mine, w	9/1/97	DM15	3	0.002	5.7	120	44	0.48	n.d.	1.3	13	500	7.0	860	67	n.d.	5,700	24	540
16	Burrows mine, e	9/1/97	DM16	3	0.003	5.4	170	57	1.0	n.d.	1.6	25	40	n.d.	350	12	n.d.	6,900	20	n.d.
17	Vermillion mine	9/1/97	DM17	3	0.016	3.1	1,000	250	0.32	n.d.	1.8	23	3,100	21,000	7,300	1,300	n.d.	52,000	210	1,600
18	Vermillion tunnel	9/1/97	DM18	3	0.24	6.3	570	160	4.0	n.d.	5.4	91	n.d.	18	1,200	n.d.	n.d.	1,000	3.3	1.1
19	Frisco tunnel	9/1/97	DM19	3	0.15	6.4	650	260	4.8	2.1	7.6	120	140	210	7,600	n.d.	n.d.	3,700	11	n.d.
23	Columbus mine	9/1/97	DM20	3	0.003	3.3	1,600	1,400	0.93	n.d.	9.5	30	19,000	77,000	14,000	7,700	75	250,000	1,000	350
31	Mogul mine	10/1/96	SO5	2	0.02	2.9	1,100	450	3.3	1.0	4.2	84	5,000	48,000	9,700	6,500	21	29,000	160	180
34	Queen Anne mine	10/1/96	SO1	2	0.05	6.4	300	97	1.0	n.d.	2.8	41	100	120	1,200	84	n.d.	2,200	9.1	1.6
35	Grand Mogul mine	10/1/96	SO3	2	0.02	3.4	510	190	1.0	n.d.	7.9	21	10,000	730	7,100	2,600	12	17,000	88	38
41	Mountain Queen mine	9/1/97	DM10	3	0.005	3.7	310	120	0.46	n.d.	1.7	15	4,000	9,100	4,100	2,300	n.d.	6,500	62	140
45	Indian Chief mine	9/1/97	DM28	3	0.004	6.8	180	46	0.87	n.d.	1.8	35	n.d.	12	600	n.d.	n.d.	220	1.0	23
53	Silver Queen mine	9/1/97	DM25	3	0.0007	3.2	680	540	0.47	n.d.	4.0	55	1,400	15,000	72,000	2,300	21	8,400	28	360
54	Sound Democrat mine	9/1/97	DM26	3	0.008	3.7	480	260	0.24	n.d.	6.6	59	1,500	260	46,000	280	17	9,400	22	150
60	Golden Fleece mine	9/1/97	DM27	3	0.008	3.8	220	84	0.22	n.d.	1.8	18	1,800	1,300	7,000	41	n.d.	1,300	7.8	69
67	Toltec mine, lower level	9/1/97	DM29	3	0.0015	8.1	340	84	5.1	n.d.	8.7	61	n.d.	n.d.	33	4.0	n.d.	27	n.d.	n.d.
87	Joe and Johns mine	10/1/96	SO6	2	<0.002	2.7	1,400	330	0.28	n.d.	1.9	1.9	13,000	62,000	290	510	33	11,000	53	550
91	Eveline mine	10/1/96	SO24	2	<0.002	3.4	470	170	2.3	n.d.	10.0	4.9	11,000	15,000	850	56	16	850	10	1.4
118	Ben Franklin mine	9/1/98	DM32	4	0.022	6.1	720	260	1.2	n.d.	15.0	81	140	64	88	n.d.	n.d.	260	0.8	1.9
119	Bavarian mine	9/1/98	DM33	4	0.001	3.3	500	88	0.38	n.d.	1.0	16	130	2,900	4,100	500	n.d.	2,300	5.4	430
123	Tom Moore mine	9/1/97	DM22	3	0.072	7.3	350	89	2.4	n.d.	2.2	75	n.d.	14	540	n.d.	n.d.	840	2.0	n.d.
125	Silver Wing mine	9/1/97	DM21	3	0.037	6.5	380	270	3.8	n.d.	4.9	120	410	1,800	3,400	1,400	n.d.	3,900	15	n.d.
133	Silver Crown mine	7/20/95	258/4194–1.307	1	0.11	7.1	413	139	3.8	0.3	3.2	75	7.0	50	60	0.7	2.6	42	0.3	<0.2
136	Imogene mine	7/19/95	259/4193–1.304	1	0.25	5.9	247	162	3.6	0.3	2.8	41	250	10,000	820	n.d.	2.1	100	n.d.	1.4
141	Brooklyn mine	7/18/95	261/4193–1.306	1	0.045	3.2	1,006	526	1.2	0.5	15.0	84	2,300	38,000	>5,000	810	19	7,300	38	62
143	U.S. Basin mine	8/24/95	262/4195–1.300	1	0.042	5.1	512	212	2.0	0.7	11.0	63	280	1,500	2,900	3.2	5.6	160	0.7	8.8
145	Kansas City # 1 mine	10/1/96	SO20	2	<0.002	3.0	1,400	600	1.0	n.d.	13.0	120	10,000	57,000	32,000	2,100	30	8,300	25	100
147	Elk tunnel	10/1/96	SO19	2	0.38	7.0	1,500	740	7.9	n.d.	6.4	330	n.d.	3,500	1,700	n.d.	n.d.	190	n.d.	n.d.
148	Mammoth tunnel	10/1/96	SO18	2	0.07	4.9	1,500	580	5.1	2.4	18.0	210	1,700	53,000	4,400	12	20	1,000	1.3	n.d.
150	Big Colorado mine	10/1/96	SO17	2	0.04	4.6	820	450	3.9	2.8	13.0	110	6,800	75,000	2,200	15	37	1,100	4.8	n.d.
153	Natalie/Occidental mine	10/1/96	SO13	2	0.89	6.3	1,000	540	3.7	n.d.	9.0	220	770	13,000	2,300	n.d.	n.d.	710	2.1	n.d.
155	Black Hawk mine	10/1/96	SO12	2	0.2	7.3	1,200	610	3.3	1.1	11.0	260	n.d.	50	2,500	n.d.	10	580	1.8	n.d.

Table 5. Adit chemistry determined at low flow for selected sites sampled by State of Colorado.—Continued

AMLI_MINE_ID	Name	Date	Sample designation	Reference	Discharge ft³/s	pH	Specific conductance µS/cm	Sulfate mg/L	Na mg/L	K mg/L	Mg mg/L	Ca mg/L	Al µg/L	Fe µg/L	Mn µg/L	Cu µg/L	Ni µg/L	Zn µg/L	Cd µg/L	Pb µg/L
159	Midway tunnel	9/1/98	DM74	4	0.018	7.6	1,200	750	8.4	n.d.	6.6	260	56	n.d.	12	n.d.	n.d.	35	n.d.	n.d.
160	Moonbeam mine	9/1/98	DM35	4	0.067	7.6	550	160	2.0	n.d.	3.7	90	n.d.	71	400	n.d.	n.d.	360	0.7	1.7
163	Senator mine	9/1/97	DM24	3	0.163	6.6	1,200	940	6.6	3.1	25.0	230	1,700	26,000	16,000	8.0	17	1,900	3.9	6.8
183	Anglo Saxon mine	10/1/96	SO16	2	0.09	6.6	1,700	810	9.2	3.5	20.0	320	340	31,000	9,200	14	22	2,900	3.0	n.d.
186	Yukon mine (Gold Hub)	10/1/96	SO14	2	1.21	7.1	950	500	5.7	n.d.	6.5	220	n.d.	1,100	1,000	n.d.	n.d.	99	n.d.	n.d.
190	Auburn mine	9/1/98	DM36	4	0.243	7.7	950	320	3.5	n.d.	5.0	150	n.d.	160	270	n.d.	n.d.	150	n.d.	2.0
193	Hamlet mine	9/1/98	DM39	4	0.331	7.6	860	300	5.3	n.d.	8.2	150	n.d.	210	550	n.d.	n.d.	100	n.d.	n.d.
203	Esmeralda mine	9/1/98	DM40	4	0.035	8.0	780	50	3.3	n.d.	3.2	41	n.d.	n.d.	14	n.d.	n.d.	8.0	n.d.	n.d.
208	Ensle tunnel	8/24/95	255/4189–1.303	1	<0.002	2.9	470	145	0.30	0.3	2.3	15	3,100	18,000	380	46	4.2	1,500	7.9	12
212	Little Casino mine (Coming Wonder)	9/1/98	DM73	4	0.004	7.6	400	110	5.7	n.d.	11.0	64	n.d.	5.0	47	n.d.	n.d.	460	0.8	n.d.
216	Blair Mtn. tunnel	9/1/98	DM65	4	0.06	7.0	850	440	5.0	n.d.	2.9	180	n.d.	620	360	8.0	n.d.	n.d.	n.d.	n.d.
218	Aspen mine	9/1/98	DM64	4	0.421	7.1	750	330	3.4	n.d.	2.5	150	n.d.	n.d.	2.0	5.0	n.d.	590	3.6	n.d.
223	Valley Forge mine	9/1/98	DM57	4	0.111	7.4	340	58	2.9	n.d.	3.9	51	n.d.	n.d.	n.d.	n.d.	n.d.	7.0	n.d.	n.d.
226	Joseph Neff mine	9/1/98	DM75	4	0.013	5.5	500	250	6.1	n.d.	8.6	86	1,400	380	400	n.d.	n.d.	79	n.d.	n.d.
228	Little Nation mine	9/1/98	DM56	4	0.137	7.0	580	240	3.7	n.d.	6.1	95	72	5,500	1,300	n.d.	n.d.	510	1.0	1.4
230	Hidden Treasure mine	9/1/98	DM44	4	0.008	6.8	300	140	4.5	n.d.	8.0	48	n.d.	3,200	1,400	n.d.	n.d.	400	1.1	n.d.
236	Smuggler mine	9/1/98	DM46	4	0.023	7.7	310	92	4.3	n.d.	5.4	57	n.d.	1,800	630	n.d.	n.d.	15	n.d.	n.d.
239	Old Hundred mine	9/1/98	DM45	4	1.146	8.2	500	220	3.9	n.d.	3.4	110	n.d.	n.d.	n.d.	n.d.	n.d.	83	0.7	0.7
244	Emma mine	9/1/98	DM47	4	0.036	7.5	600	260	4.4	n.d.	6.9	130	n.d.	7.0	10	n.d.	n.d.	29	n.d.	n.d.
285	Mighty Monarch mine	9/1/98	DM67	4	0.064	7.4	350	120	3.5	n.d.	4.5	63	n.d.	47	850	n.d.	n.d.	500	1.6	n.d.
289	Last Chance mine	9/1/98	DM66	4	0.277	7.4	290	96	3.0	n.d.	2.6	49	n.d.	250	410	n.d.	n.d.	18	n.d.	n.d.
298	Ezra R mine	9/1/98	DM58	4	0.011	7.7	220	100	2.4	n.d.	0.8	60	n.d.	n.d.	11	n.d.	n.d.	64	n.d.	n.d.
301	Argentine tunnel	9/1/98	DM78	4	0.041	8.2	370	120	2.8	n.d.	2.0	66	n.d.	n.d.	2.0	n.d.	n.d.	34	n.d.	n.d.
302	Jess mine	9/1/98	DM77	4	0.006	7.9	380	130	2.5	n.d.	2.7	71	n.d.	59	200	n.d.	n.d.	47	n.d.	n.d.
305	Black Prince mine	9/1/98	DM60	4	0.061	7.9	62	6.6	0.31	n.d.	0.4	16	n.d.	n.d.	n.d.	n.d.	n.d.	14	n.d.	n.d.
306	King Solomon mine	9/1/98	DM59	4	0.001	7.7	98	26	1.0	n.d.	1.2	26	n.d.	14	5.0	24	n.d.	180	1.0	3.8
315	Green Mtn. mine	9/1/98	DM52	4	0.008	8.3	240	48	2.1	n.d.	2.4	47	n.d.	5.0	4.0	7.8	n.d.	940	5.7	13
319	Pride of the West mine	9/1/98	DM51	4	0.227	8.6	350	48	1.7	n.d.	5.2	75	n.d.	n.d.	230	13	n.d.	1,200	6.3	2.8
323	Oyama tunnel	9/1/98	DM49	4	0.072	7.7	390	220	12.0	2.2	12.0	98	n.d.	210	870	n.d.	n.d.	21	n.d.	n.d.
327	Queen of Maggie mine	9/1/98	DM71	4	0.007	4.6	230	58	2.9	4.1	11.0	34	n.d.	1,200	20	n.d.	n.d.	59	0.7	n.d.
332	Bandora mine	7/19/95	235/4185–1.3000	1	0.071	6.2	32	290	2.1	0.3	7.1	90	25	11,000	>5,000	140	23	16,000	88	<0.2
345	Iowa mine	9/1/98	DM62	4	0.001	7.3	41	13	0.18	n.d.	0.5	6.7	n.d.	n.d.	13	22	n.d.	880	6.1	18
345	South Iowa mine adit	9/1/98	DM79	4	0.002	5.2	110	200	0.29	n.d.	1.0	12	390	57	130	400	n.d.	7,500	29	970
348	Royal Tiger mine	9/1/98	DM63	4	0.007	4.9	350	190	1.0	n.d.	8.2	41	5,700	340	6,500	1,400	16	9,800	38	2,200
360	Innis tunnel	9/1/98	DM53	4	0.053	7.8	300	83	3.3	n.d.	3.3	60	n.d.	n.d.	2.0	n.d.	n.d.	64	n.d.	n.d.
504	Lower Ransom mine	9/1/98	DM69	4	0.061	7.6	1,300	1,000	4.9	n.d.	7.5	220	n.d.	14	78	n.d.	n.d.	330	n.d.	n.d.

[1]Reference: Unpub. abandoned mine land inventory report, San Juan Forest, Columbine district, CGS, 1997.

[2]Reference: Unpub. Cement Creek reclamation feasibility report, CDMG, 1998.

[3]Reference: Unpub. Upper Animas River reclamation feasibility report, CDMG, 1999.

[4]Reference: Unpub. Lower Animas River reclamation feasibility report, CDMG, 2000.

Table 6. Adit chemistry determined at low flow for selected sites sampled by U.S. Geological Survey.

[Adit flow in cubic feet/second, ft^3/s; all samples were filtered at 0.45 micrometers; concentrations expressed in milligrams per liter, mg/L; or in micrograms per liter, µg/L; < detection limit, not detected; --, not determined; all methods and data are in the database (Sole and others, this volume)]

AMLI_MINE_ID	Name	Date	Sample designation	Discharge ft^3/s	pH	Specific conductance µS/cm	Sulfate mg/L	Na mg/L	K mg/L	Mg mg/L	Ca mg/L	Al µg/L	Fe µg/L	Mn µg/L	Cu µg/L	Ni µg/L	Zn µg/L	Cd µg/L	Pb µg/L
Detection limit —							*2*	*0.5*	*0.03*	*0.01*	*0.02*	*2*	*50*	*0.2*	*0.5*	*0.5*	*0.5*	*0.02*	*0.05*
7	London mine	9/4/98	MS22	0.011	6.8	405	167	5.2	1.25	3.91	59	20	15	1,400	6.0	10	6,450	44	15
8	Early Bird Crosscut	8/13/97	NAW150	0.0045	3.2	350	--	0.53	--	5.30	13	4,400	1,400	3,800	260	18	1,400	24	69
		9/14/98	NAW727	0.0022	3.2	330	--	< 0.5	--	6.90	29	6,300	2,300	6,800	350	19	2,200	23	83
9	Ben Butler mine	8/14/97	NAW156	0.0045	3.0	600	--	< 0.5	--	0.64	4.5	1,500	3,200	210	1,100	4.2	13,000	110	2,500
		9/14/98	NAW726	0.0067	3.0	530	--	< 0.5	--	0.56	4.8	1,700	4,300	320	1,400	3.5	18,000	110	1,800
		9/2/99	NAW822	0.0067	2.9	230	--	< 0.5	--	0.65	5.4	2,500	5,800	310	1,100	5.0	20,000	110	2,400
13	Lucky Jack mine	10/3/98	MS23	0.01	3.5	284	80	1.0	0.68	1.75	14	1,220	2,050	615	63	10	4,280	21	253
15	Little Ida mine	9/7/97	NAW380	0.011	7.3	90	--	0.64	--	0.69	3.9	160	110	130	30	1.7	740	4.0	49
17	Vermillion mine	9/27/99	MS55	0.005	2.6	783	269	0.38	0.62	1.82	26	3,280	21,500	7,340	1,410	10	49,800	202	1,380
19	Frisco tunnel	8/24/98	MS3	0.062	6.2	845	300	4.6	2.74	6.93	113	116	226	6,860	2.0	10	3,000	4.9	15
		9/11/98	NAW704	0.067	5.4	580	--	4.8	--	7.70	120	69	1,300	7,900	1.5	3.2	3,100	5.7	0.6
		9/2/99	NAW828	0.18	5.5	260	--	4.7	--	7.10	120	71	300	7,300	3.0	10	3,400	10	25
31	Mogul mine	8/31/99	NAW802	--	2.8	780	--	4.5	--	13.0	160	46,000	130,000	31,000	12,000	59	100,000	1,600	240
32	Mogul North mine	9/10/97	MS26	0.015	4.7	180	85	0.72	--	2.49	25	373	15	36	10	10	1,050	2.3	15
34	Queen Anne mine	9/6/97	MS50	0.05	7.0	367	344	1.5	--	3.94	61	116	77	1,680	98	10	2,430	11	15
35	Grand Mogul mine	8/15/97	NAW176	0.067	3.3	400	--	0.79	--	3.00	8.9	1,900	5,200	1,900	1,000	5.8	5,500	42	35
		9/10/97	MS16	0.003	3.4	488	190	1.0	--	6.05	17	9,170	1,470	7,110	3,240	24	15,800	89	44
		8/15/98	NAW530	0.045	2.9	630	--	<0.5	--	13.0	23	13,000	43,000	13,000	7,300	24	34,000	170	42
		8/31/99	NAW801	0.056	3.0	380	--	0.64	--	5.20	15	5,500	25,000	4,300	2,000	14	14,000	73	25
42	Mountain Queen mine	8/22/02	CGS-350	0.004	3.6	243	82		0.49	1.60	12	2,500	3,700	3,900	930	2.5	3,800	37	190
58	Evening Star mine	9/5/99	NAW860	0.011	4.6	92	--	1.2	--	4.30	16	12,000	21,000	7,200	3.0	15	4,400	14	300
62	Sandiago tunnel (Treasure Mountain mine)	9/8/98	MS54	0.433	7.0	590	203	2.0	1.44	5.76	77	20	15	717	2.0	10	27	1.0	15
		9/5/99	NAW854B	0.22	7.1	170	--	2.1	--	7.30	78	5.0	<50	490	0.7	5.0	5.0	0.04	25
70	Lower Bullion King mine	8/19/98	NAW592	0.011	4.6	140	--	< 0.5	--	1.00	30	450	--	1,100	28	2.5	1,600	10	12
		8/25/99	MS9	0.045	4.8	175	88	0.69	0.47	0.60	24	447	60	911	32	10	1,610	8.6	15
		9/7/99	NAW876	0.045	6.4	76	--	1.0	--	0.66	34	100	4,100	1,200	6.0	5.0	1,300	5.2	25
75	Koehler tunnel	9/25/95	MS81	0.02	2.5	3,520	2,720	19.4	0.70	26	111	71,400	686,000	23,700	98,600	300	228,000	780	235
		9/25/95	MS82	0.15	2.5	3,310	2,700	14.3	0.40	39	144	70,300	494,000	20,300	61,100	290	157,000	550	300
		8/18/98	NAW580	--	2.4	2,200	--	26.0	--	22	120	51,000	460,000	19,000	40,000		120,000	450	280
82	Galena Queen	9/9/97	MS59	--	2.6	1,060	368	0.67	--	1.36	7.2	7,180	60,100	603	3,920	57	44,700	183	417
83	Hercules mine	9/9/97	MS60	--	2.3	1,780	691	0.35	--	0.81	3.0	5,870	118,000	205	3,000	68	52,400	279	966
85	Henrietta mine, #7 level	8/17/97	NAW215	0.011	2.5	1,600	--	0.68	--	5.10	16	11,000	130,000	530	380	67	6,500	41	18
		6/30/99	H7A	--	2.6	530	--	0.23	--	1.09	3.5	1,914	27,696	78	50	10	296	1.0	15
		9/29/99	H7A	--	2.5	2,450	1,100	0.83	1.40	7.50	49	23,000	270,000	910	590	110	8,200	35	25
86	Lark mine	8/17/97	NAW204	0.011	3.2	380	--	0.62	--	1.00	4.6	1,300	760	120	420	5	3,300	21	320
		8/17/97	NAW212	--	4.2	50	--	0.54	--	2.90	14	820	1,500	210	100	6	490	3.0	28
		7/22/98	MS21	0.001	2.8	678	133	0.59	0.72	1.21	5.5	1,850	11,300	208	1,640	10	9,780	44	357
		8/31/99	NAW807	--	3.0	390	--	0.56	--	2.10	2.6	5,000	67,000	200	990	28	6,900	30	25
		9/29/99	L3A	--	4.1	228	53	2.6	2.20	0.90	16	350	24,000	220	160	11	2,200	9.2	25
		9/29/99	L3P	--	4.0	157	83	3.0	0.89	1.70	16	1,100	120	190	230	5	3,100	12	97

Table 6. Adit chemistry determined at low flow for selected sites sampled by U.S. Geological Survey.—Continued

AMLI_MINE_ID	Name	Date	Sample designation	Discharge ft³/s	pH	Specific conductance µS/cm	Sulfate mg/L	Na mg/L	K mg/L	Mg mg/L	Ca mg/L	Al µg/L	Fe µg/L	Mn µg/L	Cu µg/L	Ni µg/L	Zn µg/L	Cd µg/L	Pb µg/L
Detection limit —							*2*	*0.5*	*0.03*	*0.01*	*0.02*	*2*	*50*	*0.2*	*0.5*	*0.5*	*0.5*	*0.02*	*0.05*
87	Joe and Johns mine	8/17/97	NAW217	0.045	2.7	740	--	<0.5	--	1.20	2.2	6,400	29,000	180	400	20	7,100	54	1,200
		9/8/97	MS19	0.006	2.8	1,090	367	0.29	--	1.87	2.0	12,600	60,300	244	638	22	12,000	58	931
		6/30/99	JJA	--	--	--	--	0.36	--	0.30	1.6	317	244	28	22	10	216	1.0	15
		7/29/99	MS19	0.001	3.8	131	40	0.56	0.58	0.71	4.6	835	793	112	116	10	1,190	3.2	46
		9/29/99	JJP	--	2.7	1,010	290	0.39	1.60	1.60	2.7	13,000	62,000	190	640	28	11,000	54	1,400
91	Eveline mine	11/6/96	MS13	0.01	3.3	472	178	2.4	--	10.2	4.6	10,600	15,500	843	55	10	858	5.2	15
		8/16/97	NAW201	0.022	3.1	370	--	2.2	--	8.20	4.8	6,500	8,800	600	91	14	640	10	3.8
		8/19/97	MS13	0.01	3.1	468	175	2.5	--	10.2	4.7	11,100	17,900	859	100	10	892	4.3	15
100	Adams mine	10/1/99	MS38	0.01	4.2	498	169	3.8	0.76	4.85	60	3,180	11,500	2,670	81	10	3,880	51	60
125	Silver Wing mine	9/5/97	NAW355	0.22	6.2	620	--	3.2	--	3.40	36	210	740	1,400	410	8.0	2,000	14	0.2
		9/30/98	MS53	0.06	6.5	679	307	2.7	1.26	3.89	96	20	4,750	3,130	14	10	2,460	11	15
132	Potomac mine	9/13/98	NAW721	0.011	5.2	120	--	<0.5	--	0.87	28	140	340	230	27	<0.5	1,900	15	170
133	Silver Crown mine	8/18/98	NAW577	0.022	5.5	360	--	8.2	--	5.50	100	--	1,600	100	5.0	8.9	160	<0.02	<0.05
		8/25/99	MS51	0.164	7.6	481	156	6.0	0.38	3.76	80	20	15	69	2.0	10	34	1.0	15
135	Chattanooga Curve mine	8/18/98	NAW579	0.022	4.9	280	--	8.5	--	9.60	78	460	2,500	1,400	5.0	9.1	390	<0.02	<0.05
		8/27/99	MS42	0.095	5.8	456	218	6.3	0.51	6.83	64	656	1,870	1,200	2.0	10	171	1.0	15
136	Imogene mine	9/11/97	NAW427	0.067	5.8	280	--	4.4	--	2.40	14	300	3,200	360	0.7	2.2	110	0.07	0.2
		8/14/98	NAW511	0.067	5.4	260	--	6.1	--	4.10	54	410	5,900	1,000	7.3	3.6	130	<0.02	6.1
		9/1/99	NAW814	0.11	5.1	120	--	5.6	--	3.40	48	440	6,000	920	3.0	5.0	130	1.0	25
		9/15/99	MS17	0.174	5.9	334	123	5.4	0.43	3.23	46	445	5,230	884	2.0	10	118	1.0	15
137	Ferricrete mine	8/14/98	NAW512	0.045	5.1	380	--	6.4	--	7.90	74	840	11,000	2,600	2.2	10	370	0.6	0.5
		9/15/99	MS14	0.52	6.0	480	193	5.7	0.60	6.72	66	962	11,300	2,540	2.0	10	380	2.7	15
140	Gold Finch group	8/26/99	MS28	0.035	6.7	1,080	480	12.3	1.34	9.26	197	221	3,610	1,730	2.0	10	106	1.0	15
141	Brooklyn mine	8/13/98	NAW508	0.045	4.8	610	--	4.2	--	24	120	810	3,000	8,100	99	25	5,300	14	11
		8/18/98	NAW589	0.045	2.9	880	--	2.8	--	22	130	4,200	16,000	9,400	380	27	6,500	27	64
		7/18/99	MS8	0.08	3.7	802	311	1.8	0.77	16.0	84	2,250	17,300	6,750	338	10	5,560	18	15
		9/1/99	NAW817	0.045	2.9	280	--	1.7	--	16.0	62	3,700	33,000	5,800	280	22	5,900	23	52
		9/1/99	NAW819	0.045	3.0	350	--	1.9	--	17.0	72	5,500	28,000	6,400	430	31	6,500	30	50
142	Upper Browns Gulch mine	9/18/99	MS37	0.003	2.9	859	240	1.3	0.37	7.80	52	4,220	27,600	4,490	490	10	2,810	28	168
143	U.S. Basin mine	8/18/98	NAW586	--	2.8	670	--	1.4	--	6.60	40	4,100	15,000	1,500	370	11	1,100	7.7	180
145	Kansas City mine #1	8/22/98	NAW630	0.011	2.9	810	--	2.2	--	18.0	150	10,000	28,000	32,000	1,600	45	7,100	28	110
147	Elk tunnel	8/21/97	NAW311	0.22	6.4	1,100	--	6.7	--	5.00	190	47	4,100	1,400	1.3	19	160	<0.02	33
		10/10/97	MS11	--	7.1	1,280	815	7.8	--	6.00	342	20	3,060	1,750	2.0	10	225	1.0	15
		8/17/98	NAW575	0.22	4.9	1,200	--	9.3	--	7.50	370	15	11,000	2,000	2.9	26	210	0.2	5.0
		10/14/98	MS11	0.338	6.8	1,450	867	7.9	0.92	6.07	322	123	3,540	1,720	2.0	10	187	1.0	15
		9/8/99	NAW882	0.22	6.8	520	--	7.2	--	5.70	270	11	3,100	1,600	2.0	5	170	0.1	25
148	Mammoth tunnel	8/17/97	NAW227	0.089	4.8	990	--	4.1	--	13.0	120	1,000	26,000	3,200	5.2	25	730	1.8	0.6
		10/10/97	MS24	--	--	--	636	4.3	--	15.8	201	1,470	21,700	5,020	39	10	1,260	1.0	15
		8/7/98	MS24	0.005	5.1	1,520	700	5.4	2.65	18.4	215	2,010	52,400	4,810	13	10	1,090	12	15
		8/16/98	NAW554	0.089	4.5	980	--	5.9	--	20	230	2,000	51,000	4,900	27	32	1,000	2.0	<0.05
149	Avalanche mine	8/21/97	NAW309	0.022	3.8	480	--	2.1	--	7.40	31	5,300	22,000	530	75	17	170	1.1	1.3
		9/5/97	MS2	0.009	3.9	614	308	2.8	--	9.82	58	9,360	48,500	812	69	30	219	1.0	15
		8/17/98	NAW555	0.022	3.7	440	--	2.8	--	9.40	64	6,900	35,000	870	54	18	200	0.8	<0.05
		8/19/98	MS2	0.015	3.9	565	286	2.7	1.59	8.42	54	7,130	36,700	748	44	10	195	5.3	15

Table 6. Adit chemistry determined at low flow for selected sites sampled by U.S. Geological Survey.—Continued

AMLI_MINE_ID	Name	Date	Sample designation	Discharge ft³/s	pH	Specific conductance µS/cm	Sulfate mg/L	Na mg/L	K mg/L	Mg mg/L	Ca mg/L	Al µg/L	Fe µg/L	Mn µg/L	Cu µg/L	Ni µg/L	Zn µg/L	Cd µg/L	Pb µg/L
Detection limit —							*2*	*0.5*	*0.03*	*0.01*	*0.02*	*2*	*50*	*0.2*	*0.5*	*0.5*	*0.5*	*0.02*	*0.05*
150	Big Colorado mine	8/16/98	NAW552	0.22	3.6	960	--	4.8	--	14.0	130	6,800	42,000	2,400	31	45	1,100	4.6	19
		8/20/98	MS5	--	4.7	1,090	500	3.9	3.27	12.2	109	6,610	64,500	2,170	18	10	1,020	11	15
153	Natalie/Occidental (Silver Ledge) mine	10/18/96	MS52	0.75	5.7	1,090	518	3.9	--	8.99	211	879	12,300	2,430	11	10	701	6.3	15
		11/4/97	MS52	--	6.8	1,000	527	3.2	--	8.73	200	1,040	12,700	2,710	2.0	10	805	10	15
		8/5/98	MS52	--	6.3	910	490	3.9	0.88	8.76	187	1,430	13,700	2,470	17	10	895	6.2	15
		8/16/98	NAW551	0.89	5.3	670	--	4.2	--	9.90	220	1,300	16,000	2,700	23	23	820	2.2	1.3
		8/31/99	NAW808	0.89	5.1	330	--	3.7	--	8.70	150	1,300	14,000	2,400	19	15	940	3.4	25
155	Black Hawk mine	10/1/97	MS6	0.6	6.9	1,020	600	4.2	--	12.9	259	123	1,220	4,300	2.0	10	1,130	2.4	15
156	South Fork mine	8/28/98	MS29	0.3	6.5	652	253	2.1	0.67	5.42	117	20	4,490	1,980	2.0	10	304	1.0	15
168	Paradise mine	9/28/95	MS77	0.6	5.7	1,962	1,200	7.8	0.80	33	400	8,600	67,000	5,100	13	25	530	0.5	0.5
		8/14/98	NAW520	0.22	4.5	1,300	--	8.9	--	49	430	22,000	77,000	6,600	1.4	52	660	0.3	0.5
		8/14/98	NAW521	0.22	4.6	1,200	--	9.8	--	47	440	19,000	75,000	6,400	3.0	51	640	0.7	1.5
		8/27/98	MS34	0.009	5.0	2,140	1,300	8.0	0.90	42	359	21,200	73,000	5,920	2.0	10	620	1.0	15
		9/6/99	NAW870	0.45	5.1	610	--	8.2	--	38	350	27,000	69,000	5,100	3.0	29	570	0.4	25
169	Ruby Trust mine	9/18/95	MS76	1.03	6.4	560	200	3.6	0.50	3.90	110	0.5	470	530	3.0	3.0	39	0.5	0.5
		8/14/98	NAW524	0.45	6.4	360	--	4.8	--	4.40	120	38	2,400	550	3.3	10	66	0.2	2.7
		9/1/99	NAW816	0.89	5.5	180	--	3.6	--	3.40	90	5.0	440	470	1.0	5.0	55	0.1	25
171	Independence mine (Silverton quadrangle)	9/26/95	MS80	0.04	3.2	667		6.8	0.50	5.80	65	4,410	12,600	1,250	0.5	0.5	243	14	0.5
		6/10/98	MS18	0.04	3.2	634	263	6.1	0.64	4.83	64	4,140	11,400	1,090	51	10	225	1.0	15
172	Bonner mine upper adit	8/14/98	NAW516	0.022	3.1	530	--	6.7	--	7.70	90	7,000	15,000	3,800	86	14	3,000	14	17
		8/14/98	NAW517	0.022	2.9	730	--	8.3	--	8.80	120	6,800	11,000	3,800	83	16	2,700	14	13
172	Bonner mine, lower adit	9/26/95	MS79	0.06	3.1	1,225		7.7		7.30	107	8,300	10,500	4,100	0.5	0.5	4,090	20	0.5
		9/1/99	NAW815	0.045	2.8	380	--	7.0	--	7.40	81	8,300	11,000	4,400	120	11	4,900	25	25
173	Molly Gulch mine	8/24/99	MS43	0.004	3.1	560	177	4.7	0.84	8.77	34	5,560	4,770	1,140	629	10	224	1.0	15
174	Magnet mine	8/23/99	MS48	0.014	7.5	980	501	11.3	0.97	7.33	186	147	88	829	11	10	106	1.0	15
181	May Day mine	5/15/97	MS61	0.03	2.6	1,810	1,060	--	--	--	--	--	--	--	--	--	--	--	--
183	Anglo Saxon mine	10/10/97	MS1	--	--	--	827	9.6	--	20	339	970	550	9,490	2.0	10	3,060	17	15
		8/7/98	MS1	0.05	6.5	1,870	867	8.8	2.61	18.8	286	484	28,800	9,320	2.0	10	3,050	10	15
		8/17/98	NAW574	0.11	5.7	1,100	--	13.0	--	27	360	530	33,000	11,000	28	49	3,400	4.0	<0.05
186	Yukon tunnel (Gold Hub)	9/11/97	NAW415	0.089	5.9	1,100	--	5.2	--	4.50	70	65	1,500	510	6.4	9.1	130	1.2	1.0
		8/17/98	NAW573	0.089	5.6	900	--	8.6	--	9.00	260	150	5,000	970	15	20	270	1.2	<0.05
189	Legal Tender mine (Howardsville quadrangle)	9/8/97	NAW396	0.045	7.0	480	--	3.0	--	2.50	29	10	700	130	1.5	3.9	220	0.9	0.6
		9/3/99	NAW845	0.045	5.4	180	--	3.8	--	3.50	88	11	420	310	1.0	5.0	390	2.0	25
195	Forest Queen mine (preremediation)	11/6/96	MS15	0.036	4.7	856	433	8.8	--	13.9	137	2,150	25,300	2,460	2.0	10	641	8.3	44
		8/18/97	NAW231	0.045	5.1	830	--	6.6	--	9.60	80	1,000	13,000	1,600	n.d.	15	440	8.9	7.5
		9/11/97	MS15	0.036	4.6	770	475	8.9	--	13.1	133	1,960	24,400	2,330	2.0	10	605	8.0	15
		8/11/98	MS15	0.083	6.7	1,390	787	8.7	1.44	11.0	272	305	10,900	2,240	2.0	10	349	1.0	15
195	Forest Queen mine (postremediation)	9/16/99	MS15	--	5.9	1,510	577	9.6	1.10	11.2	334	601	10,400	2,590	2.0	10	393	39	15
		9/20/00	MS15	0.0007	6.1	733	345	8.4	1.55	10.8	124	70	8,240	2,200	0.8	1.5	79	9.0	11

Table 6. Adit chemistry determined at low flow for selected sites sampled by U.S. Geological Survey.—Continued

AMLI_MINE_ID	Name	Date	Sample designation	Discharge ft³/s	pH	Specific conductance µS/cm	Sulfate mg/L	Na mg/L	K mg/L	Mg mg/L	Ca mg/L	Al µg/L	Fe µg/L	Mn µg/L	Cu µg/L	Ni µg/L	Zn µg/L	Cd µg/L	Pb µg/L
Detection limit —							*2*	*0.5*	*0.03*	*0.01*	*0.02*	*2*	*50*	*0.2*	*0.5*	*0.5*	*0.5*	*0.02*	*0.05*
201	Kittimack mine	8/18/97	NAW235	0.067	6.3	270	--	4.1	--	4.90	33	17	360	200	110	3.7	1,000	7.0	5
		8/5/98	MS20	--	7.8	392	115	5.9	0.95	6.15	59	42	15	256	160	10	1,440	4.6	15
		9/13/98	NAW717	0.045	5.5	320	--	7.3	--	8.50	71	67	570	390	250	<0.5	1,500	7.3	21
		9/3/99	NAW835	0.045	5.6	120	--	4.0	--	5.30	58	15	<50	220	130	5.0	1,200	6.4	25
203	Esmeralda mine, lower adit	10/3/98	MS12	0.05	7.0	252	56	3.2	0.69	3.19	41	20	15	7.0	2.0	10	10	1.0	15
207	Burbank mine	8/20/98	NAW603	0.11	5.7	530	--	5.0	--	18.0	150	--	6,200	1,400	3.2	10	52	1.8	<0.05
		8/24/98	MS10	0.087	6.3	898	327	4.3	0.72	16.7	135	20	2,810	1,310	2.0	10	47	1.0	15
		9/9/99	NAW890	0.45	7.4	250	--	4.4	--	15.0	98	5.0	2,600	1,100	1.0	5.0	38	0.2	25
239	Old Hundred mine, lower adit	8/19/97	NAW271	0.11	7.1	450	--	3.5	--	3.00	58	8.4	500	1.4	3.2	6.1	130	1.3	1.9
		10/17/97	MS49	--	7.5	520	205	3.8	--	3.44	109	229	15	1.5	2.0	10	127	1.0	15
260	Columbine mine	8/19/98	MS57	0.011	3.0	715	240	3.9	3.43	5.32	28	10,700	4,560	445	12	10	137	1.0	15
		9/24/98	MS57	0.01	2.9	694	207	4.1	2.77	4.97	20	10,800	4,060	339	21	10	102	1.0	15
263	North Star mine	12/17/97	MS63	0.632	6.8	716	363	4.8	0.92	17.1	132	101	1,820	2,560	2.0	10	619	1.0	15
		7/23/98	MS63	1.18	7.2	726	327	4.1	0.87	16.3	117	20	1,590	2,520	11	10	667	1.0	15
		10/13/98	MS63	0.935	6.8	756	340	4.9	0.77	17.0	131	197	1,600	2,600	2.0	10	621	1.0	15
266	Sultan tunnel	8/21/97	NAW298	0.056	6.9	600	--	4.0	--	7.70	56	30	540	580	8.1	7.1	52	0.3	0.6
		8/19/98	NAW601	0.056	5.5	390	--	5.3	--	11.0	120	57	3,000	580	4.0	7.7	49	0.3	<0.05
		9/14/98	NAW733	--	3.0	760	--	3.8	--	7.70	35	17,000	29,000	580	10	31	200	0.4	4.1
285	Mighty Monarch mine	9/24/98	MS25	0.041	6.8	359	122	3.9	0.39	4.58	63	20	33	881	2.0	10	484	1.0	15
287	Lackawanna mill tailings	8/21/98	NATW622	--	5.9	1,800	--	<0.5	--	11.0	580	59	21,000	31,000	42	69	63,000	150	190
289	Last Chance mine	9/6/97	NAW364	0.13	7.2	230	--	2.5	--	1.90	16	10	390	160	< 0.5	2.2	15	0.1	0.2
		9/15/98	NAW735	0.11	5.2	180	--	3.1	--	2.60	48	18	400	410	1.1	<0.5	25	0.04	0.2
306	King Soloman mine	9/8/99	NAW883	0.022	7.3	40	--	1.3	--	1.40	24	52	64	20	32	5	140	1	25
332	Bandora mine	9/9/97	NAW399	0.045	6.6	540	--	2.9	--	5.80	32	4.7	4,800	3,200	35	19	8,300	65	1.9
		8/23/98	NAW648	0.056	5.6	410	--	3.8	--	8.50	100	24	9,300	6,800	63	23	12,000	51	1.6
		10/13/98	MS4	0.09	6.1	556	260	2.8	0.29	6.46	84	55	6,770	5,780	39	20	10,500	43	15
		9/9/99	NAW887	0.22	6.4	250	--	2.5	--	7.20	79	19	11,000	7,200	120	21	16,000	80	25
360	Highland Mary mine, #8 level	9/16/98	NAW741	0.022	5.8	240	--	3.7	--	3.40	62	7.6	300	2.6	3.5	<0.5	60	0.4	0.9
505	Henrietta mine, #8 level	8/17/97	NAW213	0.011	2.6	1,100	--	0.52	--	1.90	2.9	2,800	21,000	190	830	18	4,400	31	43
		8/17/98	NAW570	0.013	2.3	2,200	--	1.5	--	11.0	9.1	22,000	29,000	1,100	5,900	110	27,000	130	18
511	unnamed adit, Porcupine Gulch	9/29/97	MS62	0.01	3.7	395	138	1.1	--	4.90	19	4,700	12,200	882	522	10	2,160	13	47
		9/24/98	MS62	0.002	3.8	234	99	1.4	0.68	4.98	23	2,120	874	377	242	10	1,360	6	15

Table 7. Time-series data from adit flow from seven mine sites.

[Discharge in ft^3/s (cfs); total concentrations are from unfiltered sample; dissolved (diss.) concentrations are from 0.45 µm filtered sample; µS/cm, microsiemens per centimeter at 25°C; mg/L, milligrams per liter; µg/L, micrograms per liter; --, not determined; n.d., not detected; < detection limit, not detected; detection limits are for instrumental methods used in the analyses. Data for 1996–99 are from Mast and others (2000). Statistical data rounded to three significant figures]

Mine	Sample date	Discharge ft^3/s	Field pH	Dissolved oxygen mg/L	Specific conductance µS/cm	Sulfate total mg/L	Na diss. mg/L	K diss. mg/L	Mg diss. mg/L	Ca diss. mg/L	Sr diss. µg/L	Ba diss. µg/L	Al diss. µg/L	Al total µg/L	Silica diss. µg/L	Silica total µg/L	Fe diss. µg/L	Fe total µg/L	Mn diss. µg/L	Cu diss. µg/L	Cu total µg/L	Zn diss. µg/L	Cd diss. µg/L	Pb diss. µg/L
Detection limit--						*1*	*0.1*	*0.01*	*0.01*	*0.15*	*3*	*2*	*40*	*40*	*0.2*	*0.2*	*30*	*30*	*10*	*4*	*4*	*20*	*2.0*	*30*
Avalanche mine	9/5/97	0.009	3.92	3.9	614	308	2.75	--	9.82	57.5	717	6.0	9,360	--	63.2	--	48,500	--	812	69	--	219	< 2.0	< 30
(AML_MINE_ID # 149)	3/26/98	0.015	3.69	7.4	563	237	2.74	1.32	7.16	55.3	466	7.0	4,150	5,000	49.5	53.9	27,900	31,200	716	45	46	166	< 2.0	< 30
	4/22/98	0.016	3.40	6.5	449	205	2.69	1.32	6.93	54.7	448	7.0	3,920	4,650	47.4	51.6	26,000	31,000	699	40	44	179	< 2.0	< 30
	5/6/98	0.022	3.99	8.1	542	237	2.55	1.34	7.59	52.6	463	10	5,230	6,310	48.0	55.9	31,000	34,000	720	42	51	177	4.1	< 30
	5/21/98	0.028	3.92	8.0	654	293	3.24	1.43	11.5	60.0	752	6.0	10,500	9,250	64.9	56.8	62,100	53,600	864	63	55	241	6.6	< 30
	6/10/98	0.024	3.85	6.7	628	330	2.32	1.56	9.93	50.5	723	5.0	9,650	10,300	57.1	65.6	54,200	53,700	712	57	70	193	4.7	< 30
	7/1/98	0.008	3.80	6.0	627	300	2.06	1.60	8.31	46.1	597	3.0	7,690	8,580	49.7	58.2	41,000	44,200	670	49	58	190	3.1	< 30
	7/23/98	0.011	3.99	8.8	601	290	2.02	1.63	8.01	47.7	539	4.0	6,820	7,230	49.9	55.8	36,200	37,100	696	43	48	172	< 2.0	< 30
	7/30/98	0.014	3.85	7.9	598	267	2.09	1.61	8.52	52.3	569	< 2	7,040	7,160	50.5	49.6	37,900	36,100	741	41	42	180	8.0	< 30
	8/19/98	0.015	3.91	8.1	565	286	2.66	1.59	8.42	54.4	554	5.0	7,130	7,530	53.1	52.4	36,700	38,400	748	44	44	195	5.3	< 30
	9/24/98	0.010	3.93	5.8	546	270	2.82	1.38	8.40	57.4	542	4.0	6,250	6,600	54.3	52.6	34,000	34,100	755	42	40	189	2.2	< 30
	10/14/98	0.003	3.92	4.6	534	260	2.42	1.28	7.64	53.6	488	4.0	5,170	5,790	49.7	51.3	31,000	31,300	721	40	42	171	5.3	< 30
	11/5/98	0.017	4.04	--	535	252	2.43	1.30	7.64	54.1	481	4.0	5,020	--	49.5	--	30,300	--	722	39	--	162	2.8	< 30
	12/18/98	0.031	4.02	--	551	259	2.05	1.47	8.27	55.2	527	< 2	5,920	--	49.3	--	34,700	--	753	38	--	177	< 2.0	< 30
Minimum		0.003	3.40	3.9	449	205	2.02	1.28	6.93	46.1	448	3.0	3,920	4,650	47.4	49.6	26,000	31,000	670	38	40	162	2.2	< 30
Median		0.015	3.92	7.0	564	269	2.49	1.43	8.29	54.3	541	5.0	6,535	7,160	49.8	53.9	35,450	36,100	722	43	46	180	4.7	< 30
Mean (n = 14)					572	271	2.49	1.45	8.44	53.7	562	5.4	6,704	7,127	52.6	54.9	37,964	38,609	738	47	49	187	4.7	< 30
Standard Deviation				1.5	53	33	0.36	0.13	1.23	3.74	101	1.9	2,036	1,739	5.5	4.4	10,369	8,367	50	10	9	21	1.9	--
Maximum		0.031	4.04	8.8	654	330	3.24	1.63	11.5	60.0	752	10	10,500	10,300	64.9	65.6	62,100	53,700	864	69	70	241	8.0	< 30
Bandora mine	5/28/98	0.10	6.04	2.8	624	260	3.45	0.33	7.82	95	587	18	86	179	13.7	14.6	8,260	17,300	8,230	55	231	15,700	55.1	< 30
(AML_MINE_ID # 332)	7/22/98	0.11	6.25	2.4	588	238	3.00	0.34	7.02	87	533	12	< 40	1,110	12.8	17.4	7,290	18,000	6,680	79	302	13,100	54.6	< 30
	10/13/98	0.09	6.06	0.9	556	260	2.79	0.29	6.46	84	554	14	55	119	11.9	12.7	6,770	14,200	5,780	39	169	10,500	42.9	< 30
	12/17/98	0.03	5.95	--	545	219	2.96	0.32	6.53	89	597	15	< 40	--	12.6	--	6,670	--	5,720	30	--	10,100	39.9	< 30
	5/27/99	0.09	5.36	0.6	628	192	2.84	0.30	7.15	87	529	28	320	--	12.1	--	8,130	--	7,610	72	--	15,400	60.7	153
	7/17/99	0.13	6.04	0.8	591	240	2.90	0.34	7.21	84	528	15	94	--	13.1	--	7,750	--	7,030	121	--	14,400	65.4	< 30
	8/25/99	0.14	5.72	0.9	618	325	3.07	--	7.72	91	538	14	232	--	13.2	--	8,480	--	8,120	143	--	17,400	77.8	< 30
Minimum		0.03	5.36	0.6	545	192	2.79	0.29	6.46	84	528	12	55	119	11.9	12.7	6,670	14,200	5,720	30	169	10,100	39.9	< 30
Median		0.10	6.04	0.9	591	240	2.96	0.33	7.15	87	538	15	94	179	12.8	14.6	7,750	17,300	7,030	72	231	14,400	55.1	< 30
Mean (n = 7)				1.4	593	248	3.00	0.32	7.13	88	552	17	157	469	12.8	14.9	7,621	16,500	7,024	77	234	13,800	56.6	< 30
Standard Deviation				0.9	33	42	0.22	0.02	0.52	4.1	29	5.3	114	556	0.6	2.4	726	2,022	1,030	42	67	2,725	13.0	--
Maximum		0.14	6.25	2.8	628	325	3.45	0.34	7.82	95	597	28	320	1,110	13.7	17.4	8,480	18,000	8,230	143	302	17,400	77.8	153
Bonner mine	12/17/97	0.07	3.16	9.2	795	346	6.18	0.66	6.16	89	381	10	7,450	7,520	49.1	48.8	3,900	3,950	2,590	106	91	1,830	12.3	< 30
(AML_MINE_ID # 172)	3/25/98	0.06	2.74	9.5	938	356	7.11	0.64	6.39	92	420	12	7,490	6,680	50.2	49.1	4,130	3,740	2,490	94	88	1,490	3.4	< 30
	5/22/98	0.04	3.00	3.1	1,220	510	10.3	0.67	8.98	155	539	7	6,620	6,000	47.2	47.7	17,700	16,500	3,650	59	62	1,840	10.9	< 30
	7/22/98	0.05	3.28	10.5	895	350	5.94	0.51	5.97	88	393	14	6,460	5,730	48.5	50.1	3,990	4,580	2,560	100	102	2,140	13.6	< 30
	10/13/98	0.03	3.09	10.3	874	360	6.01	0.51	6.32	91	395	12	7,390	7,170	48.9	49.7	4,100	4,110	2,940	97	96	2,330	13.0	< 30
	7/16/99	0.07	3.23	8.0	807	291	5.74	0.46	5.22	77	348	16	6,120	--	44.9	--	3,540	--	2,440	96	--	2,610	7.0	< 30
	8/25/99	0.05	3.35	8.5	770	325	5.82	--	5.72	76	349	22	7,270	--	46.3	--	3,630	--	3,430	121	--	3,730	33.5	< 30
Minimum		0.03	2.74	3.1	770	291	5.74	0.46	5.22	76	348	7	6,120	5,730	44.9	47.7	3,540	3,740	2,440	59	62	1,490	3.4	< 30

Table 7. Time-series data from adit flow from seven mine sites.—Continued

Mine	Sample date	Discharge ft³/s	Field pH	Dissolved oxygen mg/L	Specific conductance µS/cm	Sulfate total mg/L	Na diss. mg/L	K diss. mg/L	Mg diss. mg/L	Ca diss. mg/L	Sr diss. µg/L	Ba diss. µg/L	Al diss. µg/L	Al total µg/L	Silica diss. µg/L	Silica total µg/L	Fe diss. µg/L	Fe total µg/L	Mn diss. µg/L	Cu diss. µg/L	Cu total µg/L	Zn diss. µg/L	Cd diss. µg/L	Pb diss. µg/L
Detection limit--						*1*	*0.1*	*0.01*	*0.01*	*0.15*	*3*	*2*	*40*	*40*	*0.2*	*0.2*	*30*	*30*	*10*	*4*	*4*	*20*	*2.0*	*30*
Bonner mine (continued)																								
Median		0.05	3.16	9.2	874	350	6.01	0.57	6.16	89	393	12	7,270	6,680	48.5	49.1	3,990	4,110	2,590	97	91	2,140	12.3	< 30
Mean (*n* = 7)					900	363	6.73	0.58	6.39	95	404	13	6,971	6,620	47.9	49.1	5,856	6,576	2,871	96	88	2,281	13.4	< 30
Standard Deviation				2.5	153	69	1.64	0.09	1.21	27	65	4.8	559	757	1.8	0.9	5,228	5,556	488	19	15	736	9.6	--
Maximum		0.07	3.35	10.5	1,220	510	10.3	0.67	8.98	155	539	22	7,490	7,520	50.2	50.1	17,700	16,500	3,650	121	102	3,730	33.5	< 30
Elk tunnel	10/10/97	--	7.10	--	1,280	815	7.85	--	6.00	342	4,790	14	< 40	--	26.9	--	3,060	--	1,750	< 4	--	225	< 2.0	< 30
(AML_MINE_ID # 147)	12/29/97	0.40	6.14	--	1,460	790	8.39	1.15	6.09	305	4,880	10	< 40	n.d.	28.2	28.3	3,080	3,440	1,730	< 4	< 4	152	< 2.0	< 30
	2/12/98	0.30	6.20	0.6	1,480	796	7.81	1.13	6.03	300	4,790	12	< 40	n.d.	27.4	28.4	3,280	3,600	1,690	< 4	< 4	164	< 2.0	< 30
	3/24/98	0.57	6.79	0.0	1,510	800	9.25	1.03	6.25	270	5,160	11	125	n.d.	28.6	32.2	3,380	3,540	1,740	< 4	< 4	168	< 2.0	< 30
	4/21/98	0.43	6.54	0.2	1,480	817	8.71	0.98	6.06	277	4,930	11	66	n.d.	27.2	31.3	3,450	8,960	1,680	< 4	< 4	168	< 2.0	< 30
	5/5/98	0.55	7.04	0.1	1,510	820	8.08	0.96	6.41	300	5,140	10	49	249	28.4	35.3	3,630	15,400	1,800	< 4	< 4	174	< 2.0	< 30
	5/21/98	0.45	7.18	0.1	1,480	793	8.56	0.93	6.13	286	4,910	11	48	n.d.	28.1	29.1	3,580	3,890	1,760	< 4	< 4	215	< 2.0	< 30
	6/24/98	0.34	6.50	0.3	1,410	800	7.26	0.96	5.71	252	4,490	11	< 40	241	26.9	29.6	3,480	3,840	1,900	< 4	< 4	201	2.3	38
	7/23/98	0.34	6.93	1.2	1,460	780	7.31	1.12	5.92	307	4,590	< 2	< 40	239	27.1	31.6	3,560	5,280	1,710	< 4	< 4	164	< 2.0	< 30
	10/14/98	0.34	6.79	0.3	1,450	867	7.93	0.92	6.07	322	5,020	10	123	123	28.0	26.9	3,540	4,880	1,720	< 4	< 4	187	< 2.0	< 30
Minimum		0.30	6.14	0.0	1,280	780	7.26	0.92	5.71	252	4,490	10	48	123	26.9	26.9	3,060	3,440	1,680	--	--	152	2.3	< 30
Median		0.40	6.79	0.3	1,470	800	8.00	0.98	6.07	300	4,895	11	66	240	27.7	29.6	3,465	3,890	1,735	--	--	171	2.3	< 30
Mean (*n* = 10)					1,452	808	8.12	1.02	6.07	296	4,870	11	82	213	27.7	30.3	3,404	5,870	1,748	--	--	182	2.3	17
Standard Deviation				0.4	67	24	0.62	0.09	0.19	26	216	1.3	39	60	0.65	2.6	203	3,972	64	--	--	24	--	--
Maximum		0.57	7.18	1.2	1,510	867	9.25	1.15	6.41	342	5,160	14	125	249	28.6	35.3	3,630	15,400	1,900	--	--	225	2.3	38
Eveline mine	11/6/96	0.010	3.31	--	472	178	2.36	--	10.2	4.60	77	< 2	10,600	10,700	57.5	49.3	15,500	17,700	843	55	51	858	5.2	< 30
(AML_MINE_ID # 91)	12/11/96	0.030	3.29	1.9	490	162	2.48	--	10.6	5.03	81	< 2	11,000	11,000	58.8	49.8	15,600	17,700	881	54	48	885	6.4	< 30
	1/22/97	0.016	3.20	2.3	500	156	2.42	--	10.3	4.71	79	< 2	10,800	10,700	57.0	49.0	15,100	17,300	860	53	47	826	4.0	< 30
	2/13/97	0.014	2.81	3.0	493	153	2.28	--	9.97	4.48	74	< 2	10,300	10,300	55.5	46.7	14,700	16,900	829	43	47	837	4.9	< 30
	3/14/97	0.023	3.18	4.9	502	161	2.43	--	11.1	5.08	87	< 2	11,100	10,600	52.4	47.0	14,700	14,700	889	49	46	904	6.7	< 30
	4/25/97	0.012	3.00	--	510	171	2.21	--	10.4	4.67	81	< 2	11,000	10,700	49.1	47.2	13,700	15,200	836	41	47	851	2.5	< 30
	5/22/97	0.018	3.16	3.2	502	170	2.47	--	10.6	4.88	79	< 2	11,100	12,300	50.4	51.4	17,400	26,300	878	67	292	895	4.3	< 30
	6/5/97	0.026	3.15	2.4	494	183	2.25		10.8	4.72	76	< 2	11,800	11,400	49.9	50.2	24,600	26,000	911	283	268	1,240	8.9	< 30
	7/17/97	0.017	3.19	2.1	470	173	2.41	--	10.1	4.62	75	< 2	11,300	11,100	59.5	59.0	20,900	23,200	853	206	202	949	3.4	< 30
	8/19/97	0.010	3.11	2.6	468	175	2.50	--	10.2	4.70	78	< 2	11,100	10,200	60.5	55.9	17,900	18,800	859	100	88	892	4.3	< 30
	9/11/97	0.022	3.04	1.4	457	180	2.49	--	10.2	4.68	76	< 2	10,900	10,600	59.9	57.8	16,600	18,000	859	88	82	885	2.7	< 30
Minimum		0.010	2.81	1.4	457	153	2.21	--	10.0	4.48	74	--	10,300	10,200	49.1	46.7	13,700	14,700	829	41	46	826	2.5	< 30
Median		0.017	3.16	2.4	493	171	2.42	--	10.3	4.70	78	--	11,000	10,700	57.0	49.8	15,600	17,700	859	55	51	885	4.3	< 30
Mean (*n* = 11)		0.018		2.6	487	169	2.39	--	10.4	4.74	78	--	11,000	10,873	55.5	51.2	16,973	19,255	863	94	111	911	4.8	< 30
Standard Deviation		0.007		1.0	17	10.0	0.10	--	0.34	0.18	3.6	--	382	583	4.3	4.4	3,215	4,048	24	78	95	114	1.9	--
Maximum		0.030	3.31	4.9	510	183	2.50	--	11.1	5.08	87	--	11,800	12,300	60.5	59.0	24,600	26,300	911	283	292	1,240	8.9	< 30
Forest Queen	11/6/96	0.036	4.68	0.5	856	433	8.84	--	13.9	137	1,270	7	2,150	1,900	57.0	45.4	25,300	24,300	2,460	< 4	< 4	641	8.3	44
(AML_MINE_ID # 195)	12/11/96	0.039	4.69	0.4	865	446	8.54	--	13.5	132	1,220	7	2,070	1,840	55.5	44.2	24,500	23,600	2,390	< 4	< 4	599	5.4	40
	1/22/97	0.058	4.80	0.2	870	442	9.90	--	15.5	153	1,420	7	2,380	1,980	62.2	46.5	28,100	24,900	2,740	< 4	< 4	709	3.3	< 30
	2/12/97	0.036	4.44	0.4	883	450	8.49	--	13.5	133	1,220	7	2,050	2,370	54.5	44.8	24,300	24,000	2,390	< 4	4	604	8.4	< 30
	3/13/97	0.036	4.76	0.0	872	425	7.87	--	13.3	128	1,150	5	2,060	1,970	45.7	44.9	23,200	24,000	2,270	< 4	< 4	569	5.4	< 30
	4/24/97	0.022	4.57	--	895	461	9.48	--	14.7	144	1,320	6	2,060	--	50.4	--	25,500	--	2,500	< 4	--	634	2.9	< 30
	5/22/97	0.044	4.49	0.0	854	477	9.31	--	14.1	141	1,390	5	2,130	2,010	60.0	47.2	25,200	25,100	2,510	< 4	< 4	613	< 2.0	< 30

Table 7. Time-series data from adit flow from seven mine sites.—Continued

Mine	Sample date	Discharge ft³/s	Field pH	Dissolved oxygen mg/L	Specific conductance µS/cm	Sulfate total mg/L	Na diss. mg/L	K diss. mg/L	Mg diss. mg/L	Ca diss. mg/L	Sr diss. µg/L	Ba diss. µg/L	Al diss. µg/L	Al total µg/L	Silica diss. µg/L	Silica total µg/L	Fe diss. µg/L	Fe total µg/L	Mn diss. µg/L	Cu diss. µg/L	Cu total µg/L	Zn diss. µg/L	Cd diss. µg/L	Pb diss. µg/L
Detection limit--						*1*	*0.1*	*0.01*	*0.01*	*0.15*	*3*	*2*	*40*	*40*	*0.2*	*0.2*	*30*	*30*	*10*	*4*	*4*	*20*	*2.0*	*30*
Forest Queen (continued)																								
	6/5/97	0.052	3.72	0.0	920	472	8.36	--	13.6	141	1,430	5	1,890	1,840	56.7	45.3	24,000	24,300	2,420	< 4	< 4	598	4.3	< 30
	6/19/97	0.077	5.06	0.0	969	456	6.72	--	11.9	125	1,260	7	1,580	2,020	48.8	57.2	21,100	25,600	2,120	< 4	< 4	538	< 2.0	< 30
	7/18/97	0.070	4.92	0.4	934	449	8.89	--	13.3	141	1,450	6	1,920	1,870	57.9	55.2	24,300	24,300	2,350	< 4	< 4	588	3.8	< 30
	8/18/97	0.050	5.05	0.0	872	481	8.28	--	12.8	133	1,340	6	1,820	1,810	55.5	53.5	23,700	22,900	2,260	< 4	< 4	567	8.7	< 30
	9/11/97	0.036	4.64	0.0	770	475	8.86	--	13.1	133	1,320	5	1,960	1,650	58.3	49.8	24,400	22,300	2,330	< 4	< 4	605	8.0	< 30
	8/11/98	0.083	6.65	--	1,390	787	8.71	1.44	11.0	272	3,760	13	305	5,360	39.1	57.8	10,900	42,700	2,240	< 4	20	349	< 2.0	< 30
	7/29/99	0.005	5.83	3.7	1,220	746	9.53	3.09	12.2	250	2,970	19	1,450	--	42.6	--	2,380	--	2,410	< 4	--	828	112.0	< 30
	8/3/99	--	6.27	--	1,640	1,250	9.56	1.56	11.1	359	4,710	14	540	--	36.7	--	10,200	--	2,550	< 4	--	485	84.8	< 30
	8/13/99	--	6.20	3.8	1,590	1,190	11.9	1.75	12.8	409	5,360	12	705	--	44.1	--	12,100	--	2,830	< 4	--	477	86.0	< 30
	8/20/99	--	6.07	6.1	1,710	1,110	8.99	1.45	10.6	378	5,150	15	241	--	35.4	--	11,500	--	2,710	< 4	--	355	37.1	< 30
	8/25/99	--	5.65	7.5	1,770	1,010	9.56	--	10.9	393	5,500	19	244	--	36.0	--	11,400	--	2,860	< 4	--	386	32.2	< 30
	9/1/99	--	5.69	7.2	1,320	756	10.3	1.60	10.9	349	4,550	13	523	--	37.8	--	10,500	--	2,600	< 4	--	337	23.7	< 30
	9/9/99	--	5.80	9.0	1,380	746	9.99	1.45	11.7	294	3,620	10	1,120	--	41.8	--	8,610	--	2,450	14	--	545	70.7	< 30
	9/16/99	--	5.92	6.9	1,510	577	9.59	1.10	11.2	334	4,350	13	601	--	38.8	--	10,400	--	2,590	< 4	--	393	39.2	< 30
	3/30/00	0.003	5.07	8.5	622	--	7.70	1.61	11.9	93	714	17	974	--	--	--	13,400	--	2,310	14	--	559	5.4	< 30
	4/26/00	0.003	5.97	6.1	617	--	7.70	1.50	12.1	95	707	11	953	--	21.3	--	15,900	--	2,340	< 4	--	614	17.2	< 30
	6/2/00	--	5.72	3.1	685	--	7.80	1.50	12.8	106	872	9.9	1,770	--	48.6	--	19,700	--	2,270	< 4	--	679	19.5	< 30
	7/19/00	0.105	5.58	--	783	--	8.70	1.58	12.8	162	1,640	15	1,480	--	48.2	--	20,200	--	2,360	< 4	--	616	19.2	< 30
	9/20/00	0.001	6.09	4.7	733	--	8.40	1.55	10.8	124	1,130	21	70	--	44.4	--	8,240	--	2,200	< 4	--	79	9.0	< 30
Minimum		0.001	3.72	0.0	617	425	6.72	1.10	10.6	93	707	5.0	70	1,650	21.3	44.2	2,380	22,300	2,120	14	4	79	2.9	< 30
Median		0.037	5.33	1.8	889	477	8.85	1.55	12.8	141	1,405	9.9	1,530	1,935	48.2	46.9	19,950	24,300	2,400	14	12	579	9.0	< 30
Mean (n = 26)					1,059	649	8.92	1.63	12.5	202	2,339	10.6	1,348	2,218	47.1	49.3	17,655	25,667	2,441	14	12	537	26.7	< 30
Standard Deviation				3.3	357	274	1.03	0.46	1.3	106	1,646	5.0	739	1,004	9.9	5.2	7,306	5,439	191	0	11	150	31.5	--
Maximum		0.105	6.65	9.0	1,770	1,250	11.9	3.09	15.5	409	5,500	21	2,380	5,360	62.2	57.8	28,100	42,700	2,860	14	20	828	112.0	44
Mighty Monarch	3/5/98	0.044	6.43	8.1	376	124	3.58	0.53	4.34	60.7	548	23	< 40	114	13.4	14.8	102	686	786	< 4	10	458	6.0	< 30
(AML_MINE_ID # 285)	4/21/98	0.076	6.35	8.5	375	118	4.20	0.39	4.63	64.9	606	19	96	72	14.2	16.8	31	545	793	< 4	< 4	449	< 2.0	< 30
	5/6/98	0.049	7.17	8.7	373	115	3.89	0.40	4.51	62.7	581	17	90	103	13.8	16.1	64	393	803	< 4	< 4	466	< 2.0	< 30
	5/21/98	0.053	7.52	7.0	371	120	2.77	0.37	3.67	49.0	449	15	< 40	99	11.1	14.6	34	451	678	< 4	9	376	< 2.0	31
	6/8/98	0.078	6.70	8.7	376	120	3.79	0.41	4.45	60.6	566	22	< 40	141	13.5	15.4	58	471	985	< 4	6	519	3.0	< 30
	7/2/98	0.058	6.50	8.4	376	123	3.66	0.41	4.19	57.0	533	19	< 40	62	12.8	14.6	57	468	837	4	9	469	< 2.0	< 30
	7/22/98	0.081	6.60	8.6	377	120	3.45	0.43	4.53	61.2	568	18	< 40	88	13.7	15.6	44	429	869	< 4	7	447	< 2.0	< 30
	8/19/98	0.047	7.20	8.6	360	115	3.76	0.43	4.43	60.7	562	19	54	137	13.8	15.5	46	393	860	< 4	8	464	2.0	< 30
	9/24/98	0.041	6.80	6.4	359	122	3.93	0.39	4.58	63.1	584	18	< 40	77	14.2	14.7	33	364	881	< 4	5	484	< 2.0	< 30
	10/14/98	0.074	6.60	6.4	359	120	3.61	0.38	4.52	62.1	585	18	55	182	13.9	15.6	< 30	578	895	< 4	11	473	< 2.0	< 30
	11/2/98	0.044	6.18	7.1	358	123	3.35	0.38	4.39	59.2	553	16	< 40	--	13.3	--	< 30	--	906	< 4	--	483	2.2	< 30
	12/29/98	0.018	7.27	--	356	91	4.17	0.44	4.53	63.2	595	15	< 40	--	14.3	--	< 30	--	676	< 4	--	426	2.4	< 30
Minimum		0.018	6.18	6.4	356	91	2.77	0.37	3.67	49.0	449	15	54	62	11.1	14.6	31	364	676	4	5	376	2.0	< 30
Median		0.051	6.65	8.4	372	120	3.71	0.41	4.48	61.0	567	18	73	101	13.8	15.4	46	460	849	4	9	465	2.4	< 30
Mean (n = 12)					368	118	3.68	0.41	4.40	60.4	561	18	74	108	13.5	15.4	52	478	831	4	8	460	3.1	< 30
Standard Deviation				0.9	8.7	8.9	0.39	0.04	0.26	4.1	41	2.5	22	37	0.87	0.72	22	99	90	--	2	35	1.7	--
Maximum		0.081	7.52	8.7	377	124	4.20	0.53	4.63	64.9	606	23	96	182	14.3	16.8	102	686	985	4	11	519	6.0	31

Quantification and Simulation of Metal Loading to the Upper Animas River, Eureka to Silverton, San Juan County, Colorado, September 1997 and August 1998

By Suzanne S. Paschke, Briant A. Kimball, and Robert L. Runkel

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Conversion Factors, Vertical Datum, Acronyms, and Abbreviations

Multiply	By	To obtain
centimeter (cm)	0.3937	inch
cubic meter (m^3)	35.31	cubic foot (ft^3)
kilogram	2.205	pound
kilometer (km)	0.6214	mile
liter (L)	0.2642	gallon
liter per minute (L/min)	5.886×10^{-4}	cubic foot per second (ft^3/s)
liter per second (L/s)	0.0353	cubic foot per second (ft^3/s)
meter	3.281	foot
square meter (m^2)	10.76	square foot

Temperature in degrees Celsius (^oC) may be converted to degrees Fahrenheit (^oF) as follows:

$$^oF = (1.8 \times {}^oC) + 32$$

Vertical coordinate information is referenced to North American Vertical Datum of 1988 (NAVD 88). Horizontal coordinate information is referenced to North American Datum of 1927 (NAD 27) except as noted.

Acronyms and Abbreviations

kilogram per day (kg/d)

meters per second (m/s)

microsiemens per centimeter at 25 degrees Celsius (μS/cm)

micrometer (μm)

milligrams per liter (mg/L)

milliliter (mL)

milliliters per minute (mL/min)

AMD	acid mine drainage
ARD	acid rock drainage
ARSG	Animas River Stakeholders Group
BLM	Bureau of Land Management
CLATIN	OTIS input parameter for lateral inflow concentration
Ma	million years before present
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

Quantification and Simulation of Metal Loading to the Upper Animas River, Eureka to Silverton, San Juan County, Colorado, September 1997 and August 1998

By Suzanne S. Paschke, Briant A. Kimball, and Robert L. Runkel

Abstract

Drainage from abandoned and inactive mines and from naturally mineralized areas in the San Juan Mountains of southern Colorado contributes metals to the upper Animas River near Silverton, Colorado. Tracer-injection studies and associated synoptic sampling were performed along two reaches of the upper Animas River to develop detailed profiles of stream discharge and to locate and quantify sources of metal loading. One tracer-injection study was performed in September 1997 on the Animas River reach from Howardsville to Silverton, and a second study was performed in August 1998 on the stream reach from Eureka to Howardsville. Drainage in the upper Animas River study reaches contributed aluminum, calcium, copper, iron, magnesium, manganese, sulfate, and zinc to the surface-water system in 1997 and 1998. Colloidal aluminum, dissolved copper, and dissolved zinc were attenuated through a braided stream reach downstream from Eureka. Instream dissolved copper concentrations were lower than the State of Colorado acute and chronic toxicity standards downstream from the braided reach to Silverton. Dissolved iron load and concentrations increased downstream from Howardsville and Arrastra Gulch, and colloidal iron remained constant at low concentrations downstream from Howardsville. Instream sulfate concentrations were lower than the U.S. Environmental Protection Agency's secondary drinking-water standard of 250 milligrams per liter throughout the two study reaches.

Elevated zinc concentrations are the primary concern for aquatic life in the upper Animas River. In the 1998 Eureka to Howardsville study, instream dissolved zinc load increased downstream from the Forest Queen mine, the Kittimack tailings, and Howardsville. In the 1997 Howardsville to Silverton study, there were four primary areas where zinc load increased. First, was the increase downstream from Howardsville and abandoned mining sites downstream from the Cunningham Gulch confluence, which also was measured during the 1998 study. The second affected reach was downstream from Arrastra Gulch, where the increase in zinc load seems related to a series of right-bank inflows with low pH and elevated dissolved zinc concentrations. A third increase in zinc load occurred 6,100 meters downstream from the 1997 injection site and may have been from ground-water discharge with elevated zinc concentrations based on mass-loading graphs and the lack of visible inflow in the reach. A fourth but lesser dissolved zinc load increase occurred downstream from tailings near the Lackawanna Mill.

Results of the tracer-injection studies and the effects of potential remediation were analyzed using the one-dimensional stream-transport computer code OTIS. Based on simulation results, instream zinc concentrations downstream from the Kittimack tailings to upstream from Arrastra Gulch would approach 0.16 milligram per liter (the upper limit of acute toxicity for some sensitive aquatic species) if zinc inflow concentrations were reduced by 75 percent in the stream reaches receiving inflow from the Forest Queen mine, the Kittimack tailings, and downstream from Howardsville. However, simulated zinc concentrations downstream from Arrastra Gulch were higher than approximately 0.30 milligram per liter due to numerous visible inflows and assumed ground-water discharge with elevated zinc concentrations in the lower part of the study reach. Remediation of discrete visible inflows seems a viable approach to reducing zinc inflow loads to the upper Animas River. Remediation downstream from Arrastra Gulch is more complicated because ground-water discharge with elevated zinc concentrations seems to contribute to the instream zinc load.

Introduction

The upper Animas River drains an extensively mineralized area of the San Juan Mountains near Silverton, Colorado. Gold deposits were first discovered in 1871 in Arrastra Gulch, and mining activity continued in the watershed at various levels of activity until the Sunnyside Mine was closed in 1991 (Church and others, 1997). The Animas River drainage basin contains more than 300 formerly producing metal mines that have affected water quality in the watershed (Church and others, 1997). Acid mine drainage (AMD) from abandoned and

inactive mines and mine-related wastes, as well as naturally occurring acid rock drainage (ARD) from mineralized areas, contributes acidic, metal-rich water to the upper Animas River.

Environmental characterization of the upper Animas River basin upstream from Silverton began in 1991 under the auspices of the Colorado Department of Public Health and Environment (Church and others, 1997). These initial studies showed seasonal and regional variation in water quality and noted several acidic tributaries upstream from Silverton. Although pH was variable, aluminum and iron concentrations in the acidic waters exceeded the solubility products of various iron and aluminum hydroxides, and iron- and aluminum-hydroxide-coated bed sediments were noted in many stream reaches. Additional reconnaissance sampling of water and bed sediments was conducted by Church and others (1997) during 1995 and 1996 to identify the sources, movement, and partitioning of metals in the upper Animas River. Results of that investigation indicated that most of the aluminum, arsenic, cadmium, copper, iron, lead, and zinc in the Animas River originated within the upper Animas River drainage basin upstream from Silverton (Church and others, 1997). Aquatic habitats in the upper Animas River and its tributaries are affected by the presence of acidic, metal-rich water and by aluminum and iron oxyhydroxide precipitates on bed sediments (Besser and others, 2001).

The Bureau of Land Management (BLM) and the Animas River Stakeholders Group (ARSG) are planning possible remedial actions along the upper Animas River to alleviate water-quality degradation. An evaluation of remedial actions requires a detailed understanding of the primary metal sources to the river and any instream geochemical processes controlling metal transport. River and tributary discharge measurements, which allow calculation of metal loads, are available for a few sites along the stream. However, a more detailed profile of discharge distribution and resultant metal loading is needed to evaluate specific locations for remedial actions.

The U.S. Geological Survey (USGS), in cooperation with the Bureau of Land Management, conducted two tracer-injection and synoptic-sampling studies during September 1997 and August 1998. The purpose of these studies was to provide an evaluation of metal loading to the upper Animas River and instream geochemical processes, which will aid in the selection of remedial alternatives. The principal objectives of the studies were to: (1) locate, identify, and quantify increases in metal loading, by surface and subsurface flow, to the upper Animas River between Eureka and Silverton, Colorado, using tracer-dilution methods; and (2) identify and describe any instream geochemical processes affecting metal concentrations and natural attenuation of metals in streamwater.

Purpose and Scope

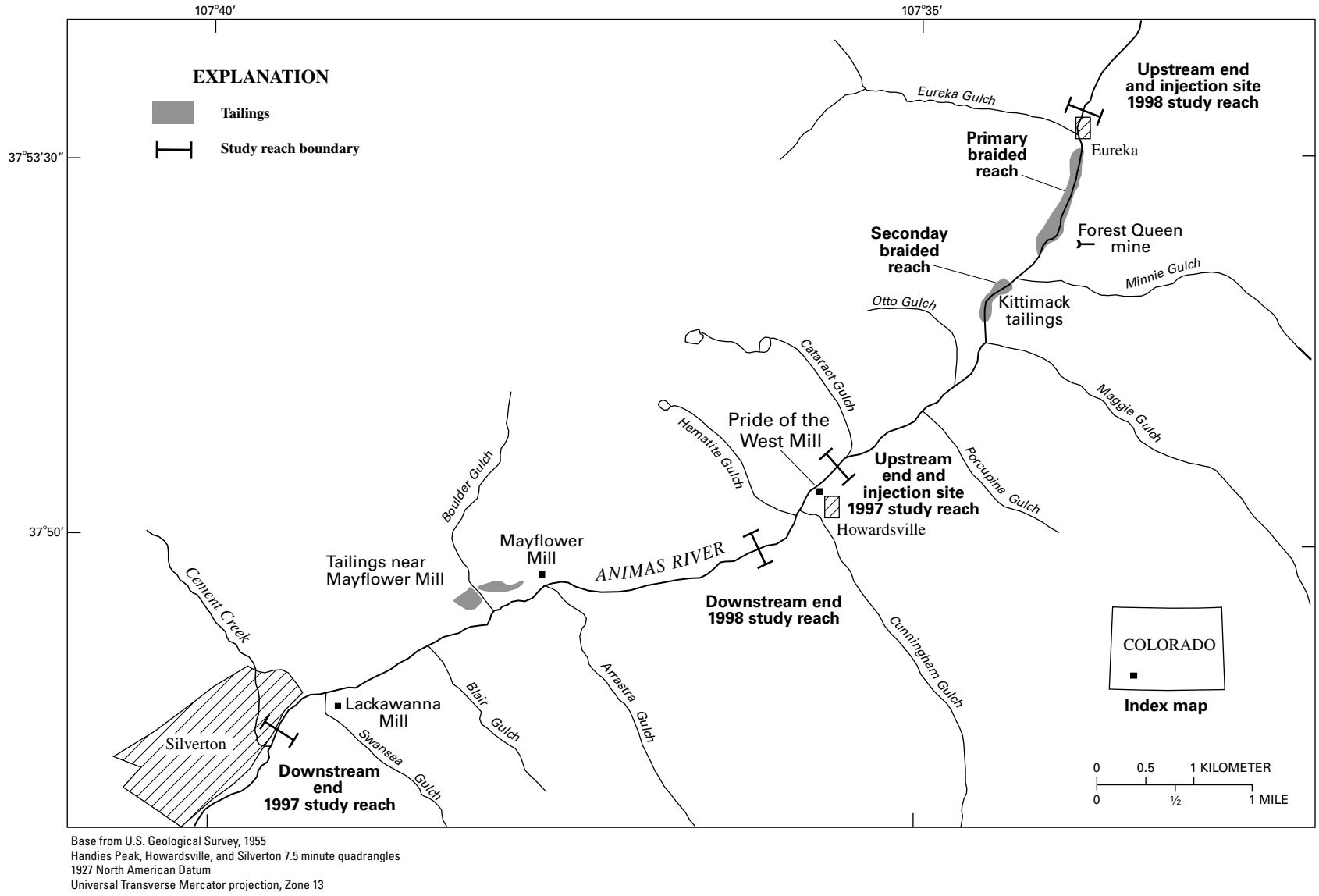
The purpose of this report is to document quantification and simulation of metal loading to the upper Animas River that was based on two tracer-injection and synoptic-sampling studies performed in 1997 and 1998. The methods used to calculate stream discharge and chemical mass loading from the collected data are described. Additionally, this report describes the computer simulations using the one-dimensional computer program OTIS (Runkel, 1998) to simulate the effects of potential remediation plans.

Study Area Description

The upper Animas River study area is in San Juan County in southwestern Colorado near Silverton. The study area encompasses the upper Animas River from the historical mining town of Eureka to the town of Silverton (fig. 1). The river and its major tributaries originate at an altitude of more than 3,000 meters (m). The watershed receives as much as 80–100 centimeters (cm) of annual precipitation principally as snow in winter (Yager and Bove, 2002), and the principal source of streamwater is snowmelt runoff, which usually occurs from May through July. Major tributaries to this reach of the upper Animas River include Eureka Gulch, Minnie Gulch, Maggie Gulch, Otto Gulch, Porcupine Gulch, Cataract Gulch, Cunningham Gulch, Hematite Gulch, Arrastra Gulch, Boulder Gulch, Blair Gulch, and Swansea Gulch (fig. 1).

Bedrock beneath much of the study area consists of Tertiary volcanic rocks of the Silverton caldera, underlain by Precambrian igneous and metamorphic rocks and Paleozoic sedimentary rocks that outcrop in the southern part of the study area (Luedke and Burbank, 1996a; 1996b; Yager and Bove, 2002). Tertiary volcanism in the San Juan volcanic field began between 35 and 30 million before present (Ma), and later caldera-related eruptions occurred between 28.2 and 27.6 Ma (Yager and Bove, 2002). Caldera-bounding ring and tangential radial fractures associated with the Silverton caldera provided pathways for later intrusive magmas and hydrothermal fluids, which contain gold and silver mineral deposits in the area (Yager and Bove, 2002). Subsequent uplift, erosion, and glaciation of the area in more recent geologic time resulted in surficial exposure of the hydrothermally altered rock, and continued weathering of the bedrock and derived surficial materials released acid and metals to surface and ground waters in the drainage basin prior to mining (Bove and others, 2000; Church and others, 2000; Mast and others, 2000).

Placer gold deposits were discovered in 1871 on Arrastra Creek upstream from Silverton, and hard-rock gold and silver mining activity spread rapidly through the area following the 1873 treaty with the Ute Indians (U.S. Geological Survey, 2000). Mining continued in the Animas River watershed at various levels of activity until 1991 when the Sunnyside Mine was closed (U.S. Geological Survey, 2000). More than 100 years of historical mining activity created many kilometers of underground workings and produced large volumes of waste rock. The mine workings provide pathways for ground water and surface water to react with mineralized rock



Base from U.S. Geological Survey, 1955
Handies Peak, Howardsville, and Silverton 7.5 minute quadrangles
1927 North American Datum
Universal Transverse Mercator projection, Zone 13

Figure 1. Location of study area and study reaches, upper Animas River, Colorado.

producing low-pH, metal-rich waters that flow from mine adits (U.S. Geological Survey, 2000). Ground-water and surface-water flow in and over waste rock piles also can contribute acidic metal-rich drainage to the Animas River and its tributaries. Mineralization and historical mining sites are present throughout the area, but several specific areas are possible contributors of metals to the Animas River: Eureka Gulch, the Forest Queen mine downstream from Eureka, the Kittimack tailings, mill tailings near Howardsville, Arrastra Gulch, mill tailings near the Mayflower Mill, and mill tailings near the Lackawanna Mill (fig. 1).

Study Methods

Metal loading to the upper Animas River was quantified by performing two tracer-injection and synoptic-sampling studies and by simulating study results with the one-dimensional solute-transport code OTIS (Runkel, 1998). One tracer-injection and synoptic-sampling study was performed on the upper Animas River reach from Howardsville to Silverton in September 1997, and a second study was performed on the stream reach from Eureka to Howardsville in August 1998 (fig. 1). This section of the report describes the methods used for tracer injection and synoptic sampling and for sampling and analyzing surface-water samples. Methods used for calculating discharge, traveltime, and mass loading also are described. A general overview of the one-dimensional computer code OTIS (Runkel, 1998) used for simulating solute transport also is provided.

Tracer-Injection and Synoptic-Sampling Methods

The methodology of tracer-injections studies was developed as part of the USGS Toxic Substances Hydrology Program to identify and enumerate sources of acid and metals to streams (Bencala and McKnight, 1987; Bencala and others, 1990; Broshears and others, 1995; Kimball and others, 1991; 1994; Kimball, 1997; Kimball and others, 1999a, 1999b, 1999c; Runkel and others, 1996; Walton-Day and others, 1999). As described in this section of the report, a tracer-injection study includes a tracer injection to quantify discharge (Kilpatrick and Cobb, 1985) and synoptic sampling to provide spatial concentration profiles of pH and inorganic constituents. Discharge and concentration data then are combined to develop mass-loading profiles for the stream.

Quantification of metal loads requires accurate discharge measurements and representative chemical concentrations. However, quantifying discharge in mountain streams by the traditional velocity-area method (Rantz, 1982) is complicated by streambed roughness and variability caused by pools and riffles (Jarrett, 1992). In addition, some percentage of discharge cannot be measured by the traditional method because of flow through the streambed (hyporheic zone) (Bencala and Walters, 1983; Bencala and others, 1991; Harvey and Bencala, 1993; Zellweger and others, 1988). Because velocity-area discharge measurements cannot measure flow through the hyporheic zone, metal-loading calculations based on traditional discharge measurements may underestimate metal loads (Kimball, 1997; Zellweger and others, 1988). Application of the velocity-area method for quantifying metal loads also is limited by the time and personnel required to measure discharge at numerous stream sampling sites in a single day.

The tracer-injection study is an alternative method of estimating discharge in gaining mountain streams (Kilpatrick and Cobb, 1985). A tracer injection consists of continuously injecting an inert chemical tracer into the stream at a constant rate and concentration and measuring the downstream dilution of the tracer at various locations. Given sufficient time during a tracer injection, all parts of the stream including side pools and the hyporheic zone become saturated with tracer, and instream tracer concentrations will reach a plateau (Kimball, 1997). Downstream decreases in tracer plateau concentration indicate tracer dilution by surface- and ground-water inflow to the stream, and stream discharge is calculated from the downstream dilution. The downstream arrival, concentration plateau, and departure (upon cessation of the injection) of the tracer also are monitored at selected transport sites to compute stream velocities and other streamflow properties. Discharge computed from tracer concentrations accounts for both the surface and the hyporheic flow because the tracer follows the water through cobbled bed sediment. The tracer-injection method also allows discharge estimates at numerous locations in a short timeframe. Zellweger and others (1988) provide additional details of tracer-injection methods.

Synoptic sampling is a one-time detailed sampling of stream sites and all visible tributary inflows to the stream performed during the plateau period of the tracer injection. Synoptic sampling provides a description of the stream and tributary inflow chemistry during the tracer injection. By combining discharge, computed from the tracer injection, with synoptic metal concentrations, metal-loading profiles are developed for the stream using mass-balance calculations. Results of the tracer-injection study can identify where changes in stream load occur. However, study results do not identify specific pathways to the stream from particular sites, except for visible surface inflows. The detailed loading information provides insight to the key geochemical processes affecting stream pH and metal concentrations, and it provides the hydrologic framework for solute-transport simulations (Bencala, 1983; Bencala and others, 1988; Broshears and others, 1993; Broshears and others, 1996; Harvey and others, 1996; McKnight and Bencala, 1989; Runkel, 1998; Runkel and others, 1996; Runkel and others, 1999; Wagner and Harvey, 1997).

Both of the upper Animas River tracer-injection studies were conducted during fall base-flow (low-flow) conditions. Application of tracer-injection studies to low-flow condi-

tions is appropriate for two reasons. First, the mass-loading profiles developed for low-flow conditions reflect base-flow metal-loading conditions, which are present all year long. Remediation that addresses sources identified during low flow therefore will improve water quality during the entire year. Second, mass-loading profiles developed for low-flow conditions indicate those sources contributing to elevated instream concentrations during the winter months when conditions most toxic to aquatic organisms likely occur (Besser and Leib, 1999). During the low-flow winter months, dilution of metals is minimal, and toxicity standards based on metal concentrations are more likely exceeded (Besser and others, 2001). Testing during low-flow conditions also makes it possible to measure discharge and collect samples at many synoptic-sampling sites during the tracer plateau.

Successful implementation of a tracer-injection study requires that the injected tracer be transported through the stream system in a conservative manner unaffected by biogeochemical reactions. Potential tracers include dyes and inorganic salts. Dye tracers have the disadvantage of being unstable at low pH, and they adsorb to solids and organic matter in the hyporheic zone (Bencala and others, 1986). Chloride and bromide salts of sodium and lithium are suitable tracers in environments where naturally occurring chloride or bromide concentrations are low. Lithium works well in streams with low pH, and chloride and bromide work well in streams with higher pH (Bencala and others, 1990). Sodium chloride tracer was used for both of the upper Animas River tracer injections where stream pH was circumneutral.

Sampling and Analytical Methods

Surface-water samples were collected at downstream transport sites and synoptic-sampling sites during the tracer injection. Sampling sites are referenced by their distance in meters downstream from the injection, and inflow samples were referenced as being on the right or left streambank looking downstream.

Frequent surface-water samples were collected at the transport sites during the tracer injections to observe the arrival, plateau, and departure of the sodium-chloride tracer. Transport-site samples were collected as manual grab samples and with auto samplers and were filtered upon collection through 0.45-micrometer (μm) in-line capsule filters into polyethylene bottles. Transport-site samples were analyzed for chloride concentrations using ion chromatography (table 1) at the USGS laboratory in Salt Lake City, Utah, using analytical techniques and quality assurance procedures described by Kimball and others (1999a).

Synoptic samples were collected from instream and inflow sites during the tracer plateau. Instream and inflow samples were collected into polyethylene bottles, and water temperature was measured at each site upon sample collection. For the instream sites, samples were collected using equal-width integration (EWI) and a DH-81 sampler (Wilde and others, 1998). Manual grab samples were collected at inflow sites. A temporary field laboratory was used to process the synoptic samples, measure pH and specific conductance, and filter the samples for the remaining analyses (table 1). To prevent photoreduction of iron, all samples were kept out of the light in dark plastic bags until processing at the temporary field laboratory.

Synoptic samples were analyzed for anions and iron speciation at the USGS laboratory in Salt Lake City, Utah. Chloride and sulfate concentrations were determined using ion chromatography (Kimball and others, 1999a), alkalinity was determined using Gran titration (Stumm and Morgan, 1981), and iron speciation was determined colorimetrically (table 1). Precision of the ion chromatography results was less than 5 percent for chloride analyses and less than 10 percent for sulfate analyses (Kimball and others, 1999a).

Dissolved and total-recoverable concentrations for aluminum, barium, calcium, cadmium, copper, iron, potassium, magnesium, manganese, sodium, silica, strontium, and zinc were determined by inductively coupled argon plasma atomic emissions spectrometry (ICP-AES, table1). The dissolved concentrations for instream samples were obtained by filtering samples through a tangential-flow filter apparatus with a 10,000-Dalton molecular-weight nominal pore size (Benoit and Rozan, 1999; Kimball and others, 1992; Moran and Moore, 1989). For inflow samples, dissolved concentrations were obtained from a 0.45-μm filtration using the same apparatus. For both instream and inflow samples, total-recoverable concentrations were obtained from an unfiltered sample. The colloidal concentration was calculated indirectly by subtracting the dissolved concentration from the total-recoverable concentration (Kimball and others, 1995). Synoptic samples for ICP-AES analyses were acidified at the field laboratory using 1 milliliter (mL) of ultrapure nitric acid. ICP-AES analyses of synoptic samples from the September 1997 tracer-injection study (Howardsville to Silverton study reach) were performed at the USGS laboratories in Boulder, Colorado, and ICP-AES analyses of synoptic samples from the August 1998 tracer-injection study (Eureka to Howardsville study reach) were performed at the Colorado School of Mines laboratories in Golden, Colorado. ICP-AES analytical techniques are described in Taylor (1982) and Garbarino and Taylor (1984a; 1984b), and quality-assurance procedures followed the methods described by Friedman and Erdmann (1982).

Discharge and Traveltime Calculations

During a tracer injection, the tracer reaches a steady plateau concentration in the stream, and discharge can be calculated by the amount of tracer dilution at each successive instream site by using the conservation of mass. If stream discharge increases downstream, the tracer will have successively lower downstream plateau concentrations. The synoptic sampling is conducted during the plateau period of the tracer injection, and tracer concentrations from the

Table 1. Analytical methods for tracer and synoptic water samples collected during the Eureka to Howardsville tracer-injection study, August 1998, and the Howardsville to Silverton tracer-injection study, September 1997.

[μm, micrometer; ICP-AES, inductively coupled plasma atomic emissions spectrometry]

Analysis	Field treatment	Analytical method
Chloride tracer concentrations and sulfate	Filtered (0.45 μm), unacidified	Ion chromatography (Kimball and others, 1999a)
pH, specific conductance	Unfiltered, unacidified	Ion-sensitive electrode measured at field laboratory
Filtered ferrous iron	Filtered (0.45 μm), unacidified	Bipyridine, colorimetric method for ferrous iron
Filtered metal concentrations	Filtered (10,000 Dalton), acidified Filtered (0.45 μm), acidified	ICP-AES (Taylor, 1982; Garbarino and Taylor, 1984a; 1984b; Friedman and Erdmann, 1982)
Total-recoverable metal concentrations	Unfiltered, acidified	ICP-AES with standard U.S. Environmental Protection Agency digestion for total-recoverable concentrations (Taylor, 1982; Garbarino and Taylor, 1984a; 1984b; Friedman and Erdmann, 1982)

synoptic sampling are used to compute stream discharge as discussed herein.

Conservation of mass requires the load of tracer in the stream at B to be equal to the load at A, upstream from the injection, plus the load added by the injection (table 2, equation 1). In addition, by flow balance, the discharge at B must equal the discharge at A plus the discharge of the injection. Discharge at the downstream site B then is computed from the injection flow rate and concentration and the measured tracer concentrations at sites A and B (table 2, equation 2). Mass and flow balance relations also are used to develop a discharge equation for site C and all subsequent sites downstream based on the flow and measured tracer concentration computed for the upstream site B and the measured tracer concentration of any inflow between sites B and C (table 2, equation 3).

Inflow to the stream can include visible tributaries, seeps, springs, and diffuse ground-water inflow. Inflow discharge is computed as the difference in discharge between sites C and B (table 2, equation 4). If a visible tributary is present in the reach between two sites, calculated inflow discharge is assigned to the tributary inflow. If there is no visible inflow between two sites, calculated inflow discharge is assigned as unsampled ground-water inflow.

During the tracer injection, the arrival, plateau, and departure of tracer in the stream are monitored at several downstream transport sites, and the transport graphs are used to calculate traveltime between sites as well as stream-channel parameters used for solute-transport simulations. The tracer arrival time at a site (t_{50}) is defined as the time at which the instream tracer concentration reaches one-half of the plateau concentration (C_{50}) (Zellweger and others, 1988). Traveltime between two sites is the difference in arrival times.

Mass-Loading Calculations

Discharge values computed from a tracer-injection study are combined with synoptic-sampling results to compute mass-loading graphs for various constituents of interest. The constituent load at the downstream end of a stream segment includes the load from the upstream end plus the load contributed by all surface and subsurface inflows between the sites (table 2, equation 5). The sampled instream load (M_S) and the sampled inflow load (M_I) are two ways to consider the load of a stream segment (Kimball and others, 1999a). The sampled instream load at site C, M_C, is calculated as the product of the discharge (Q) and synoptic constituent concentration (C) at each stream sampling site (table 2, equation 5). The sampled instream load represents the effect of constituent sources in the watershed on the stream, and it is used to identify changes in constituent load because it can increase, decrease, or remain constant between stream sites. An increase generally indicates a source of constituent loading, and the magnitude of the increase compared to other stream segments ranks the sources in the context of the watershed. A decrease generally indicates a loss of metal from the water through chemical reactions such as precipitation or adsorption. Both reactions can result in loss to the streambed or a transformation from the dissolved phase to a colloidal solid phase.

The net change in sampled instream load between stream sites includes the instream load at site B plus the inflow load contributed by all the surface and subsurface inflow between sites B and C (table 2, equation 5). Because it is not possible to sample all the inflow affecting the stream, especially the diffuse ground-water inflow, the inflow concentration in equation 5 (table 2) represents an effective inflow concentra-

Table 2. Equations defining calculated quantities in tracer-injection studies (modified from Kimball and others, 1999a) [Subscripts correspond to sites illustrated in the diagram].

Calculated quantity	Tracer-dilution equations	Variables
(1) Mass balance downstream from the injection site	$M_B = C_B Q_B$ $= C_A Q_A + C_{inj} Q_{inj}$ $Q_B = Q_A + Q_{inj}$	M_B, Load at site B C_B, Concentration at site B Q_B, Discharge at site B C_A, Concentration at site A Q_A, Discharge at site A C_{inj}, Concentration of injectate solution Q_{inj}, Discharge of injection pump
(2) Discharge at first site downstream from tracer injection	$Q_B = \frac{Q_{inj}(C_{inj} - C_A)}{(C_B - C_A)}$	All variables defined above
(3) Discharge at subsequent downstream sites	$Q_C = \frac{Q_B(C_B - C_I)}{(C_C - C_I)}$	Q_C, Discharge at downstream site C C_C, Concentration of tracer at site C C_I, Sampled inflow concentration of tracer
(4) Inflow discharge	$Q_I = Q_C - Q_B$	Q_I, Computed inflow discharge. If visible inflow is present in the reach, Q_I is assigned inflow discharge, otherwise, Q_I is assigned to unsampled ground-water discharge.
Solute-loading equations		
(5) Sampled instream load at subsequent stream sites	$M_C = C_C Q_C$ $= C_B Q_B + C_I^E (Q_C - Q_B)$	M_C, Load at site C or subsequent sites downstream C_I^E, Effective inflow concentration
(6) Effective inflow concentration	$C_I^E = \frac{(C_C Q_C - C_B Q_B)}{(Q_C - Q_B)}$	All variables defined above
(7) Change in sampled instream load	$\Delta M_S = C_C Q_C - C_B Q_B$ $= C_I^E (Q_C - Q_B)$	ΔM_S, Net change in load between sites B and C
(8) Change in sampled inflow load	$\Delta M_I - C_I (Q_C - Q_B)$	ΔM_I, Net change in load between sites B and C based on sampled inflow concentration C_I, Sampled inflow concentration

tion (C_I^E), which is a discharge-weighted mean concentration of all surface and subsurface inflow contributions within the stream segment (table 2, equation 6).

The change in instream load between two stream sites (ΔM_S) is defined as the downstream load minus the upstream load (table 2, equation 7), and the cumulative instream load is defined as the sum of the positive values of ΔM_S. Each negative value of ΔM_S indicates a stream segment where there is a net reduction in constituent load, and the cumulative instream load is held constant for a segment with a negative ΔM_S. The cumulative instream load represents the minimum total load added to the stream over the study reach. Comparison of ΔM_S to M_S indicates the extent of instream constituent attenuation along the study reach, because ΔM_S is greater than M_S when M_S is reduced by physical, chemical, or biological process.

The change in sampled inflow load, ΔM_I, represents the load contributed to the stream from visible inflows and is calculated for each stream reach as the product of the sampled inflow concentrations, C_I, and the change in discharge between stream sites, Q_I (table 2, equation 8). The change in sampled inflow load represents the net change in stream loading from the sampled inflow concentrations. For stream segments with no visible inflow, ΔM_I is set to zero. The cumulative inflow load is the sum of the values for ΔM_I along the study reach.

Table 3 presents probable explanations for the various relations between ΔM_S and ΔM_I. If ΔM_S and ΔM_I are nearly equal for a stream segment, then the sampled inflow concentrations, C_I, approximate the effective inflow concentrations, C_I^E, and the sampled inflow loads account for the change in stream loading. If ΔM_S is greater than ΔM_I, then C_I^E is greater than C_I, presumably because there is unsampled inflow such as ground-water discharge to the stream with high constituent concentrations. For colloidal constituent loads, if ΔM_S is greater than ΔM_I, chemical precipitation of colloidal material is indicated. For dissolved constituent loads, if ΔM_S is less than ΔM_I, then there has been a reduction in load by chemical reaction.

Solute-Transport Simulations

To interpret mass-loading calculations and simulate the effects of potential remediation plans in the basin, surface-water flow and zinc solute transport were simulated for the Eureka to Howardsville and the Howardsville to Silverton study reaches using the one-dimensional computer program OTIS (Runkel, 1998). A general overview of OTIS is provided in this section of the report. Details on the site-specific application of OTIS to the Eureka to Howardsville and Howardsville to Silverton study reaches are provided in subsequent sections.

OTIS is a computer code for simulating one-dimensional solute transport of a single solute in a stream based on the advection-dispersion equation with additional terms to account for transient storage, lateral inflow, first-order decay, and adsorption (Runkel, 1998). Transient storage refers to the temporary storage of streamwater in the stream and adjacent streambed, and OTIS accounts for transient stor-

Table 3. Probable explanations for various cumulative stream-load relations (modified from Kimball and others, 1999a).

[ΔM_S, change in sampled instream load; M_I, change in sampled inflow load; <, less than; >, greater than]

Condition	Probable explanation
$\Delta M_S = \Delta M_I$	The sampled inflow concentrations approximate the effective inflow concentrations, and the sampled inflow load accounts for the change in sampled stream load.
$\Delta M_S > \Delta M_I$	The sampled stream load is greater than the sampled inflow load, and the sampled inflow load does not account for the change in sampled stream load. For dissolved constituents, ground-water discharge with elevated constituent concentrations is indicated. For colloidal constituents, transfer from the dissolved to the colloidal phase by chemical precipitation is indicated.
$\Delta M_S < \Delta M_I$	The sampled inflow load is greater than the sampled stream load indicating a loss of stream load through physical, chemical, or biological reaction or dilution by ground-water inflow.
$\Delta M_S < 0$	There is a net loss of load through physical, chemical, or biological reaction in the stream reach.

age by solving separate mass-balance equations for the main stream channel and the stream storage zone. The main channel is defined as the stream portion where advection and dispersion are the dominant transport processes, and the storage zone is defined as the stream portion where transient storage occurs. Advection and dispersion are not included in the storage zone, where downstream transport is negligible. Lateral inflow represents additional water coming into the main channel as overland flow, interflow, and ground-water discharge. Chemical reactions can be specified within the main channel, the storage zone, or both.

OTIS can be used in conjunction with data from field-scale tracer-injection studies to quantify the hydrologic parameters affecting surface-water flow (Runkel, 1998). The application of OTIS to tracer-injection results generally involves a trial-and-error process where estimates for the hydrologic parameters of channel cross-sectional area, transient storage cross-sectional area, and solute dispersion are adjusted to obtain an acceptable match between simulated and measured tracer concentrations for the tracer-transport sites and synoptic sampling. OTIS-P is a modified version of OTIS that couples OTIS with a nonlinear regression package to automate the hydrologic parameter-estimation process.

Once the hydrologic parameters are established for the conservative tracer, OTIS is used to simulate measured mass loading and solute transport for constituents of interest. For the two upper Animas River study reaches, the measured inflow concentrations (C_1) are used as lateral inflow values to simulate conservative solute transport for zinc. The simulated instream concentration profile is compared to the measured synoptic instream concentration profile to identify potential instream physical, chemical, or biological processes in the stream reach. If the simulated instream concentrations for a given constituent are higher than the measured synoptic instream concentrations, then removal of the constituent by physical, chemical, or biological processes is indicated. For the two upper Animas River study reaches, the effects of instream chemical reactions are simulated using first-order decay. The resulting OTIS simulations then are used to predict the effects of hypothetical remedial actions for the upper Animas River.

Metal Loading to the Upper Animas River, Eureka to Howardsville, Colorado, Study Reach, August 1998

The Eureka to Howardsville tracer-injection study started near the historical mining town of Eureka and ended downstream from Howardsville at the USGS gaging station 09358750 (referenced herein using the Colorado State gaging station number A53). This study reach encompassed a 7,250-m reach of the upper Animas River (fig. 2).

Tracer-Injection Study Objectives

There were three primary objectives for the Eureka to Howardsville tracer-injection study. The first objective was to identify and locate metal loading in the stream study reach. Although a tracer-injection study can help identify where load increases occur, it does not identify specific pathways to the stream from particular sites, except for visible surface inflows. Possible sources of metal loading include Eureka Gulch, the Forest Queen mine discharge, the Kittimack mill tailings, and tailings near Howardsville. The second objective was to determine (for low-flow conditions) if the stream reach is a net sink or source of metals to the downstream areas. This objective was accomplished by identifying and describing any instream physical, chemical, or biological processes affecting metal concentrations and natural attenuation. A third objective for the Eureka to Howardsville study was to characterize the effects of braided stream reaches on streamwater quality. There is a primary braided reach just downstream from Eureka from 786 to 2,030 m and a secondary braided reach near the Kittimack tailings from 3,150 to 3,435 m. Channel restoration is being considered for these braided reaches, and an understanding of 1998 conditions will aid in rechannelization planning.

Tracer-Injection Study Methods

The Eureka to Howardsville tracer-injection study was conducted August 11 through August 14, 1998. A solution containing 166,700 milligrams per liter (mg/L) of sodium chloride was injected into the upper Animas River at an average flow rate of 1.784 liters per minute (L/min). The injection started at 1000 hours on August 11, 1998, but the pump stopped at approximately 1200 hours the same day. The injection began again at 1002 hours on August 12, 1998 and ran continuously until 1930 hours on August 14, 1998 (table 4). For reporting results, time 0.0 is the beginning of experiment time, which was midnight on August 11, 1998, and subsequent times are reported as decimal hours.

The Eureka to Howardsville injection site was located approximately 347 m upstream from Eureka Gulch so inflow from Eureka Gulch could be quantified as tributary inflow. The arrival of the sodium-chloride pulse and the development of a plateau concentration were measured at four downstream locations, transport sites T1 through T4 (fig. 2). Transport site T1 was located upstream from Eureka Gulch at 282 m. Transport site T2 was located at 2,240 m, downstream from the braided reach, and site T3 was located at 5,467 m at the same location as the tracer injection for the Howardsville to Silverton tracer-injection study conducted in 1997. Transport site T4 was located at 6,993 m at the Howardsville gaging station A53.

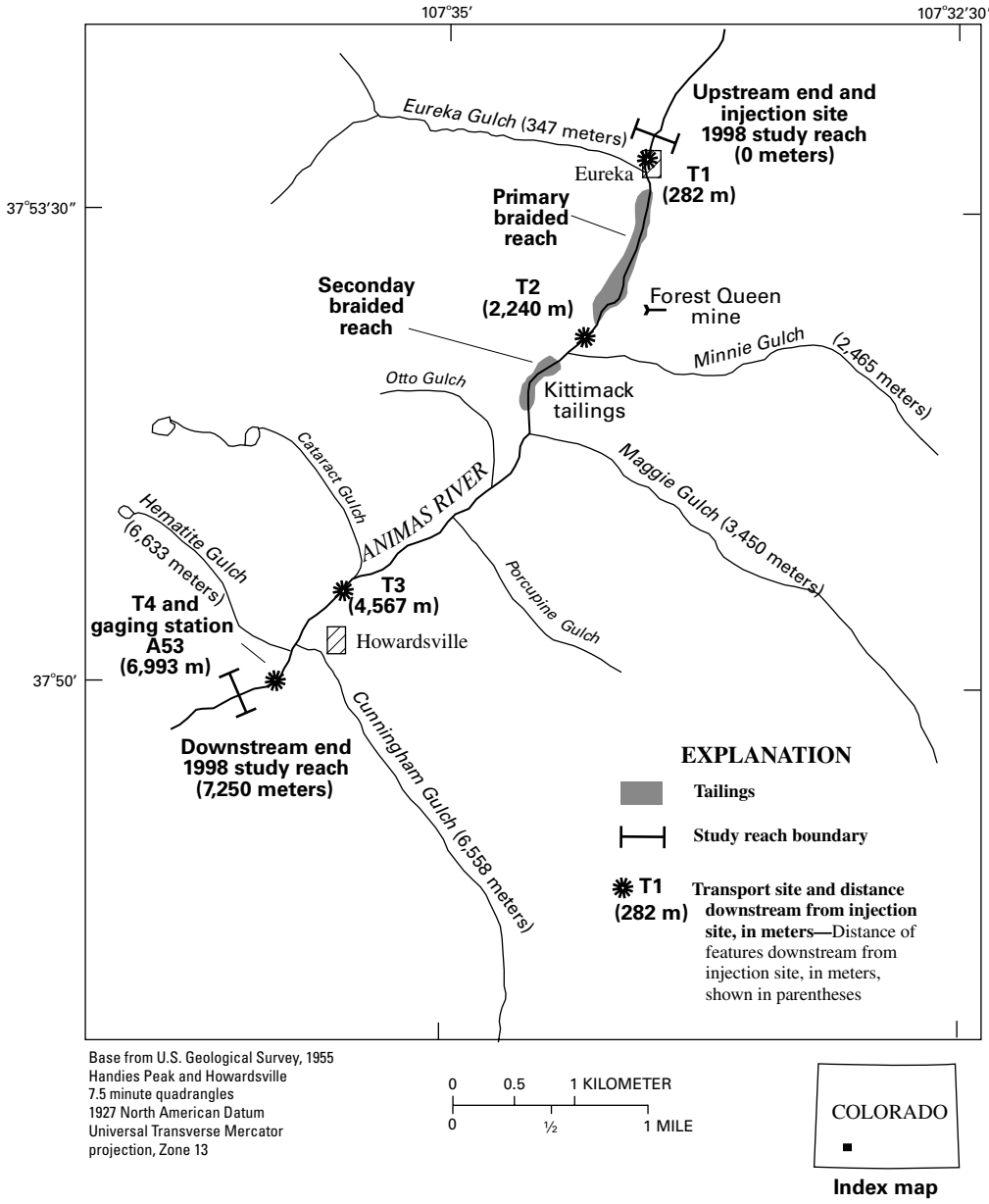


Figure 2. Eureka to Howardsville study reach, upper Animas River, Colorado, August 1998.

Synoptic Sampling and Analyses

Synoptic samples were collected from 34 instream sites, including the 4 transport sites and 4 sites in the breaded reach at 1,618 m, and 17 inflows on August 14, 1998, during the plateau period of the tracer injection. Although there was rain before and after the synoptic sampling, there was no rain during the sampling, so steady-state conditions were achieved during the synoptic sampling. Instream sampling sites were located upstream and downstream from identified inflows to allow mass-balance calculations for each inflow, and additional sites were located in longer subreaches between inflows to account for subsurface inflow. Seventeen inflow-sampling sites were chosen to represent the range of pH and specific conductance of water entering the stream. Although there were several sampling sites in the braided reach, only the samples upstream and downstream from the braided reach can account for the metal loading or loss that could occur in the braided reach. The instream sample at 786 m represents input to the braided reach, and the instream sample at 2,030 m represents output from the braided reach.

Instream and inflow water samples were analyzed in the field and laboratory for various constituents as presented in the

Table 4. Tracer-injection study sequence of events, upper Animas River, Eureka to Howardsville, Colorado, August 1998.

[mL/min, milliliters per minute]

Date	Clock time	Experiment time (hours)	Activity
08/09/1998–08/10/1998			Stream reconnaissance and discharge measurements
08/11/1998	0000	0.0	Start of experiment time
	1000	10.0	Start of initial injection
	1800	18.0	Initial injection pump stopped
08/12/1998	1002	34.03	Started injection pump
	1115	35.25	Injectate sample, measured pump rate at 2,517 mL/min
	1135	35.58	Adjusted pump rate to approximately 1,833 mL/min
	1705	41.08	Injectate sample, measured pump rate at 1,783 mL/min
	1920	43.33	Finished refilling the tank with injectate solution
	1932	43.53	Injectate sample, measured pump rate at 1,817 mL/min
08/13/1998	1056	58.93	Finished refilling the tank with injectate solution
	1115	59.25	Measured pump rate at 1,725 mL/min
	1538	63.63	Measured pump rate at 1,800 mL/min
	1600	64.00	Finished refilling the tank with injectate solution
08/14/1998	1000 –1830	82.0 – 90.5	Synoptic sample collection
	1135	83.58	Injectate sample, measured pump rate at 1,790 mL/min
	1520	87.33	Measured pump rate at 1,767 mL/min
	1930	91.50	Stopped pumps

"Study Methods" section of this report. The analytical methods are listed in table 1.

Tracer-Injection Study Results

Chemical analyses results for chloride tracer concentrations at the Eureka to Howardsville transport and synoptic sites were used to compute traveltime, stream discharge, and chemical mass loading as discussed herein. The 1998 synoptic-sampling site locations are listed in table 5, field measurements and major ion concentrations are listed in Appendix 1, and ICP-AES synoptic-sampling results are listed in Appendix 2. Data are sorted in downstream order within groups of instream and inflow sites to emphasize the downstream changes.

Arrival Times

Information from the arrival and departure of tracer from the transport sites was used to calculate the traveltime between sites. Despite the complication caused by the pumps stopping on the first day of injection, the arrival times of the tracer at the downstream sites during the subsequent injection were not affected, and data from the restarted continuous injection are reported herein.

Data for transport sites T1 and T2 are used to demonstrate how arrival times of the chloride tracer were calculated and to discuss traveltime through the braided reach (fig. 3). At transport site T1, an abrupt chloride arrival is noted; indicating that the interval of time between sample collections was too large to discern a gradual tracer arrival. However, the tracer arrival curve is well defined at transport site T2. After the initial arrival of chloride tracer at sites T1 and T2, the plateau concentration decreased between 35 and 40 hours because of a decrease in the upstream tracer injection rate (table 4). A second decrease in the tracer plateau is noted at both sites T1 and T2 at approximately 75 hours because of a local rainstorm, which diluted the instream tracer concentrations. Because of variations in tracer plateau concentration at sites T1 and T2, an assumed average tracer plateau concentration for each site was used to compute the traveltime between sites. An average plateau concentration of 11.0 mg/L was assumed at site T1, and an average plateau concentration of 5.5 mg/L was assumed at T2, resulting in C_{50} values of 5.5 mg/L and 2.25 mg/L for sites T1 and T2, respectively. Interpolations of C_{50} arrival times

Table 5. Synoptic-sampling sites and discharge calculated from tracer-dilution, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

[distance, distance downstream from injection site; L/s, liters per second; ft^3/s, cubic feet per second; --, not applicable]

Distance (meters)	Site name	Source	Inflow location	Discharge (L/s)	Discharge (ft^3/s)
0	Upstream from injection site	Stream	--	261	9.2
80	First site downstream from injection	Stream	--	261	9.2
282	T1 site—Upstream from Eureka Gulch	Stream	--	310	11.0
347	Eureka Gulch	Inflow	Right bank	162	5.7
586	Downstream from Eureka Gulch	Stream	--	472	16.7
786	Near right bank talus slope	Stream		473	16.7
906	Upstream from first braids	Stream		477	16.8
1,061	Upper braided reach	Stream		481	17.0
1,411	Left braid near Forest Queen	Stream	--	491	17.3
1,618	1618 Braids	Stream	--	496	17.5
1,918	Left braid upstream from Forest Queen	Stream	--	505	17.8
2,030	Upstream from Forest Queen inflow	Stream	--	706	25.0
2,090	Inflow from Forest Queen mine	Inflow	Left bank	80.2	2.8
2,240	T2 site—Downstream from end of braids	Stream	--	786	27.8
2,420	Upstream from Minnie Gulch	Stream	--	786	27.8
2,465	Minnie Gulch	Inflow	Left bank	90.3	3.2
2,860	Near braided area	Strean	--	877	31.0
3,150	Upstream from inflow near Kittimack	Stream	--	948	33.5
3,165	Upstream from Otto Gulch fan	Inflow	Right bank	104	3.7
3,400	Downstream from braids near Kittimack	Stream	--	1,052	37.2
3,405	Drains hillslope or alluvium	Inflow	Left bank	168	5.9
3,435	Upstream Maggie Gulch downstream Kittimack tailings	Stream	--	1,200	43.1
3,450	Maggie Gulch	Inflow	Right bank	80.5	2.8
3,665	Downstream from Maggie Gulch	Stream	--	1,301	46.0
3,905	Upstream from braided reach	Stream	--	1,328	46.9
3,954	Drains large area of willows	Inflow	Right bank	29.3	1.0
4,164	Near beaver ponds on left bank	Stream	--	1,357	48.0
4,189	Inflow from beaver ponds	Inflow	Left bank	84.2	3.0
4,430	Downstream from beaver ponds on left bank	Stream	--	1,441	50.9
4,670	Downstream from braids	Stream	--	1,560	55.1
4,970	Along smooth reach of stream	Strean	--	1,570	55.5
5,190	Upstream from beaver pond inflow	Strean	--	1,595	56.4
5,210	Drains beaver pond	Inflow	Right bank	0.8	0.03
5,407	Drains ponds	Inflow	Right bank	0.8	0.03
5,467	T3 site--Site of 1997 Howardsville injection	Inflow	Left bank	0.8	0.03
5,648	Drains upstream from tailings piles	Stream	--	1,597	56.4
6,038	Along tailings piles (1997 T1)	Inflow	Left bank	30.2	1.1
6,438	Inflow from Howardsville Mill	Stream	--	1,627	57.5

Table 5. Synoptic-sampling sites and discharge calculated from tracer-dilution, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.—Continued

[distance, distance downstream from injection site; L/s, liters per second; ft^3/s, cubic feet per second; --, not applicable]

Distance (meters)	Site name	Source	Inflow location	Discharge (L/s)	Discharge (ft^3/s)
6,528	Downstream from Howardsville Mill	Inflow	Left bank	15.7	0.6
6,558	Cunningham Gulch	Stream	--	1,662	58.7
6,618	Downstream from Cunningham Gulch	Inflow	Left bank	445	15.7
6,633	Hematite Gulch	Stream	--	2,107	74.4
6,753	Downstream from Hematite Gulch	Inflow	Right bank	65	2.3
6,993	T4 site—Howardsville gage	Stream	--	2,172	76.8
7,008	Drains left bank adit up hill	Inflow	Left bank	30.6	1.1
7,013	Drains old mill site	Inflow	Right bank	30.6	1.1
7,063	Also drains old mill site (?)	Inflow	Right bank	30.6	1.1
7,250	End of study reach	Stream	--	2,319	81.9

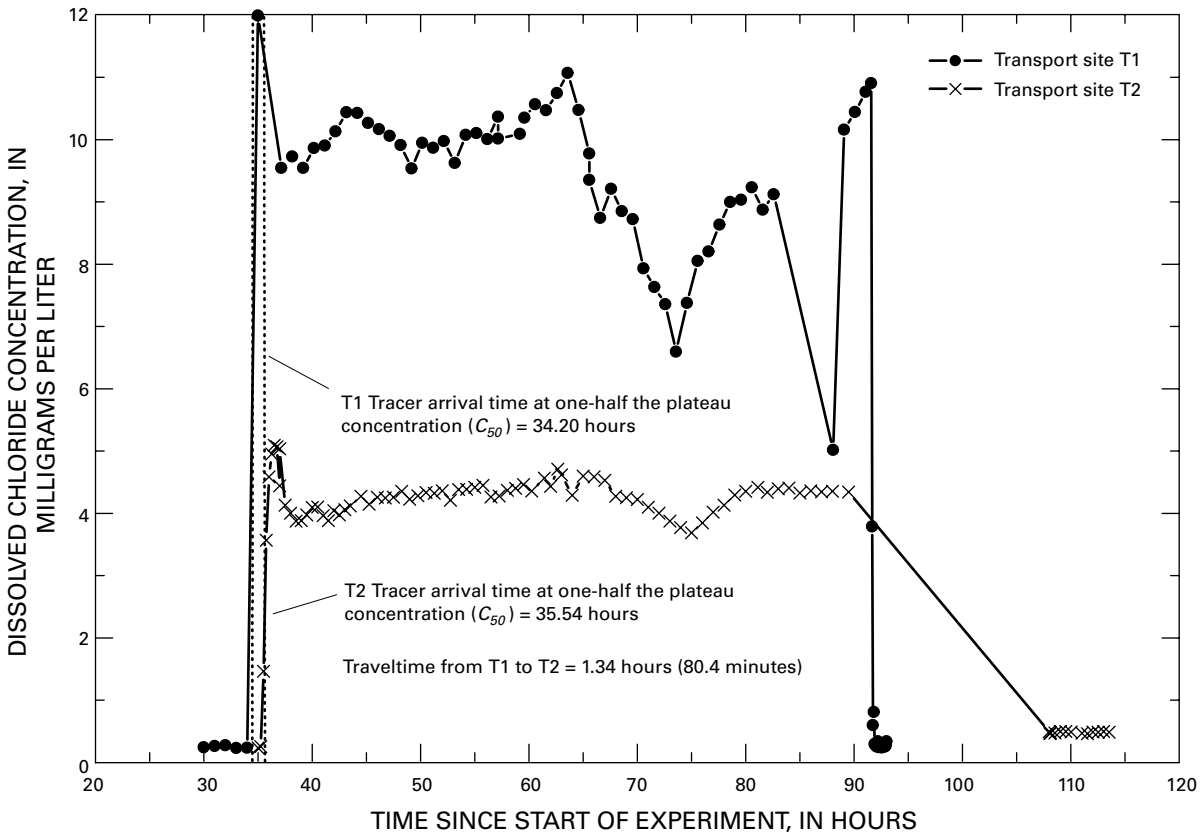


Figure 3. Dissolved chloride concentrations with time at transport sites T1 and T2, Eureka to Howardsville study reach, upper Animas River, Colorado, August 1998.

(t_{50} values) from figure 3 result in an arrival time of 34.2 hours for T1 and an arrival time of 35.54 hours for site T2.

The difference between the T1 and T2 arrival times is 1.34 hours (80.4 minutes) and represents the average travel-time from site T1 to site T2. Site T2 is located downstream from the braided reach of interest, and the traveltime calculated for this stream reach indicates relatively rapid flow of water through the braided reach. A stream velocity of 0.47 meter per second (m/s) was computed for the open stream channel from the injection site to site T1, and a stream velocity of 0.45 m/s was computed for the braided reach from site T1 to T2. This small difference in stream velocity between reaches indicates that the braided reach did not substantially reduce water flow velocity under low-flow conditions.

Discharge Profile

A detailed discharge profile for the 1998 Eureka to Howardsville study reach was developed using the chloride tracer concentrations that were measured in the synoptic samples and adjusted for analytical precision. Discharge calculations based on chloride concentrations for a given tracer-injection study depend on two conditions. First, the instream tracer concentration should be consistently higher than the inflow tracer concentrations, and this condition was generally met during the 1998 Eureka to Howardsville tracer-injection study (fig. 4). Second, the tracer concentration in the synoptic samples must represent the steady-state tracer-plateau concentration at that sampling site. For the 1998 Eureka to Howardsville study, the tracer-plateau chloride concentrations at the transport sites do match the synoptic-sampling chloride concentrations (fig. 4).

Concentrations of chloride, in a downstream direction, indicate the initial addition of the tracer and then the dilution due to surface and subsurface inflows (fig. 4). For a decrease of chloride to be considered a measurable change and not a product of analytical error, the decrease in concentration between stream samples must be higher than the precision of the chemical analyses. Error bars are indicated for chloride concentrations to show the precision of 1.75 percent for the 1998 data set (fig. 4). If a change in instream chloride concentration was lower than the precision of the analysis, the downstream chloride concentration was held constant for discharge calculations until a change higher than the precision of the analysis was measured.

The resulting profile of chloride concentration was used to calculate discharge according to the equations presented in table 2. Discharge results are presented in table 5 and in fig. 4. The total flow increase through the study reach was 2,058 L/s (72.7 ft^3/s), with visible tributary inflow contributing 1,449 L/s (51.1 ft^3/s) or about 70 percent of the total flow increase. By difference, unsampled ground-water inflow accounted for 609 L/s (21.6 ft^3/s) or about 30 percent of the total flow increase through the study reach. Cunningham Gulch (distance 6,558 m) was the largest tributary inflow, accounting for 445 L/s (15.7 ft^3/s) or about 22 percent of the total flow increase. The change in flow through the braided reach was the difference in flow between sites at 2,030 m and 786 m and was 233 L/s (8.2 ft^3/s) or about 11 percent of the total flow increase. Eureka Gulch (586 m) contributed 162 L/s (5.7 ft^3/s) or about 8 percent of the total flow increase. Notable flow increases also occurred downstream from the Kitty Mack tailings at 3,405 m (168 L/s, 5.9 ft^3/s, 8 percent of total increase), Otto Gulch at 3,165 m (104 L/s, 3.7 ft^3/s, 5 percent of total increase), Minnie Gulch at 2,465 m (90 L/s, 3.2 ft^3/s, 4 percent of total increase), willows and beaver ponds at 4,189 m (84 L/s, 3.0 ft^3/s, 4 percent of total increase), Maggie Gulch at 3,450 m (80 L/s, 2.8 ft^3/s, 4 percent of total increase), and Hematite Gulch at 6,633 m (65 L/s, 2.3 ft^3/s, 3 percent of total increase).

A streamflow-gage measurement at the downstream monitoring site (gaging station A53) did not compare well with the discharge values calculated from tracer dilution (fig. 4). Similar to other streams, the volume of flow measured by tracer dilution was much higher than concurrent flowmeter measurements because of flow through streambed cobbles (Kimball, 1997; Kimball and others, 1999a, 1999c).

Synoptic-sampling and Mass-Loading Calculation Results

This section presents results for the 1998 Eureka to Howardsville synoptic-sampling results and mass-loading calculations for constituents of interest. Synoptic-sampling data are presented in Appendixes 1 and 2, and the data are contained in USGS digital database for the Animas River watershed Abandoned Mine Land Program (Sole and others, 2005). Although concentrations of many metals were determined in the study, constituents of interest in the Eureka to Howardsville reach of the upper Animas River included pH, aluminum, calcium, magnesium, copper, iron, manganese, zinc, and sulfate.

pH

Instream pH is an important chemical parameter used to evaluate ARD effects and instream chemical reactions because pH can control chemical reactions such as aluminum or iron hydroxide precipitation and adsorption of metals onto sediment. The downstream profile of instream and inflow pH values for the Eureka to Howardsville study reach is presented in figure 5. Instream pH values were near neutral, ranging from about 6.6 at 1,918 m to 7.6 at 3,905 m. There was no clear downstream trend to the instream pH values; however, instream pH did appear to be affected by inflow pH. Instream pH values decreased downstream from inflows with pH values lower than the stream (3,165-m inflow, 3,954-m inflow, and 6,438-m inflow), and instream pH values increased downstream from inflows with high pH values (Minnie Gulch, Maggie Gulch, beaver ponds at 5,210 m, Cunningham Gulch,

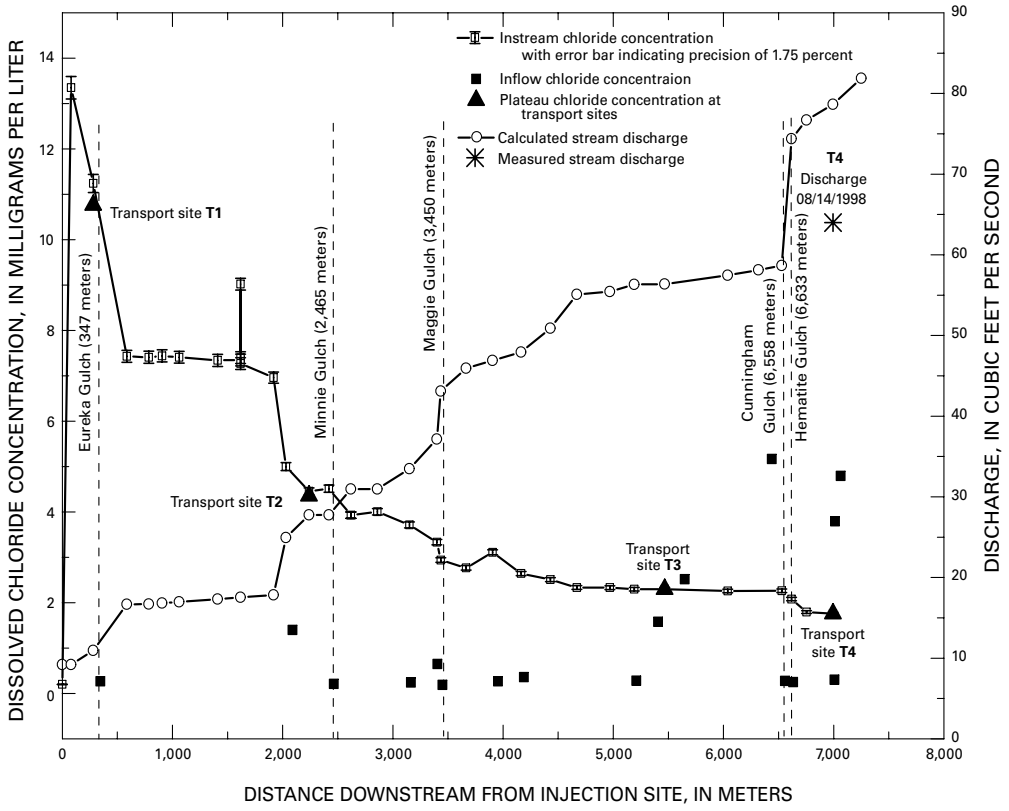


Figure 4. Dissolved chloride concentrations and calculated discharges with distance downstream from the injection site, Eureka to Howardsville study reach, upper Animas River, Colorado, August 14, 1998.

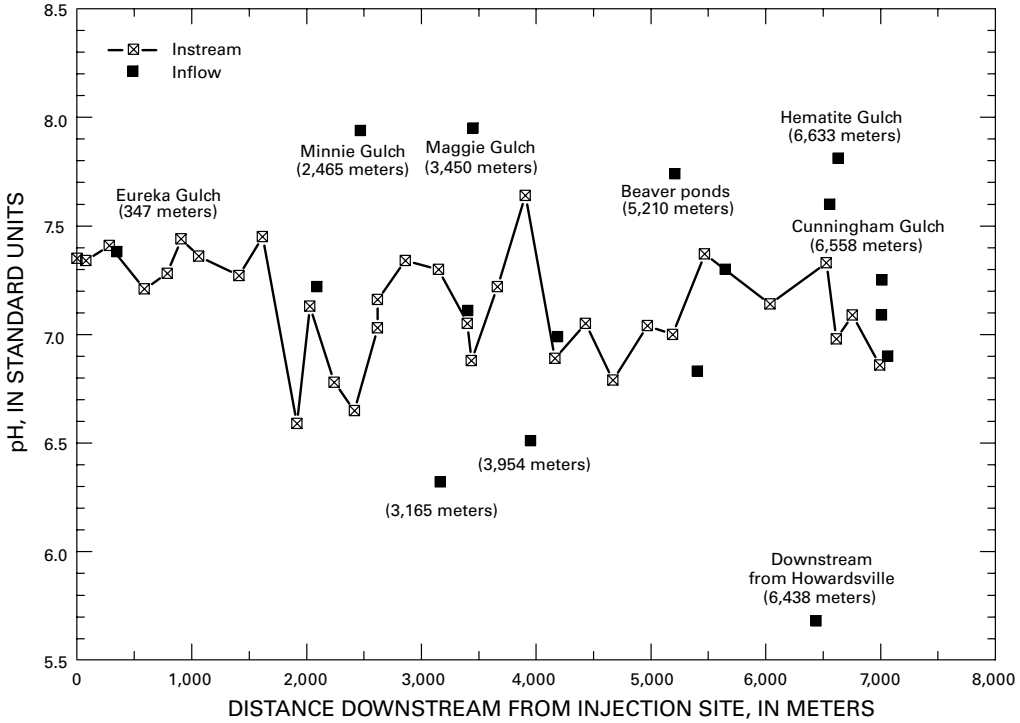


Figure 5. Instream and inflow pH with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

and Hematite Gulch) (fig. 5). The inflow sample from 6,438 m had the lowest pH of all sampled inflows (5.7), and there were no acidic inflows (pH lower than 5.0) identified during the synoptic sampling.

Aluminum

There was little variability in dissolved aluminum instream and inflow concentrations (Appendix 2). Instream aluminum concentrations ranged from 0.014 to 0.084 mg/L with a mean of 0.049 mg/L, and inflow aluminum concentrations ranged from 0.014 to 0.56 mg/L with a mean of 0.067 mg/L. The maximum dissolved aluminum inflow concentration of 0.56 mg/L occurred at 6,438 m.

Instream colloidal aluminum concentrations decreased downstream from Eureka to just upstream from Howardsville at 6,038 m (fig. 6). The maximum instream colloidal aluminum concentration of 0.226 mg/L occurred at the upstream end of the study reach near the injection site, indicating that colloidal aluminum was contributed to the Eureka to Howardsville study reach from sources upstream from Eureka. Instream colloidal aluminum concentrations decreased through the primary braided reach from a concentration of 0.172 mg/L at 786 m to a concentration of 0.077 mg/L at 2,030 m (fig. 6). Colloidal aluminum loss also occurred through a secondary braided reach where the colloidal aluminum concentration decreased from 0.088 mg/L at 3,150 m to 0.036 mg/L at 3,435 m (fig. 6). A graph of sampled instream load (fig. 7) also shows a loss of colloidal aluminum through the braided reaches and supports conclusions that the braided reaches contributed to attenuation of colloidal aluminum probably by settling and entrapment of colloidal particles through the shallow water. Downstream from transport site T3 at 5,467 m, colloidal aluminum concentrations increased slightly in response to inflows with elevated colloidal aluminum concentrations (fig. 6). The instream colloidal aluminum load also increased downstream from the inflow at 6,438 m (fig. 7).

Calcium and Magnesium

Calcium and magnesium concentrations in the upper Animas River for 1998 were controlled by the calcium and magnesium concentrations of surface-water inflows. Instream concentrations of calcium ranged from approximately 25 to 37 mg/L with a mean of 30 mg/L, and inflow calcium concentrations ranged from 27 to 96 mg/L with a mean of 43 mg/L. Instream calcium concentrations increased in a downstream direction, from approximately 26 mg/L at Eureka to approximately 37 mg/L at the downstream end of the study reach, in response to elevated inflow calcium concentrations (fig. 8).

Magnesium concentrations in the stream ranged from approximately 2.0 to 2.4 mg/L with a mean of 2.2 mg/L, and inflow magnesium concentrations ranged from approximately 1.9 to 8.8 mg/L with a mean of 3.0 mg/L. Magnesium concentrations increased slightly in the downstream direction from 2.2 mg/L at Eureka to 2.4 mg/L at the downstream end of the study reach. Inflow magnesium concentrations were similar to stream concentrations with the exception of the inflow at 6,438 m (fig. 9).

Copper

Instream dissolved copper concentrations were compared to acute and chronic toxicity standards for aquatic life. These standards were computed for each water sample as a function of hardness (the sum of calcium, magnesium, barium, and strontium concentrations in milligrams per liter as calcium carbonate) according to the following relations (Colorado Department of Public Health and Environment, written commun., 1997):

$$\text{Copper Acute Toxicity Standard} = 0.5 * \frac{\left(e^{(0.9422 * 1n(\text{hardness}) - 0.7703)}\right)}{1{,}000}, \text{ and}$$

$$\text{Copper Chronic Toxicity Standard} = \frac{\left(e^{(0.8545 * 1n(\text{hardness}) - 1.465)}\right)}{1{,}000}.$$

Figure 10 presents a graph of instream and inflow dissolved copper concentrations for the Eureka to Howardsville 1998 synoptic sampling and the acute and chronic toxicity standards computed for each instream sample. The highest dissolved copper concentrations were in the upstream part of the study reach, indicating that dissolved copper was contributed by sources upstream from Eureka. Similar to colloidal aluminum, dissolved copper concentrations decreased through the primary braided reach downstream from Eureka from approximately 0.033 mg/L at 906 m to less than the method detection limit of 0.002 mg/L at 2,030 m (fig. 10). A graph of sampled instream copper load (fig. 11) also shows a loss of dissolved copper at the downstream end of the primary braided reach at 2,030 m. Adsorption of dissolved copper was the likely mechanism of copper attenuation through the primary braided reach.

Instream dissolved copper concentrations remained lower than both the acute and chronic toxicity standards downstream from the primary braided reach at 2,030 m to the end of the study reach (fig. 10), and the mass-loading graph for copper also indicates a relatively constant instream copper load downstream from the primary braided reach (fig. 11). An increase in copper load at the downstream end of the study reach (fig. 11) seems to be related to inflows from abandoned mines downstream from Hematite Gulch (6,633 m), although the instream dissolved copper concentrations remained lower than the acute and chronic toxicity standards downstream from Hematite Gulch (fig. 10). Dissolved copper was not detected in the 6,438-m inflow downstream from Howardsville in 1998.

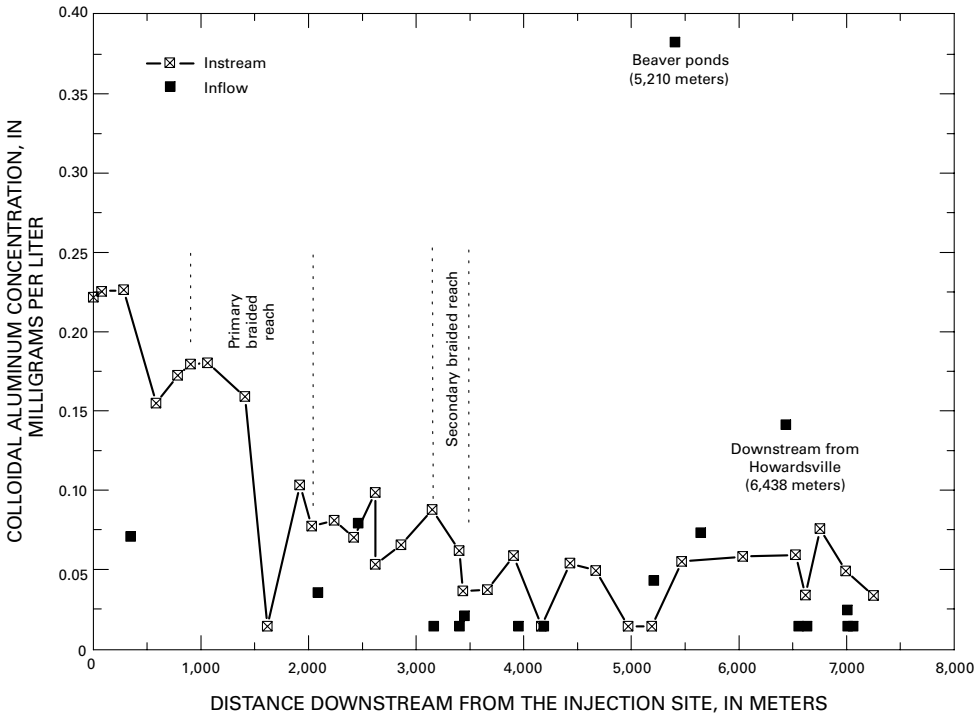


Figure 6. Instream and inflow colloidal aluminum concentrations with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

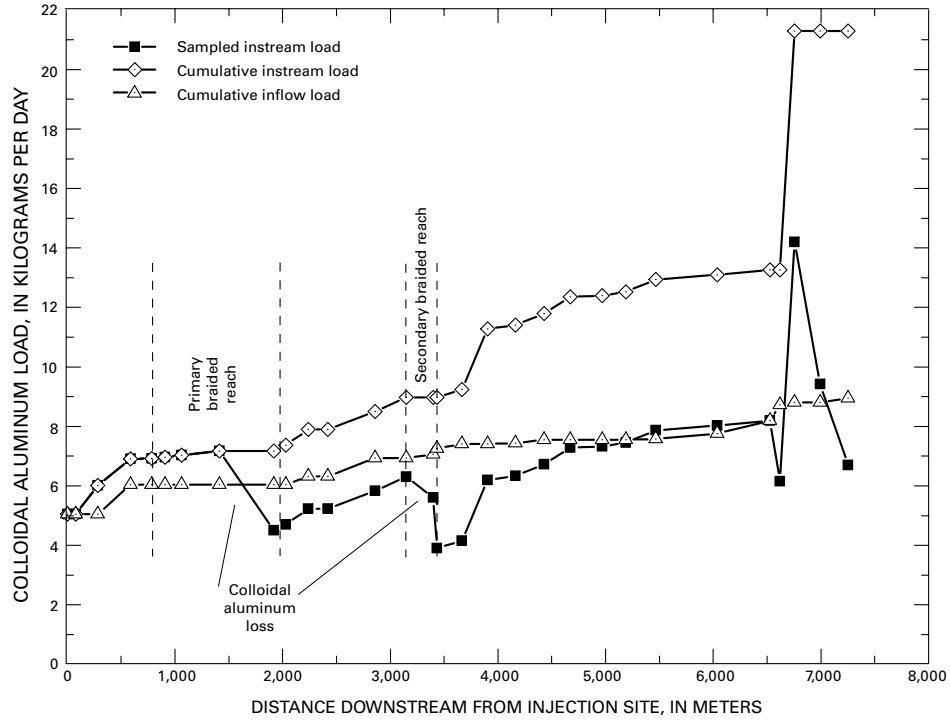


Figure 7. Sampled instream load, cumulative instream load, and cumulative inflow load of colloidal aluminum with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

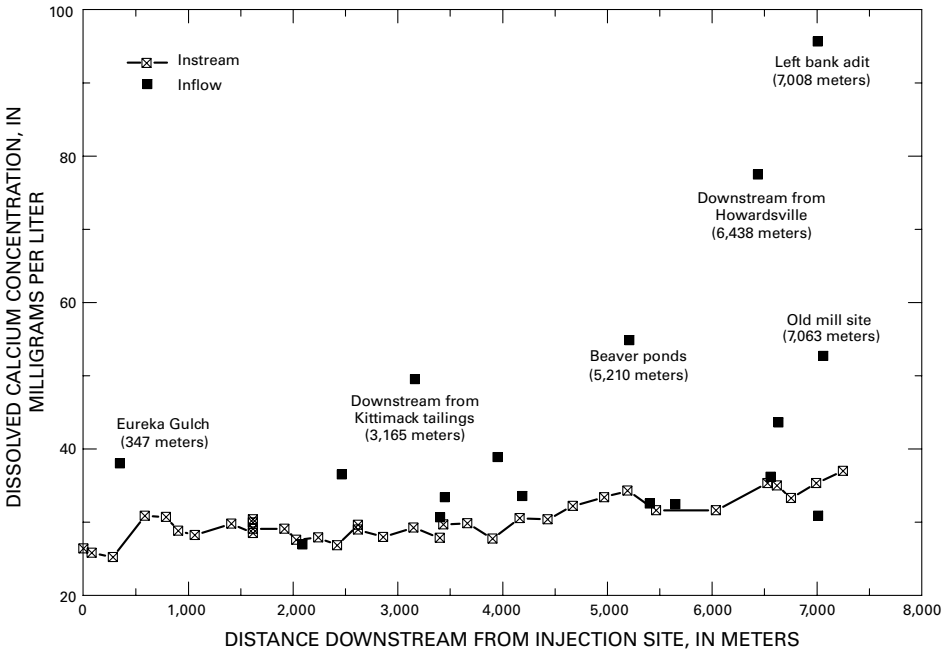


Figure 8. Instream and inflow dissolved calcium concentrations with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

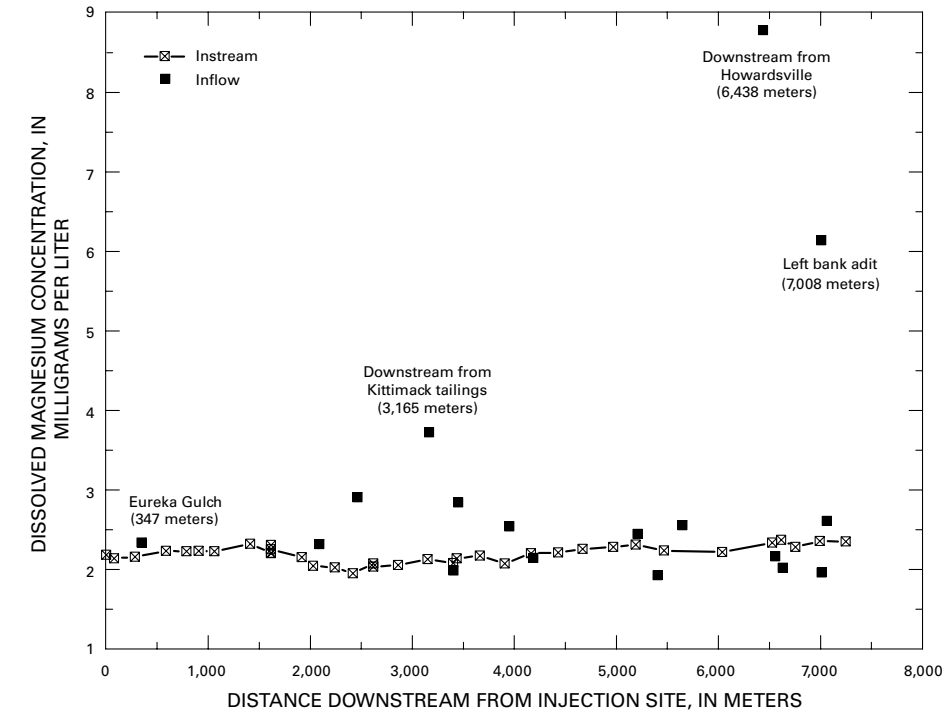


Figure 9. Instream and inflow dissolved magnesium concentrations with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

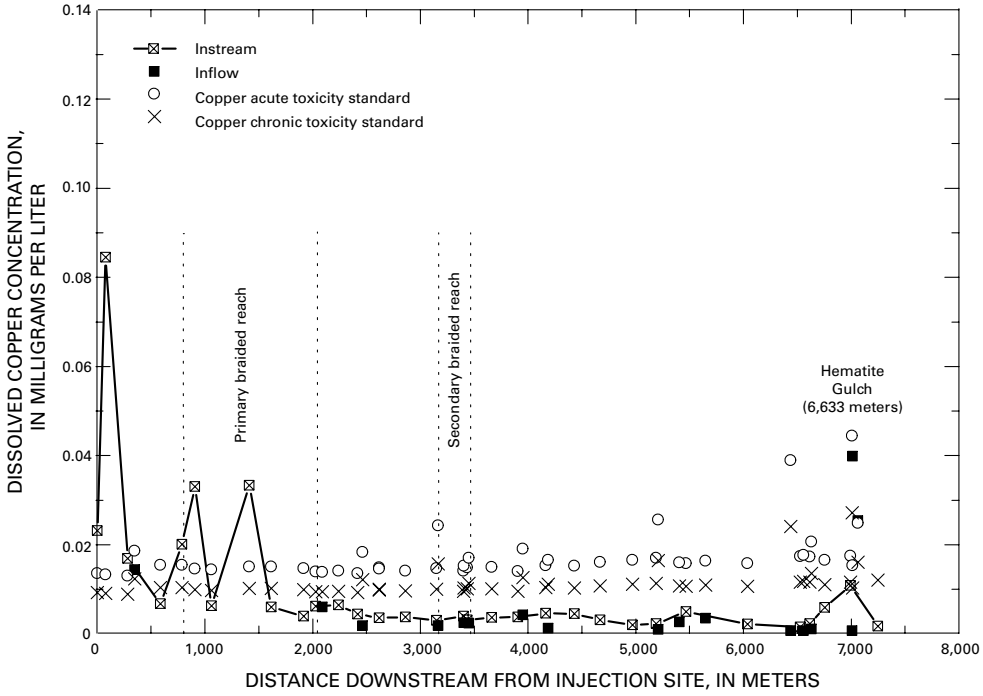


Figure 10. Instream and inflow dissolved copper concentrations, copper acute toxicity standard, and copper chronic toxicity standard with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

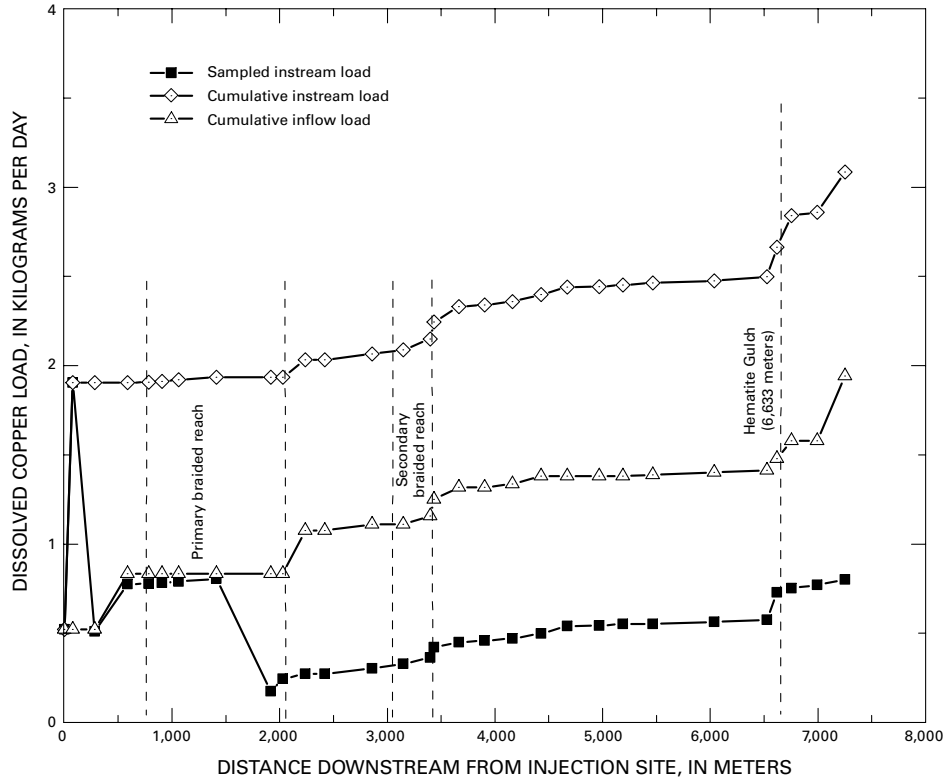


Figure 11. Sampled instream load, cumulative instream load, and cumulative inflow load of dissolved copper with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

Iron

Instream dissolved and colloidal iron concentrations during the 1998 Eureka to Howardsville study generally were low or not detected upstream from Howardsville, where dissolved iron concentrations were less than 0.014 mg/L, and colloidal iron concentrations were less than 0.088 mg/L. There was essentially no change in the instream load, the cumulative instream load, or the cumulative inflow load for dissolved or colloidal iron upstream from Howardsville (figs. 12 and 13).

Downstream from Howardsville, the sampled instream load for dissolved iron increased because of the elevated iron concentration from the inflow at 6,438 m (11.7 mg/L) and then decreased downstream probably because iron colloids precipitated in the near-neutral pH streamwater (fig. 12). A second but smaller increase in the dissolved iron instream load occurred at 7,008 m where an adit inflow contributed additional dissolved (1.03 mg/L) and colloidal (1.13 mg/L) iron to the stream. Downstream from Howardsville, the dissolved iron cumulative inflow load was higher than the cumulative instream and sampled instream loads indicating chemical removal probably as precipitation of iron colloids (fig. 12).

The sampled instream load for colloidal iron increased downstream from Howardsville because of the elevated colloidal iron concentration from the inflow at 6,438 m (3.87 mg/L) and likely from precipitation of iron colloids from the dissolved iron. For colloidal iron, the cumulative instream load was higher than the cumulative inflow load (fig. 13), indicating that the source of iron colloids was instream chemical precipitation rather than inflow contributions. The decrease in the colloidal iron instream load between Howardsville and the adit drainage at 7,008 m likely reflects the settling of iron colloids onto the streambed.

Based on synoptic-sampling concentration data and mass-loading calculations, the inflow at 6,438 m was a substantial source of dissolved and colloidal iron to the upper Animas River from Eureka to Howardsville in 1998. This inflow drains the area of tailings near Howardsville and the Pride of the West Mill. Some of these tailings were relocated during 1997 and 1998, and the effects of tailings removal on stream inflow quality are undocumented. Inflow from a draining adit at 7,008 m was a secondary source of dissolved and colloidal iron to the study reach. The instream dissolved iron load downstream from each of these inflows first increased in response to the inflow and then decreased in response to precipitation of iron colloids in the near-neutral pH stream. The colloidal iron load increased downstream from each of these inflows in response to the elevated inflow concentrations of colloidal iron and the chemical precipitation of iron colloids.

Manganese

Instream dissolved manganese concentrations in the Eureka to Howardsville study reach ranged from 0.14 to 0.78 mg/L in 1998. The highest instream manganese concentration (fig. 14) was upstream from the injection site at 0 m (0.78 mg/L) indicating that dissolved manganese was contributed by sources upstream from Eureka. Downstream from Eureka to upstream from Howardsville, instream manganese concentrations decreased (fig. 14), and the cumulative instream manganese load remained relatively constant (fig. 15). Inflows dissolved manganese concentrations upstream from Howardsville ranged from less than the method detection limit of 0.01 to 0.26 mg/L and generally were lower than the instream manganese concentrations from Eureka to Howardsville. The highest manganese inflow concentration in the Eureka to Howardsville study reach in 1998 was from the inflow at 6,438 m (18.5 mg/L), and the second highest manganese inflow concentration was downstream from Howardsville at 7,008 m where visible drainage from an adit contributed 1.0 mg/L dissolved manganese to the upper Animas River.

The mass-loading graphs for dissolved manganese showed little increase in sampled instream load, cumulative instream load, or cumulative inflow load upstream from Howardsville (fig. 15). All three loads increased downstream from Howardsville in response to the elevated manganese concentrations from the inflows at 6,438 m and 7,008 m. The manganese cumulative inflow loads were higher than the cumulative instream loads downstream from Howardsville, indicating chemical removal of manganese possibly by precipitation of manganese oxyhydroxides.

Zinc

Instream dissolved zinc concentrations were compared to acute and chronic toxicity standards for aquatic life. These standards were computed for each water sample as a function of hardness (in milligrams per liter as calcium carbonate) according to the following relations (Colorado Department of Public Health and Environment, written commun., 1997):

$$\text{Zinc Acute Toxicity Standard} = \frac{\left(e^{(0.8473*1n(\text{hardness})+0.8604)}\right)}{1{,}000}, \text{ and}$$

$$\text{Zinc Chronic Toxicity Standard} = \frac{\left(e^{(0.8473*1n(\text{hardness})+0.7614)}\right)}{1{,}000}.$$

Instream dissolved zinc concentrations ranged from 0.27 to 0.54 mg/L and exceeded the acute and chronic aquatic-life standards along the entire study reach (fig. 16). The highest dissolved zinc concentrations were upstream from the primary braided reach, indicating that dissolved zinc was contributed by sources upstream from Eureka. Dissolved zinc concentrations decreased through the primary braided reach similar to colloidal aluminum and dissolved copper concentrations (fig. 16), and the graph of sampled instream zinc load (fig. 17) also shows slight dissolved zinc loss through the primary braided reach. Adsorption of dissolved zinc likely contributed to its attenuation through the braided reach.

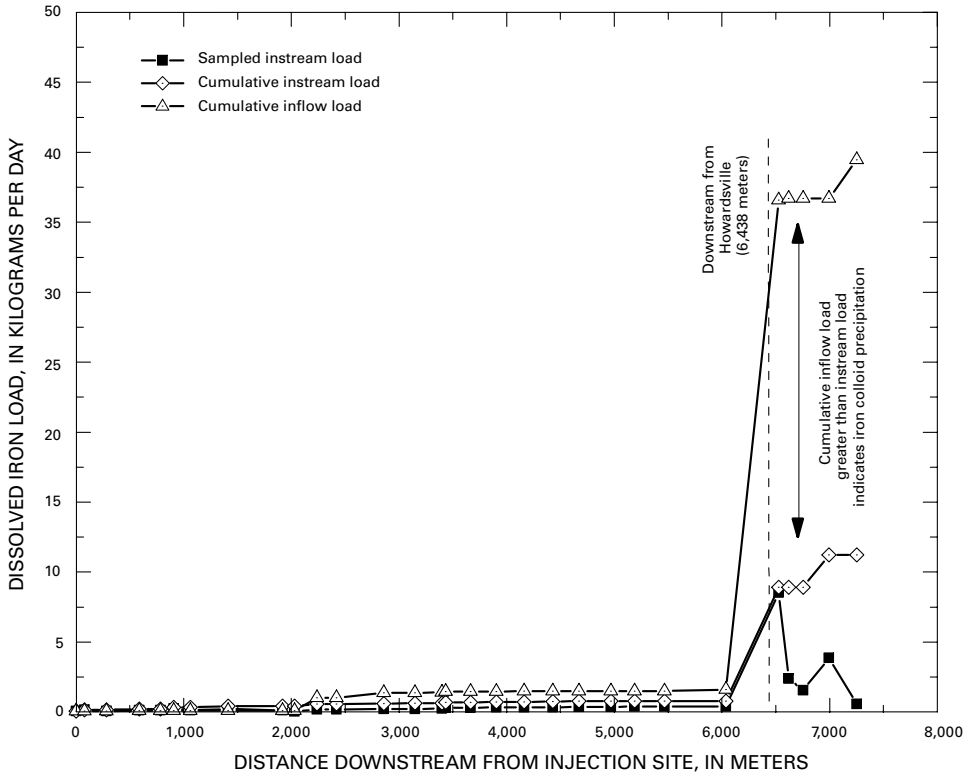


Figure 12. Sampled instream load, cumulative instream load, and cumulative inflow load of dissolved iron with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

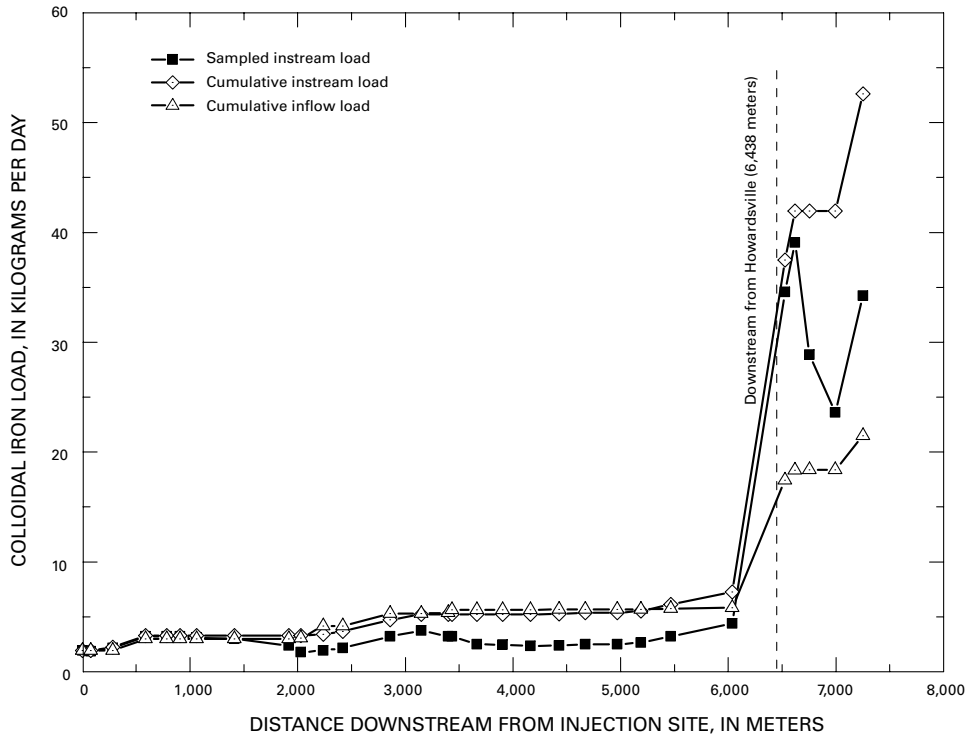


Figure 13. Sampled instream load, cumulative instream load, and cumulative inflow load of colloidal iron with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

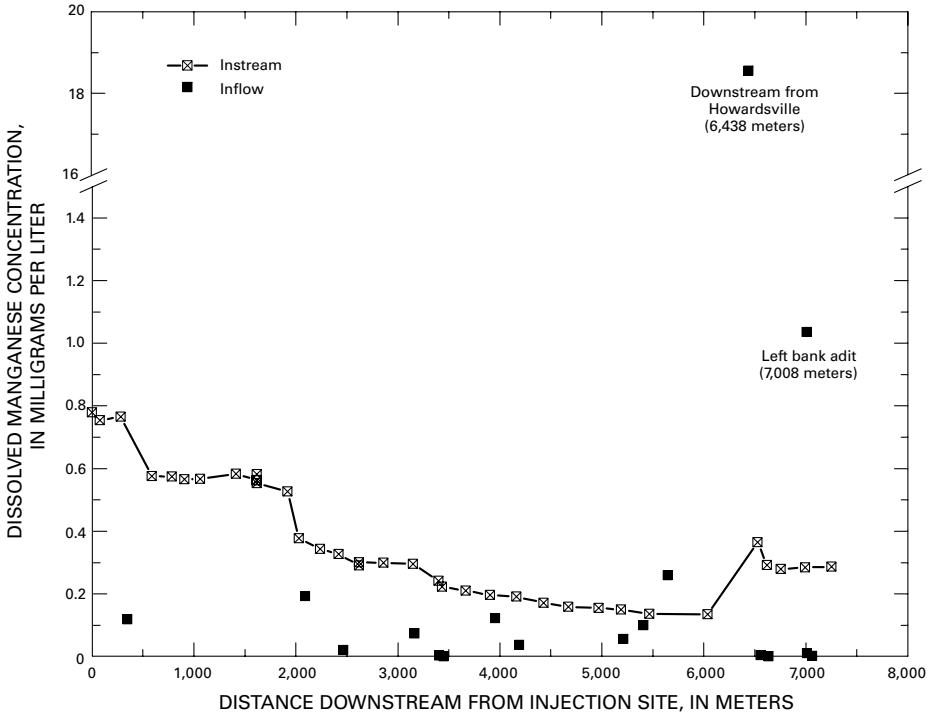


Figure 14. Instream and inflow dissolved manganese concentrations with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

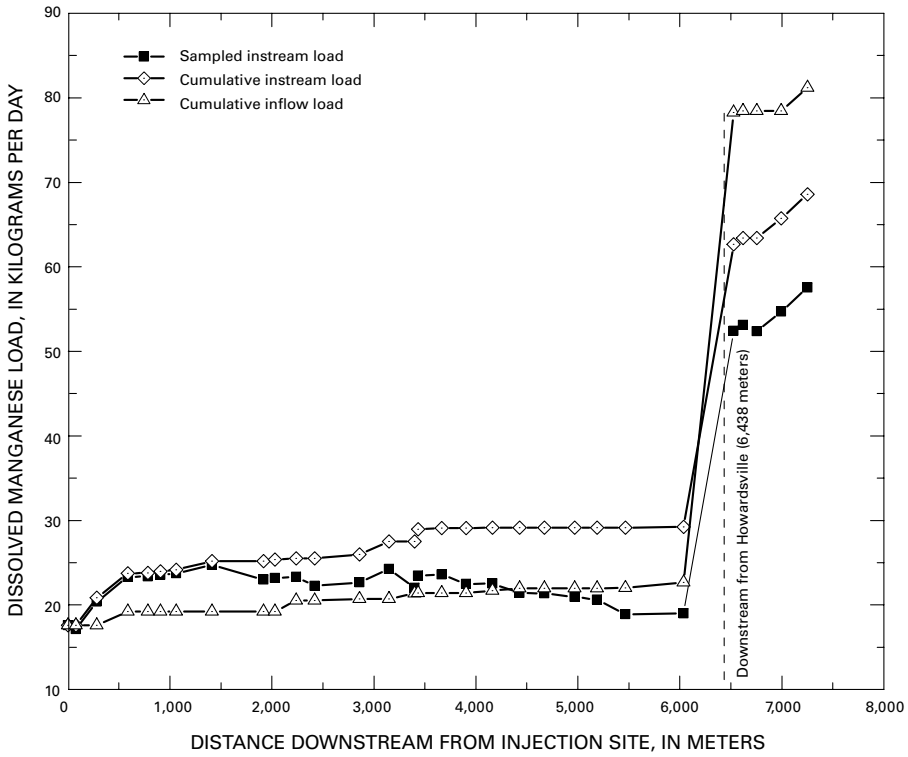


Figure 15. Sampled instream load, cumulative instream load, and cumulative inflow load of dissolved manganese with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

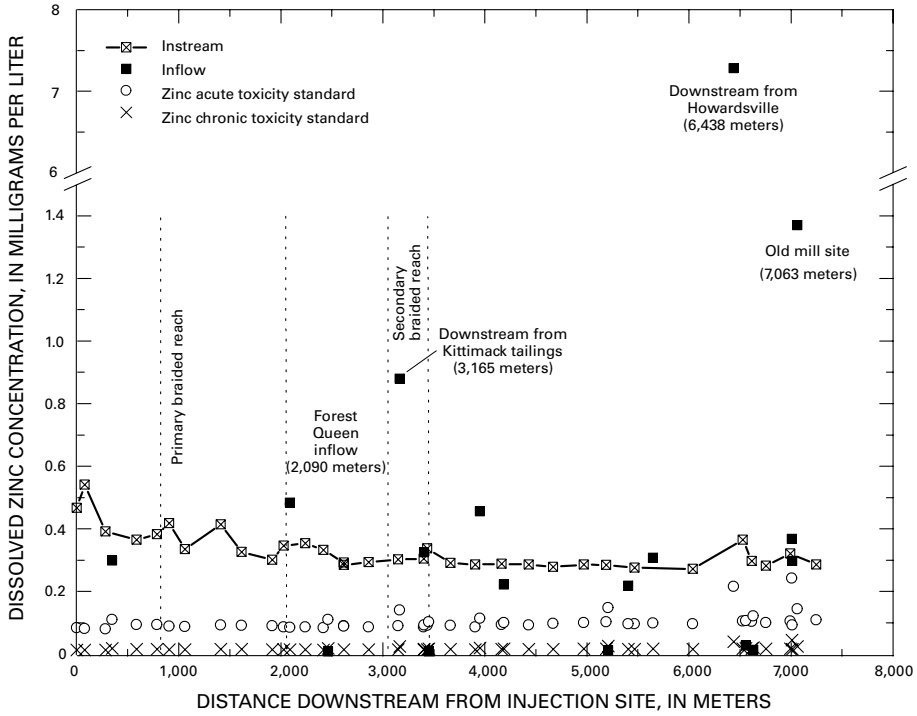


Figure 16. Instream and inflow dissolved zinc concentrations, zinc acute toxicity standard, and zinc chronic toxicity standard with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

The zinc concentration of inflow samples varied more than instream zinc concentrations. Inflow zinc concentrations ranged from a minimum value of 0.008 mg/L to a maximum value of 7.3 mg/L for the inflow downstream from Howardsville at 6,438 m (fig. 16). Increases in the dissolved zinc sampled instream load, cumulative instream load, and cumulative inflow load are noted at approximately 2,000 m, 3,500 m, and 6,500 m downstream from the 1998 injection site (fig. 17). Corresponding increases in instream dissolved zinc concentrations also occurred in these reaches (fig. 16).

The dissolved zinc load increase at approximately 2,000 m apparently was the result of elevated dissolved zinc concentrations in unsampled inflow at the downstream end of the primary braided reach and the Forest Queen inflow at 2,090 m (0.48 mg/L). Zinc loading from unsampled inflow could be from ground-water and/or surface-water interaction with historical tailings dispersed from Eureka, which now are located in and downstream from the braided reach (Vincent and others, 1999). A smaller load increase at 2,090 m was attributed to visible inflow from the Forest Queen mine (fig. 2). However, in the fall of 1998, a wetland was constructed at the mouth of the Forest Queen mine, and dissolved zinc concentrations in the Forest Queen discharge to the Animas River had decreased to near detection limits (0.003 mg/L) in 2000 as a result of this remedial action (M.A. Mast, U.S. Geological Survey, oral commun., 2000).

Downstream from the Kittimack tailings, from approximately 3,000 to 3,500 m, the dissolved zinc loads again increased (figs. 16 and 17). This area included the secondary braided reach and is identified as a contributor of dissolved zinc to the Eureka to Howardsville study reach. The effects of remediating this area are addressed through solute-transport simulations later in the "Zinc Solute-Transport Simulations" section.

The large increases in dissolved zinc load and instream dissolved zinc concentration at approximately 6,500 m likely were the result of inflow downstream from Howardsville at 6,438 m, where the maximum dissolved zinc inflow concentration of 7.3 mg/L was measured. Some of the tailings near Howardsville were relocated during 1997 and 1998, and the effects of tailings removal on instream zinc concentrations are undocumented. Inflows downstream from Howardsville and Cunningham Gulch drain abandoned adits and other historical mining sites and contribute dissolved zinc to the upper Animas River including the inflow at 7,063 m (1.4 mg/L dissolved zinc). Summing all the positive changes in zinc load between stream sites provides a minimum estimate of the total mass of zinc entering the study reach, which was approximately 76 kilograms per day (kg/d) for low-flow conditions in 1998.

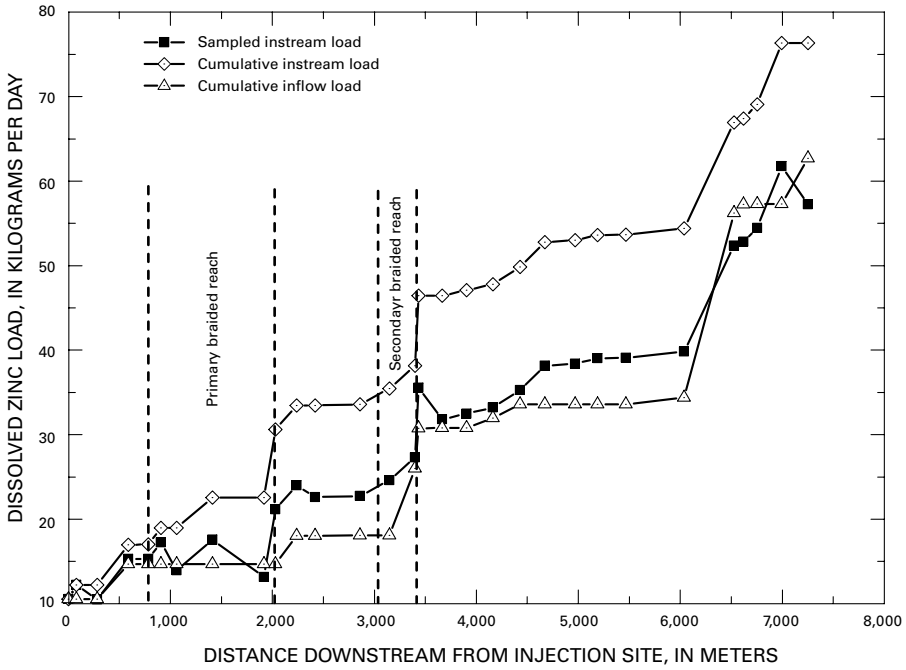


Figure 17. Sampled instream load, cumulative instream load, and cumulative inflow load of dissolved zinc with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

Sulfate

Instream sulfate concentrations ranged from 55 to 74 mg/L and were lower than the U.S. Environmental Protection Agency's (USEPA) secondary drinking-water standard of 250 mg/L (U.S. Environmental Protection Agency, 1992). A slight increase of instream sulfate concentration occurred downstream from the Eureka Gulch inflow, and concentrations remained nearly constant downstream from Eureka Gulch (fig. 18). Inflow sulfate concentrations in the study reach were more variable, ranging from 44 to 307 mg/L. The highest inflow sulfate concentrations were from Eureka Gulch at 347 m (90.7 mg/L), inflow downstream from the Kittimack tailings at 3,165 m (128 mg/L), inflow downstream from Howardsville at 6,438 m (307 mg/L), adit inflow at 7,008 m (266 mg/L), and inflow downstream from an old mill site at 7,063 m (108 mg/L) (fig. 18).

The mass-loading graphs for sulfate show increases in the sampled instream load, cumulative instream load, and cumulative inflow load from Eureka to Howardsville, indicating a general increase in instream and inflow sulfate load through the study reach. The sampled instream load and the cumulative instream load were approximately equal throughout the entire study reach, indicating no loss of sulfate because of chemical reaction (fig. 19).

Discussion of Sources and Loadings, Eureka to Howardsville Study Reach

Surface-water drainage in the Eureka to Howardsville study reach contributed aluminum, calcium, copper, iron, magnesium, sulfate, and zinc to the upper Animas River in 1998. Based on the 1998 synoptic-sampling results and mass-loading graphs, sources upstream from Eureka contributed aluminum, copper, manganese, and zinc to the Eureka to Howardsville study reach.

Colloidal aluminum, dissolved copper, and dissolved zinc were attenuated through the primary reach downstream from Eureka indicating that the braided reach is a sink for these metals. Colloidal aluminum attenuation through the primary braided reach likely was the result of physical processes such as particle settling and entrapment. Attenuation of dissolved copper and zinc through the primary braided reach likely was the result of adsorption of the dissolved constituents onto colloidal iron particles or streambed coatings. Instream colloidal aluminum concentrations were low downstream from the braided reaches to upstream from Howardsville (less than approximately 0.05 mg/L). The instream dissolved copper concentrations were lower than both the acute and chronic toxicity standards downstream from the primary braided reach to the end of the study reach.

Instream loads for colloidal aluminum, dissolved iron, colloidal iron, dissolved manganese, dissolved zinc, and dis-

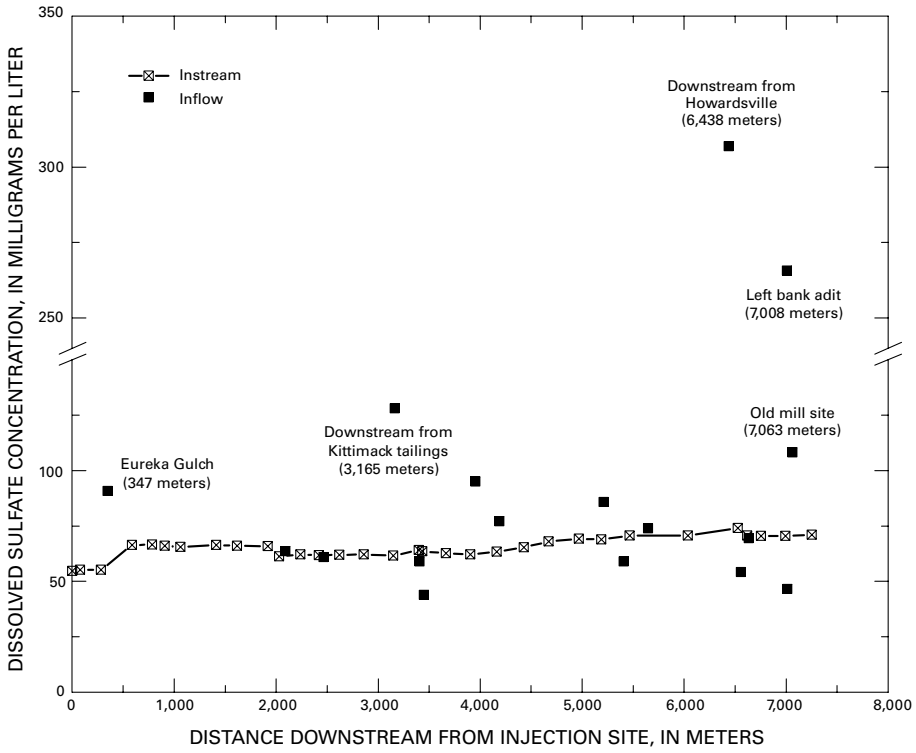


Figure 18. Instream and inflow dissolved sulfate concentrations with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

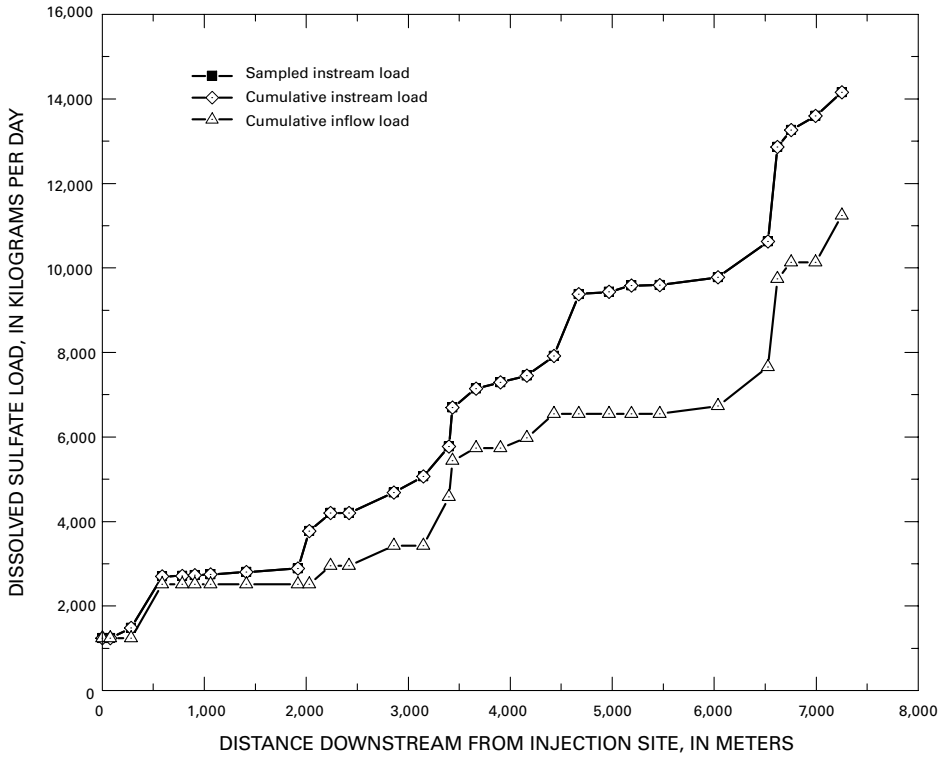


Figure 19. Sampled instream load, cumulative instream load, and cumulative inflow load of dissolved sulfate with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

solved sulfate all increased substantially downstream from the inflow at 6,438 m. The inflow at 6,438 m drains the area of tailings near Howardsville and the Pride of the West Mill. Some of these tailings were relocated during 1997 and 1998, and the effects of tailings removal on streamwater quality are uncertain. Upstream from Howardsville, dissolved manganese was diluted by inflow, and dissolved and colloidal iron concentrations generally were low or not detected. Although instream sulfate loads increased in a downstream direction, instream sulfate concentrations were lower than the USEPA's secondary drinking-water standard of 250 mg/L.

Based on synoptic-sampling results, dissolved zinc was the primary constituent of concern in the Eureka to Howardsville study reach of the upper Animas River, and a cumulative instream zinc load of 76 kg/d was calculated for low-flow conditions in 1998. Increases in zinc load were measured downstream from Howardsville at 6,438 m (19 percent of the total load), downstream from the braided reach near the Forest Queen mine at 2,090 m (13 percent of the total load), near the Kittimack tailings at 3,165 m (12 percent of the total load), downstream from site T4 at 6,993 m (10 percent of the total load), and downstream from Eureka Gulch at 347 m (6 percent of the total load). Zinc loading from the upper Animas drainage upstream from the study area also was substantial (14 percent of the total load). A constructed wetland installed at the mouth of the Forest Queen mine in 1998 was successfully reducing zinc concentrations in the Forest Queen discharge to near detection limits (0.003 mg/L) in 2000.

Zinc Solute-Transport Simulations

To interpret mass-loading calculations and to evaluate the effects of potential remediation, one-dimensional surface-water transport of dissolved zinc was simulated for the Eureka to Howardsville study reach using OTIS. This section of the report describes the conservative and first-order decay simulations and the remediation simulations for the Eureka to Howardsville reach.

Conservative and First-Order Decay Simulations

The Eureka to Howardsville study reach was divided into 14 model reaches based on discharge calculations and mass-loading graphs. Main channel cross-sectional area, storage zone cross-sectional area, and storage-zone exchange coefficients were determined using OTIS-P simulations of the transport site data, and a uniform dispersion coefficient of 1.0 m was used for all model reaches. For each model reach, a lateral inflow discharge was computed based on the stream discharge profile, and lateral inflow concentrations were assigned to each model reach based on measured inflow concentrations for 1998 (table 6 and fig. 20).

Using lateral inflow concentrations representative of measured inflow concentrations (table 6), the conservative (no decay) OTIS simulation computed instream zinc concentrations higher than the measured instream concentrations downstream from reach 2 (Eureka Gulch) (fig. 21). Consistent with the mass-loading graphs, this simulation result indicates removal of dissolved zinc from the stream. The loss of dissolved zinc likely was caused by zinc adsorption onto colloidal particles or streambed sediment and was represented as a first-order decay process using OTIS. First-order decay rates determined from best-fit trial and error simulations were assigned to model reaches 3, 5, 8, and 13 (table 6) to represent the decrease of sampled instream zinc load through these reaches (fig. 17). The OTIS result for instream zinc concentrations using measured lateral inflow concentrations and first-order decay is shown in figure 21 and is a reasonable match to the measured instream zinc concentrations.

Remediation Simulations

Two remediation alternatives were evaluated for the Eureka to Howardsville study reach using the first-order decay zinc solute-transport simulation described in the previous section. The first set of remediation simulations evaluated the effects of remediating inflow zinc concentrations in model reaches representing the Forest Queen mine inflow and unsampled inflow downstream from the braided reach in model reach 4 and inflow downstream from the Kittimack tailings in model reach 6. The second set of remediation simulations evaluates the effects of remediating inflow zinc concentrations in model reaches 4 and 6 in addition to inflow downstream from Howardsville in model reach 10.

To simulate remediation of stream reaches, the zinc lateral inflow concentrations were reduced from the measured inflow concentrations to hypothetical concentrations representative of inflow after remediation. Because these post-remediation concentrations are uncertain, remediation simulations of the Eureka to Howardsville study reach used a 50-percent reduction and then a 75-percent reduction in zinc concentrations for the lateral inflow concentrations of remediated reaches. A list of remediation simulations, zinc lateral inflow concentrations, and simulation results are presented in table 7.

The first set of remediation simulations address remediation of zinc concentrations in the model reaches representing the Forest Queen mine inflow and inflow below the Kittimack tailings (table 7, simulations 3 and 4). Model reach 4 represents the zinc inflow from the Forest Queen mine and unsampled inflow downstream from the braided reach, and model reach 6 represents the Kittimack tailings inflow. The zinc lateral inflow concentrations for these reaches were reduced by 50 percent and by 75 percent, and the simulations were run with first-order decay. Simulation results are shown in figure 22 and indicate that instream zinc concentrations downstream from the Kittimack tailings and upstream from Howardsville (end of model reach 7) would approach concentrations near 0.16 mg/L (fig. 22 and table 7) if zinc inflow

Table 6. OTIS setup and input parameters for zinc solute-transport model, upper Animas River, Eureka to Howardsville, Colorado.

[m, meters; m^2, square meters; m^3/s-m, cubic meters per second per meter; mg/L, milligrams per liter; /s, per second; --, not applicable]

Model reach	Distance from injection site (m)	Reach length (m)	Main channel cross-sectional area (m^2)	Lateral inflow rate (m^3/s-m)	Lateral inflow concentration (mg/L)	First-order decay rate (/s)	Description (see figure 2)
1	282	282	0.65	1.767×10^{-4}	0.008	--	T1
2	586	304	1.20	5.329×10^{-4}	0.299		Downstream from Eureka Gulch
3	1,918	1,332	1.20	2.445×10^{-5}	0.008	4.0×10^{-5}	Downstream from braided reach
4	2,240	322	1.20	8.751×10^{-4}	0.483		T2 and downstream from Forest Queen mine
5	3,150	910	1.50	1.777×10^{-4}	0.008	2.5×10^{-5}	Upstream from Kittimack tailings
6	3,400	250	1.50	4.169×10^{-4}	0.879		Downstream from Kittimack tailings
7	3,435	35	1.50	4.806×10^{-3}	0.325		Downstream from flow increase at 3,405 m
8	4,670	1,235	1.50	2.754×10^{-4}	0.229	1.0×10^{-4}	Increase in flow from willows and beaver ponds
9	5,467	797	1.50	4.584×10^{-5}	0.115		T3 and upstream from Howardsville
10	6,528	1,061	3.00	6.112×10^{-5}	2.62		Downstream from Howardsville and upstream from Cunningham Gulch
11	6,618	90	3.00	4.947×10^{-3}	0.020		Downstream from Cunningham Gulch
12	6,993	375	3.00	3.217×10^{-4}	0.400		T4
13	7,250	257	3.00	3.570×10^{-4}	1.37	5.0×10^{-4}	End of study reach
14	7,350	100	3.00	--	--	--	Downstream boundary

concentrations were reduced by 75 percent in model reaches 4 and 6. An instream zinc concentration of 0.16 mg/L is the upper limit of acute toxicity for some sensitive aquatic species (Besser and others, 2001).

For the second set of remediation simulations, the effects of remediating model reaches representing the Forest Queen mine (model reach 4), inflow downstream from the Kittimack tailings (model reach 6), and inflow downstream from Howardsville (model reach 10) were evaluated (table 7, simulations 5 and 6). The zinc lateral inflow concentrations for these reaches were reduced by 50 percent and by 75 percent, and the simulations were run with first-order decay. Simulation results are shown in figure 23 and indicate that instream zinc concentrations downstream from the Kittimack tailings and downstream from Howardsville would approach concentrations near 0.16 mg/L (fig. 23 and table 7) if zinc inflow concentrations were reduced by 75 percent in model reaches 4, 6, and 10.

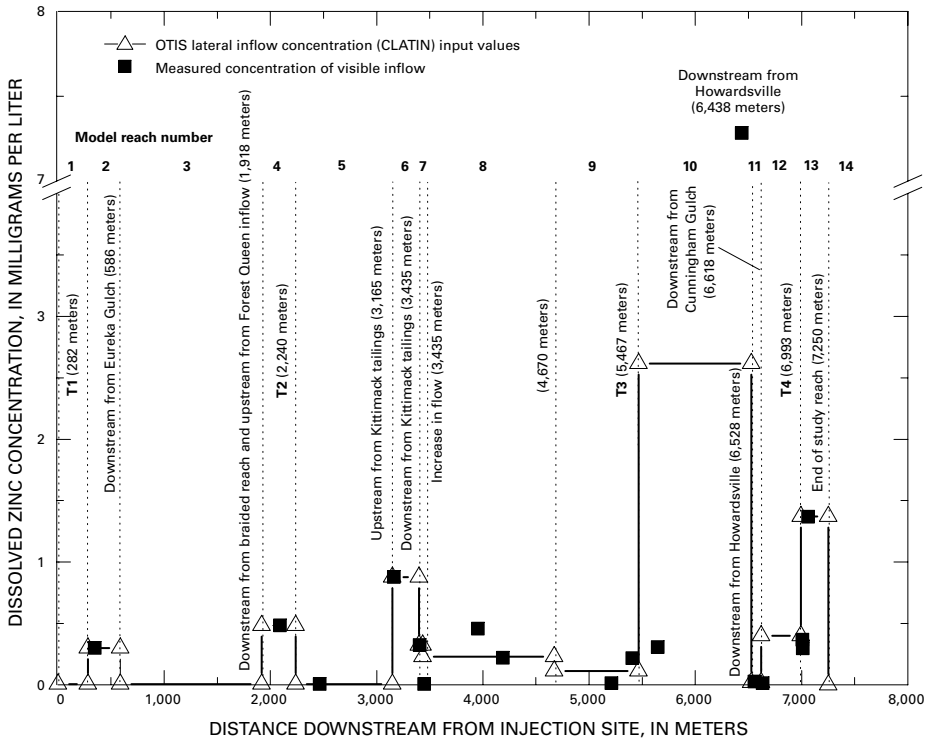


Figure 20. OTIS lateral inflow concentrations and measured inflow concentrations for dissolved zinc with distance from the injection site, upper Animas River, Eureka to Howardsville, Colorado.

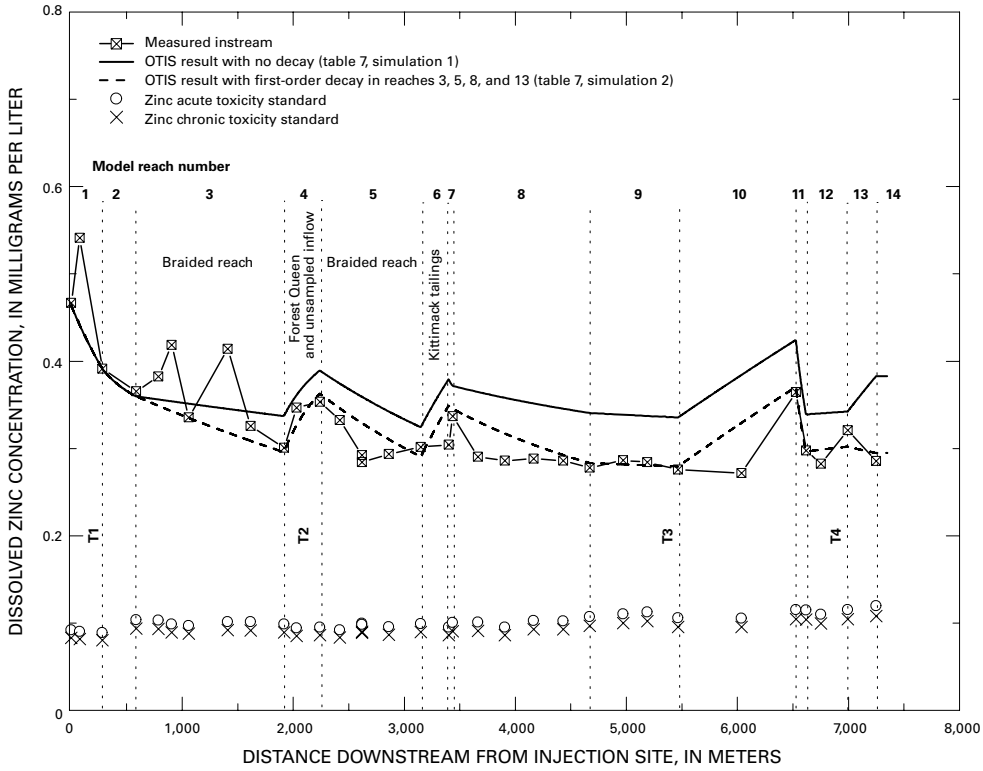


Figure 21. OTIS results for conservative and first-order decay simulations, upper Animas River, Eureka to Howardsville, Colorado.

Table 7. OTIS results for zinc solute-transport and remediation simulations, upper Animas River, Eureka to Howardsville, Colorado.

[CLATIN, OTIS input parameter for lateral inflow concentration; m, meters; mg/L, milligrams per liter; %, percent]

Simulation number	OTIS input lateral inflow concentration (CLATIN) (mg/L)			OTIS result — computed instream zinc concentration (mg/L)		Description
	Reach 4	Reach 6	Reach 10	End of reach 7 (3,435 m)	End of study reach (7,250 m)	
1	0.483	0.879	2.615	0.372	0.383	Zinc CLATIN represents measured inflows with no decay.
2	0.483	0.879	2.615	0.346	0.295	Zinc CLATIN represents measured inflows with first-order decay in reaches 3, 4, 8, and 13.
3	0.242	0.440	2.615	0.255	0.259	Forest Queen and Kittimack remediation. 50% reduction in zinc CLATIN in reaches 4 and 6 with first-order decay in reaches 3, 5, 8, and 13.
4	0.121	0.220	2.615	0.165	0.238	Forest Queen and Kittimack remediation. 75% reduction in zinc CLATIN in reaches 4 and 6 with first-order decay in reaches 3, 5, 8 and 13.
5	0.242	0.440	1.308	0.255	0.229	Forest Queen, Kittimack, and Howardsville remediation. 50% reduction in zinc CLATIN in reaches 4, 6, and 10 with first-order decay in reaches 3, 5, 8, and 13.
6	0.121	0.220	0.654	0.165	0.191	Forest Queen, Kittimack, and Howardsville remediation. 75% reduction in zinc CLATIN in reaches 4, 6, and 10 with first-order decay in reaches 3, 5, 8 and 13.

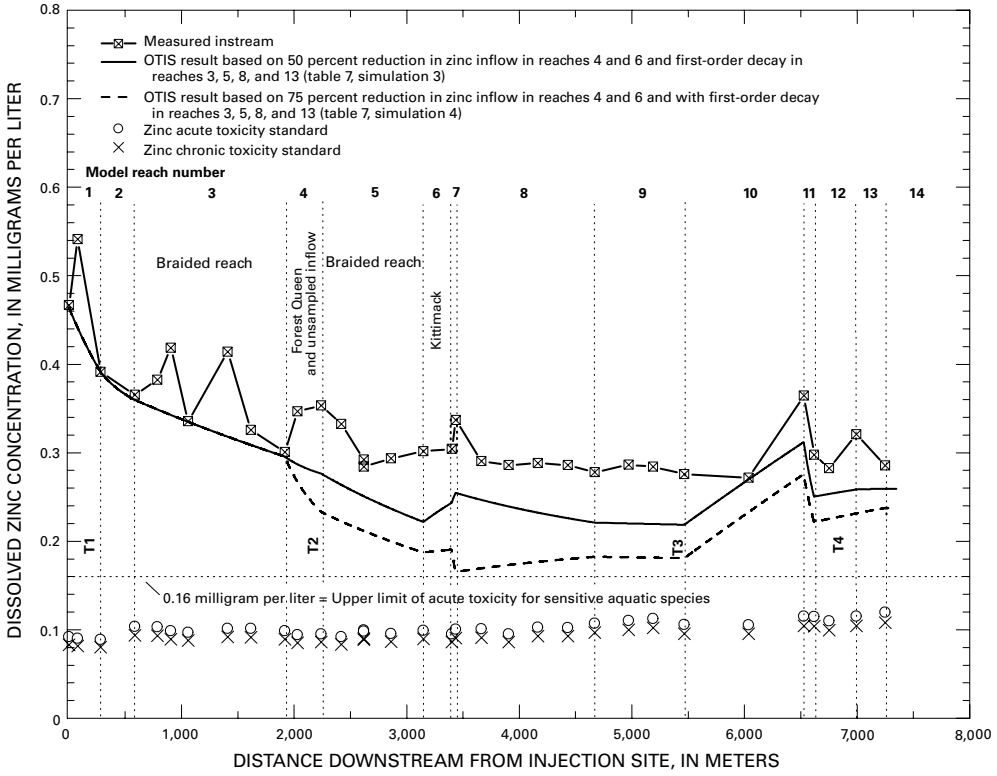


Figure 22. OTIS results for remediation simulations 3 and 4, upper Animas River, Eureka to Howardsville, Colorado.

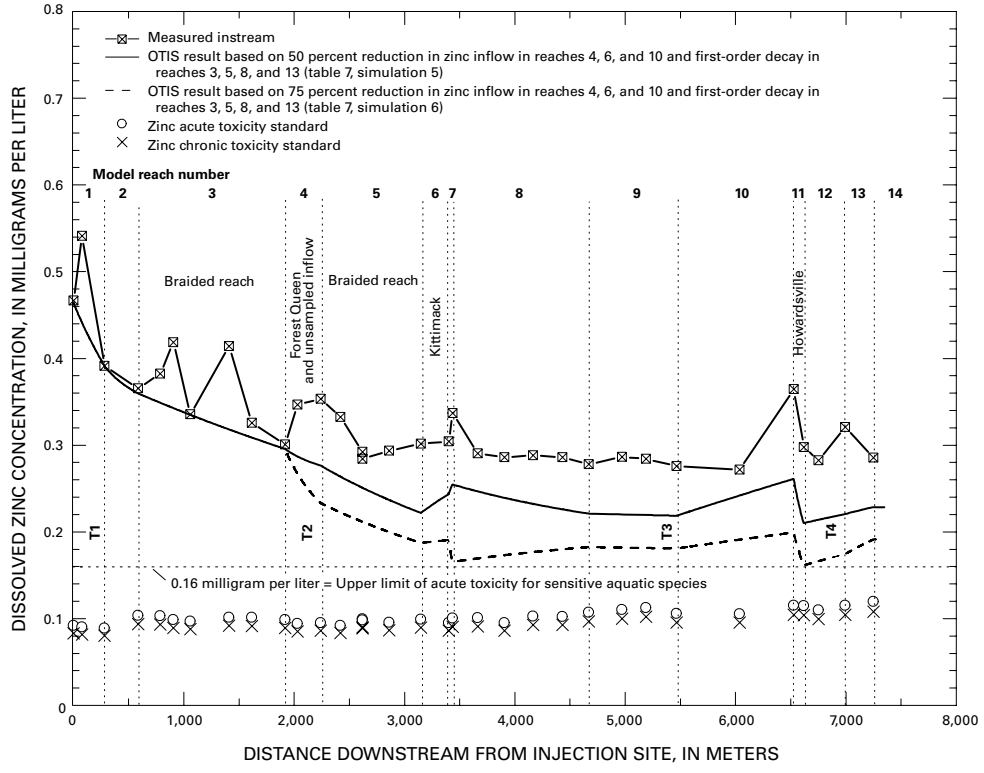


Figure 23. OTIS results for remediation simulations 5 and 6, upper Animas River, Eureka to Howardsville, Colorado.

Metal Loading to the Upper Animas River, Howardsville to Silverton, Colorado, Study Reach, September 1997

The Howardsville to Silverton tracer-injection study started near the historical mining town of Howardsville and ended just upstream from Silverton at the USGS gaging station 09358000 (referenced herein using the Colorado State gaging station number A68). The study reach encompassed a 7,858-m reach of the upper Animas River (fig. 24).

Tracer-Injection Study Objectives

There were two primary objectives for the Howardsville to Silverton tracer-injection study. The first objective was to identify and locate where metal loading occurred in the study reach. Although a tracer-injection study can help identify where load increases occur, it does not identify specific pathways to the stream from particular sites, except for visible surface inflows. Potential sources of metal loading included the tailings near Howardsville, Arrastra Gulch, tailings near the Mayflower Mill, and tailings near the Lackawanna Mill. The second objective was to determine (for low-flow conditions) if the stream reach is a net sink or source of metals to the downstream areas. Identifying and describing any instream geochemical processes that affect metal concentrations and natural attenuation accomplished this objective.

Tracer-Injection Study Methods

The Howardsville to Silverton tracer-injection study began at 1206 on September 13, 1997, and ran continuously until 0900 on September 15, 1997 (table 8). A solution containing 128,200 mg/L of sodium chloride (or 77,760 mg/L of chloride) was injected into the upper Animas River at an average rate of 1.098 L/min. A leak in the injectate pool prior to the injection start likely resulted in elevated preinjection chloride concentrations at the transport sites. For reporting results, time 0.0 is the beginning of the experiment time, which was midnight on September 13, 1997, and subsequent times are reported as decimal hours.

The Howardsville to Silverton injection site was located approximately 180 m upstream from a ditch near Howardsville so that inflow near Howardsville and Cunningham Gulch could be quantified as tributary inflow to the stream. The arrival of the sodium-chloride pulse and the development of a plateau concentration were measured at six downstream locations, transport sites T1 through T6 (fig. 24). Transport site T1 was located upstream from a channelized stream reach at 595 m, and transport site T2 was located at 1,059 m, which is downstream from Howardsville and upstream from Cunningham Gulch, to differentiate between these inflows. Transport site T3 was located upstream from a canyon in the river at 2,800 m, and transport site T4 was located upstream from Arrastra Gulch at 4,166 m. Transport site T5 was located at 6,038 m, and transport site T6 was located at 7,858 m at gaging station A68.

Synoptic Sampling and Analyses

Synoptic samples were collected from 41 instream sites, including the 6 transport sites, and 46 inflows on September 14, 1997, during the plateau period of the tracer injection. Instream sampling sites were located upstream and downstream from identified inflows to allow mass-balance calculations for each inflow, and additional sites were located in longer subreaches between inflows to account for subsurface inflow. Forty-six inflow sites were chosen to represent the range of pH and specific conductance of water entering the stream. Instream and inflow water samples were analyzed in the field and laboratory for various constituents as presented in the "Study Methods" section of this report. The analytical methods are listed in table 1.

Tracer-Injection Study Results

Chemical analyses results for chloride tracer concentrations at the Howardsville to Silverton transport and synoptic sites were used to compute traveltime, stream discharge, and chemical mass loading as discussed herein. The 1997 synoptic-sampling site locations are listed in table 9, field measurements and major ion concentrations are listed in Appendix 3, and the ICP-AES synoptic-sampling results are listed in Appendix 4. Data are sorted in downstream order within groups of stream and inflow sites to emphasize the downstream changes.

Arrival Times

Tracer arrival data and traveltime calculations for the six transport sites from Howardsville to Silverton are listed in table 10. The tracer sampling frequency provided well-defined tracer arrival graphs at sites T1, T2, T4, T5, and T6 (figs. 25a and 25b). A complete arrival curve was not obtained for site T3. However, a complete departure curve for site T3 was obtained, and the departure curve was used to compute traveltime between sites T2 and T3. Instream chloride concentrations increased to a maximum of 5.22 mg/L at sites T4, T5, and T6 from approximately 18 to 28 hours because of a rainstorm and the possible associated runoff of magnesium chloride road salts from the adjacent roadway.

The tracer moved quickly from the injection site upstream from Howardsville to the downstream transport site T6 (gaging station A68) at Silverton (table 10). The injection began at 12.1 hours, and the tracer arrival time at site T1 was

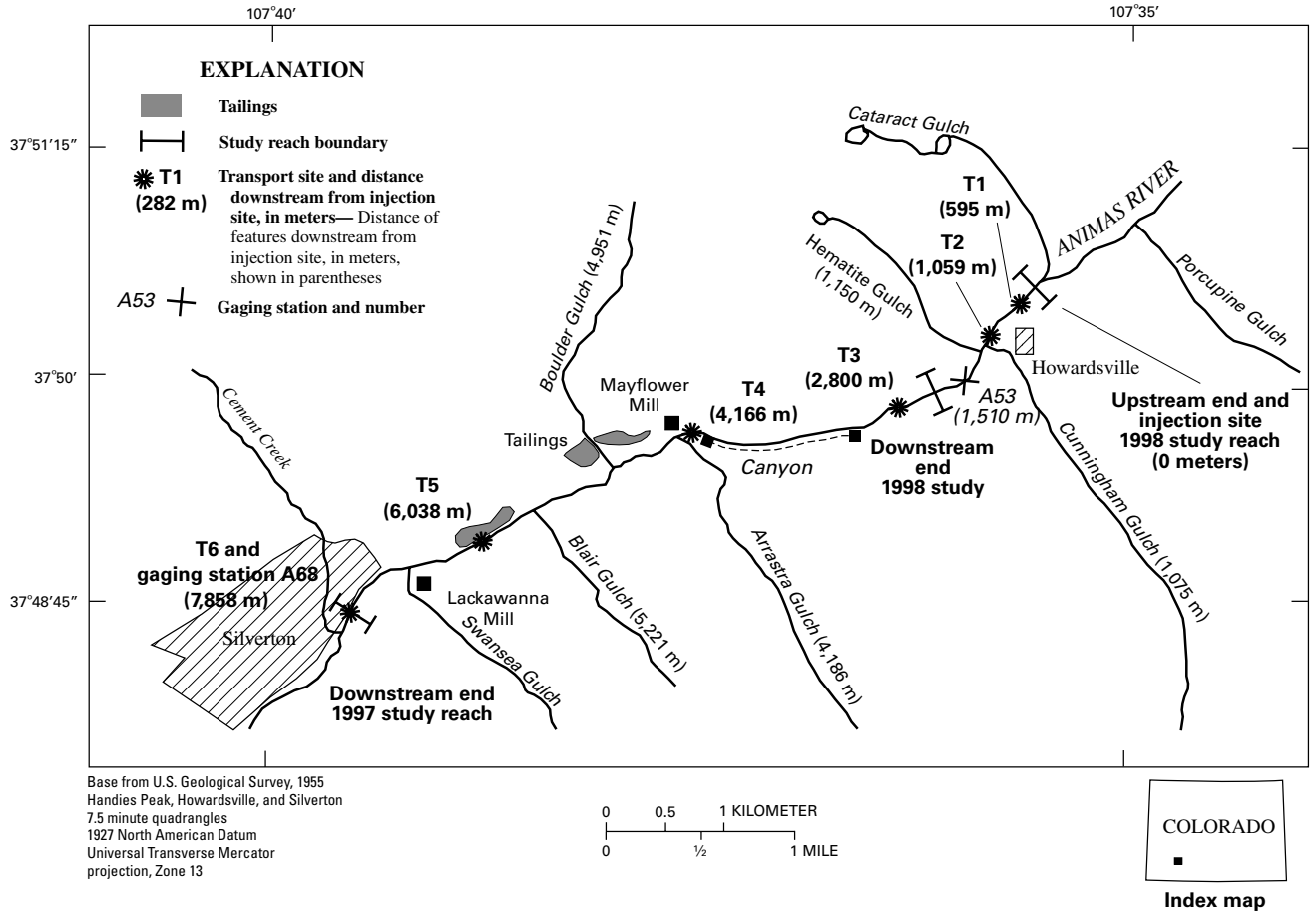


Figure 24. Howardsville to Silverton study reach, upper Animas River, Colorado, September 1997.

Table 8. Tracer-injection study sequence of events, upper Animas River, Howardsville to Silverton, Colorado, September 1997.

[mL/min, milliliters per minute]

Date	Clock time	Experimental time (hours)	Activity
09/12/1997			Stream reconnaissance and discharge measurements
09/13/1997	0000	0.0	Start of experimental time
	0900	9.0	Scheduled injection start, but injectate pool leaked
	1206	12.10	Started injection; measured pump rate of 1,075 mL/min
	1400	14.00	Measured pump rate at 1,100 mL/min
	1630	16.50	Measured pump rate at 1,100 mL/min
	1810	18.17	Measured pump rate at 1,100 mL/min
09/14/1997			Synoptic sampling
	0905	33.08	Measured pump rate at 1,080 mL/min; mixed more salt into pool
	1330	37.50	Measured pump rate at 1,070 mL/min
09/15/1997	0900	57.00	Stopped injection
	1100	59.00	Slug injection of remaining solution

Table 9. Synoptic-sampling sites and discharge calculated from tracer-dilution, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

[distance, distance downstream from injection sites; L/s, Liters per second; ft^3/s, cubic feet per second; RB, right bank; LB, left bank; --, not applicable]

Distance (meters)	Site name	Source	Inflow location	Discharge (L/s)	Discharge (ft^3/s)
0	Upstream from injection site	Stream	--	1,107	39.1
160	Downstream from injection site	Stream	--	1,107	39.1
181	Dredged ditch from Howardsville Ponds	Inflow	Left bank	1.6	0.05
213	Stream from beaver ponds	Inflow	Right bank	1.6	0.05
310	Downstream from RB ponds	Stream	--	1,110	39.2
315	RB seep from talus	Inflow	Right bank	0	0
595	T1—near construction	Stream	--	1,110	39.2
745	Drains beaver pond	Inflow	Right bank	35	1.2
905	Upstream from RB inflow	Stream	--	1,145	40.4
910	From cobble road bank RB	Inflow	Right bank	10.5	0.37
955	Upstream from Howardsville Mill	Stream	--	1,156	40.8
965	Mill discharge	Inflow	Left bank	14.4	0.51
1,059	T2—Downstream from Howardsville Mill	Stream	--	1,170	41.3
1,075	Cunningham Gulch	Inflow	Left bank	386	13.6
1,135	Downstream from Cunningham Gulch	Stream	--	1,556	54.9
1,150	Hematite Gulch	Inflow	Right bank	56.6	2.0
1,270	Downstream from bridge	Stream	--	1,612	56.9
1,510	At State gage (A53)	Stream	--	1,615	57.0
1,605	Draining LB adit—large inflow	Inflow	Left bank	6.4	0.23
1,648	RB road bank seep (old mill site)	Inflow	Right bank	6.4	0.23
1,665	RB seep beneath old road bank	Inflow	Right bank	6.4	0.23
1,725	Downstream from clean and dirty inflows	Stream	--	1,634	57.7
1,745	Water across road RB	Inflow	Right bank	88.6	3.1
1,925	At upper “campground” A	Stream	--	1,723	60.8
1,925	At upper “campground” B	Stream	--	1,723	60.8
2,050	LB spring inflow	Inflow	Left bank	3.6	0.13
2,110	Downstream from campground	Stream	--	1,726	61.0
2,125	Drains LB ponds with iron precipitate	Inflow	Left bank	3.7	0.13
2,360	LB inflow	Inflow	Left bank	3.7	0.13
2,361	LB rapid inflow from marsh	Inflow	Left bank	3.7	0.13
2,425	Swift inflow from marshy area	Inflow	Left bank	3.7	0.13
2,515	Upstream from draining adit	Stream	--	1,737	61.4
2,522	Drains old mining	Inflow	Left bank	16.9	0.60

Table 9. Synoptic-sampling sites and discharge calculated from tracer-dilution, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.—Continued

[distance, distance downstream from injection sites; L/s, Liters per second; ft^3/s, cubic feet per second; RB, right bank; LB, left bank; --, not applicable]

Distance (meters)	Site name	Source	Inflow location	Discharge (L/s)	Discharge (ft^3/s)
2,572	Downstream from adit	Stream	--	1,754	61.9
2,605	RB inflow from willows	Inflow	Right bank	0.3	0.01
2,709	RB inflow	Inflow	Right bank	0.3	0.01
2,800	T3—Truck park	Stream	--	1,754	61.9
3,040	Narrow chute within canyon	Stream	--	1,788	63.1
3,235	RB cascade across road	Inflow	Right bank	0.0	0.00
3,295	Downstream from first cableway	Stream	--	1,788	63.1
3,555	Mid canyon	Stream	--	1,788	63.1
3,682	RB drainage off grassy hillside	Inflow	Right bank	21.2	0.75
3,820	RB cascade from rocky bank	Inflow	Right bank	21.2	0.75
4,023	Between RB inflows in canyon	Stream	--	1,830	64.6
4,033	RB cascade from rocky bank	Inflow	Right bank	2.8	0.10
4,166	T4—upstream from Arrastra Gulch	Stream	--	1,833	64.7
4,186	Arrastra Gulch	Inflow	Left bank	218	7.7
4,190	Inflow from pipe RB	Inflow	Right bank	2.8	0.10
4,310	Downstream from Arrastra Gulch	Stream	--	2,053	72.5
4,334	From “pipe bridge”	Inflow	Right bank	3.2	0.11
4,353	Stream level spring RB	Inflow	Right bank	3.2	0.11
4,473	Downstream from river level spring	Stream	--	2,060	72.7
4,533	Marsh area RB	Inflow	Right bank	27.1	0.96
4,581	Downstream from LB abandoned mill	Stream	--	2,087	73.7
4,586	Ponded water RB	Inflow	Right bank	12.0	0.42
4,656	Upstream from Pinnacle Gap	Stream	--	2,099	74.1
4,816	Upstream from acid inflows	Stream	--	2,099	74.1
4,886	Seep w/acid algae	Inflow	Right bank	2.8	0.10
4,916	Downstream from acid inflows	Stream	--	2,102	74.2
4,951	Boulder Gulch	Inflow	Right bank	39.0	1.4
4,970	RB inflow—substantial	Inflow	Right bank	39.0	1.4
5,131	Downstream from Boulder Gulch	Stream	--	2,180	77.0

Table 9. Synoptic-sampling sites and discharge calculated from tracer-dilution, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.—Continued

[distance, distance downstream from injection sites; L/s, Liters per second; ft^3/s, cubic feet per second; RB, right bank; LB, left bank; --, not applicable]

Distance (meters)	Site name	Source	Inflow location	Discharge (L/s)	Discharge (ft^3/s)
5,161	Pond to stream LB with fish	Inflow	Left bank	14.2	0.50
5,221	Blair Gulch	Inflow	Left bank	14.2	0.50
5,306	Downstream from Blair Gulch	Stream	--	2,208	78.0
5,355	LB inflow from willow bog	Inflow	Left bank	0.3	0.01
5,356	Small ponds RB in cobbles	Inflow	Right bank	0.3	0.01
5,446	LB inflow near wells	Inflow	Left bank	0.3	0.01
5,536	Downstream from first of capped tailings	Stream	--	2,208	78.0
5,756	Upstream from drain from tails	Stream	--	2,233	78.3
5,766	Drains tailings RB in “ditch”	Inflow	Right bank	0.3	0.01
5,858	Seep along 60 m of grass	Inflow	Right bank	0.3	0.01
6,038	T5—Downstream from capped tailings	Stream	--	2,233	78.8
6,105	LB inflow from willows	Inflow	Left bank	24.2	0.86
6,288	Downstream from toe of Mayflower	Stream	--	2,257	79.7
6,528	Upstream from Lackawanna Bridge	Stream	--	2,257	79.7
6,768	Downstream from Lackawanna Bridge	Stream	--	2,257	79.7
7,008	Upstream from Lackawanna Mill	Stream	--	2,257	79.7
7,103	Discharge from Lackawanna Mill	Inflow	Left bank	0.00	0.00
7,163	LB inflow	Inflow	Left bank	0.30	0.01
7,283	Downstream from Lackawanna Mill	Stream	--	2,257	79.7
7,483	LB inflow	Inflow	Left bank	2.8	0.10
7,523	Among braids near town	Stream	--	2,257	79.7
7,688	RB drainage from Mayflower	Inflow	Right bank	7.1	0.25
7,858	T6—At bridge/gage A68 - end of study reach	Stream	--	2,264	79.9

Table 10. Tracer arrival data and traveltime calculations for transport sites downstream from the tracer-injection site, upper Animas River, Howardsville to Silverton, Colorado, September 1997.

[m, meters; m/s, meters per second; mg/L, milligrams per liter; NM, not measured (arrival time computed from departure curve for transport site T3)]

Transport site	Distance downstream from injection site (m)	Distance between transport sites (m)	Arrival time (t_{50}) (hours)	Traveltime from injection site (hours)	Traveltime between transport sites (hours)	Average velocity between transport sites (m/s)	Comments
T1	595	595	12.38	0.28	0.28	0.59	Injection start time = 12.1 hours
T2	1,059	464	12.60	0.50	0.22	0.59	
T3	2,800	1741	NM(13.4)	1.30	0.80	0.60	T3 traveltime computed from departure curve instead of arrival curve
T4	4,166	1,366	14.07	1.97	0.67	0.57	
T5	6,038	1,872	14.90	2.80	0.83	0.63	
T6	7,858	1,820	15.68	3.58	0.78	0.65	

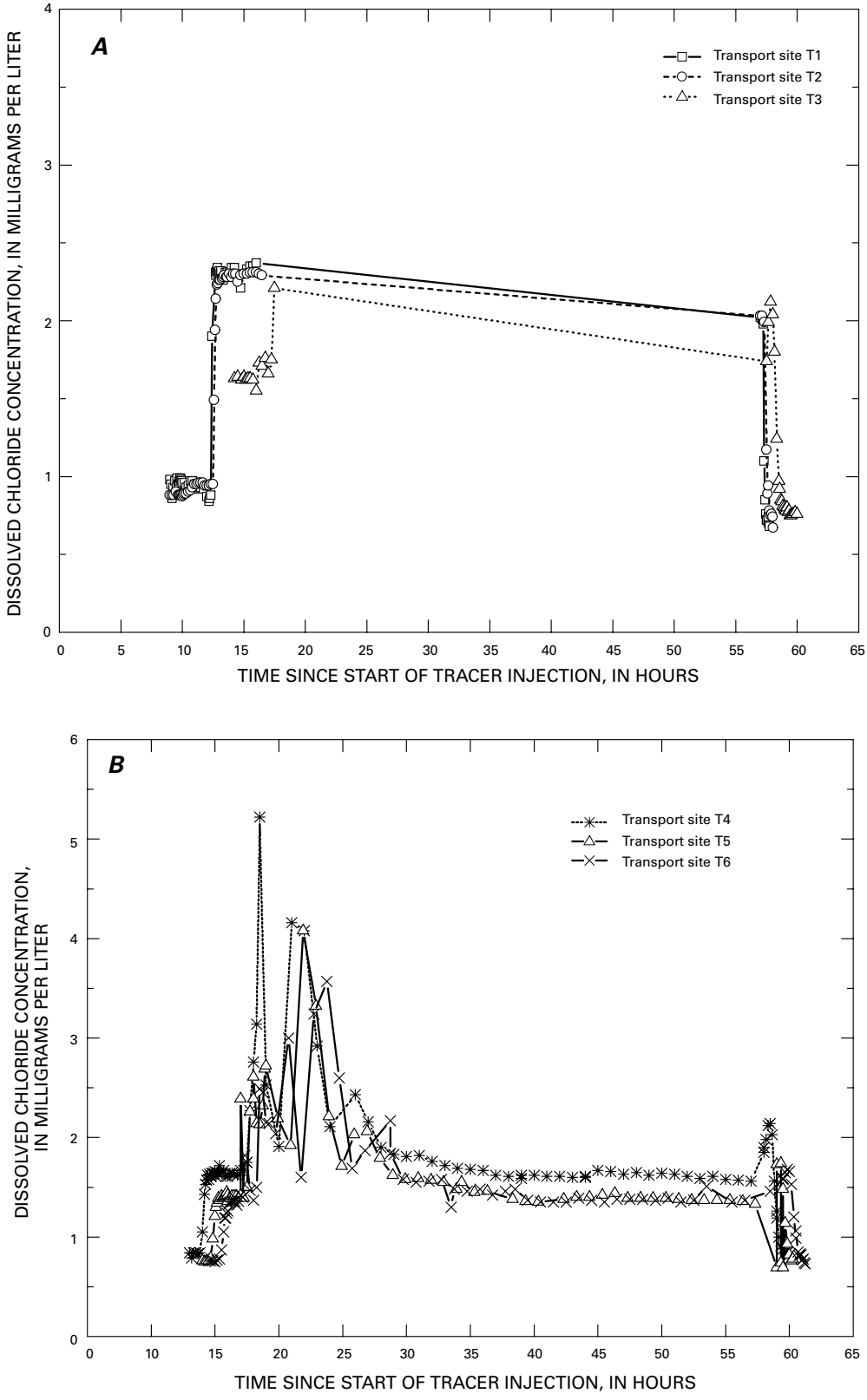


Figure 25. Dissolved chloride concentrations with time at (*A*) transport sites T1, T2, and T3, and (*B*) transport sites T4, T5, and T6, upper Animas River, Howardsville to Silverton, Colorado, September 1997.

12.38 hours, indicating a traveltime of 0.28 hour (16 minutes) and an average flow velocity of 0.59 m/s between the injection site and site T1. A similar traveltime (0.22 hour) and velocity (0.59 m/s) were measured for a similar distance between sites T1 and T2. The tracer arrival time at site T3, computed from the T3 departure curve, was 13.4 hours, indicating a traveltime of 1.3 hours from the injection site. The total traveltime from the injection site to site T6 was 3.58 hours. The average flow velocity generally increased downstream to a maximum value of 0.65 m/s between sites T5 and T6.

Discharge Profile

A detailed discharge profile for the Howardsville to Silverton study reach was developed using the chloride tracer concentrations measured in the synoptic samples. For the Howardsville to Silverton study reach, synoptic instream chloride concentrations generally were higher than the inflow chloride concentrations, and chloride concentrations decreased downstream due to dilution (fig. 26a). However, several inflow chloride concentrations were higher than instream chloride concentrations, and downstream increases of instream chloride concentrations were measured in the synoptic chloride profile. The inflows with higher chloride concentrations were located primarily on the right streambank, and some possibly were the result of runoff containing magnesium chloride road salts from the roadway, which also is located on the right streambank. For stream reaches where chloride was not an appropriate indicator of dilution because of higher inflow concentrations, the conservative ions strontium, manganese, and sulfate were used to calculate discharge.

For a decrease in chloride concentration to be considered a measurable change and not a product of analytical error, the decrease in concentration between instream samples must be higher than the precision of the chemical analyses. Error bars are indicated for chloride concentrations to show the precision of 1.83 percent for the 1997 data set (fig. 26a). If a change in instream chloride concentration was lower than the precision of the analysis, the downstream chloride concentration was held constant for discharge calculations until a change higher than the precision of the analysis was measured.

The synoptic-sampling profile of chloride concentration (fig. 26a), supplemented by strontium, manganese, and sulfate concentrations, was used to calculate discharge according to the relations presented in table 2. Discharge results are presented in table 9 and in figure 26b. The resulting discharge profile for the Howardsville to Silverton study reach indicates stream discharge ranged from 1,107 L/s (39.1 ft^3/s) at the injection site to 2,264 L/s (79.9 ft^3/s) at gaging station A68 (fig. 26b), and the total increase of discharge through the study reach was 1,157 L/s (40.8 ft^3/s). The largest inflow was Cunningham Gulch (1,075 m) with a computed inflow discharge of 386 L/s (13.6 ft^3/s) or 33 percent of the total flow increase. Arrastra Gulch (4,186 m) contributed 218 L/s (7.7 ft^3/s) or 19 percent of the total flow increase. The contributions from Hematite Gulch (1,150 m) and Boulder Gulch (4,951 m) were 5 percent and 3 percent, respectively, of the total increase in stream discharge. Small surface inflows and ground-water seeps caused the remaining streamflow increase along the study reach. Discharge values computed from the synoptic-sampling results compare well with discharge measured at the six transport sites (fig. 26b).

The Howardsville to Silverton discharge values computed from the September 1997 tracer-injection study were higher than the discharge values computed from the August 1998 Eureka to Howardsville tracer-injection study. At the instream site immediately downstream from Cunningham Gulch, the 1997 computed discharge at site 1,135 m was 1,556 L/s (54.9 ft^3/s), whereas the 1998 computed discharge at this same site (6,618 m in 1998 study) was 2,107 L/s (74.4 ft^3/s) (table 5). The difference in discharge from 1997 to 1998 is attributed to seasonal variation.

Synoptic-Sampling and Mass-Loading Calculation Results

This section presents results for the 1997 Howardsville to Silverton synoptic-sampling results and mass-loading calculations for constituents of interest. Synoptic-sampling data are presented in Appendixes 3 and 4, and the data are contained in the USGS digital database for the Animas River watershed Abandoned Mine Land Program (Sole and others, 2005)

pH

The downstream profile of instream and inflow pH values for the 1997 Howardsville to Eureka study reach is presented in figure 27. Instream pH values were near neutral and ranged from a minimum of 7.4 at 4,581 m to a maximum of 7.8 at 3,295 m. Although there was no clear downstream trend for the instream pH values, instream pH did appear to vary with inflow pH. Instream pH values increased downstream from inflows with high pH values, such as those from Cunningham and Hematite Gulches, and instream pH values decreased downstream from inflows with pH values lower than the stream.

Based on the pH downstream profile, the study reach can be subdivided into sections with similar characteristics. First is the upper part of the stream from the injection site to Cunningham Gulch where the inflows at 181 m and 965 m had pH values of 6.9. These inflows lowered the instream pH to 7.4 upstream from Cunningham Gulch. The 1997 pH from the inflow downstream from Howardsville (965 m) was higher than the pH for this same inflow in the 1998 Eureka to Howardsville synoptic sampling (pH of 5.7 for the 6,438-m inflow). Instream pH increased to 7.7 downstream from Cunningham Gulch because of the high-pH inflow from Cunningham (8.0) and Hematite (8.1) Gulches.

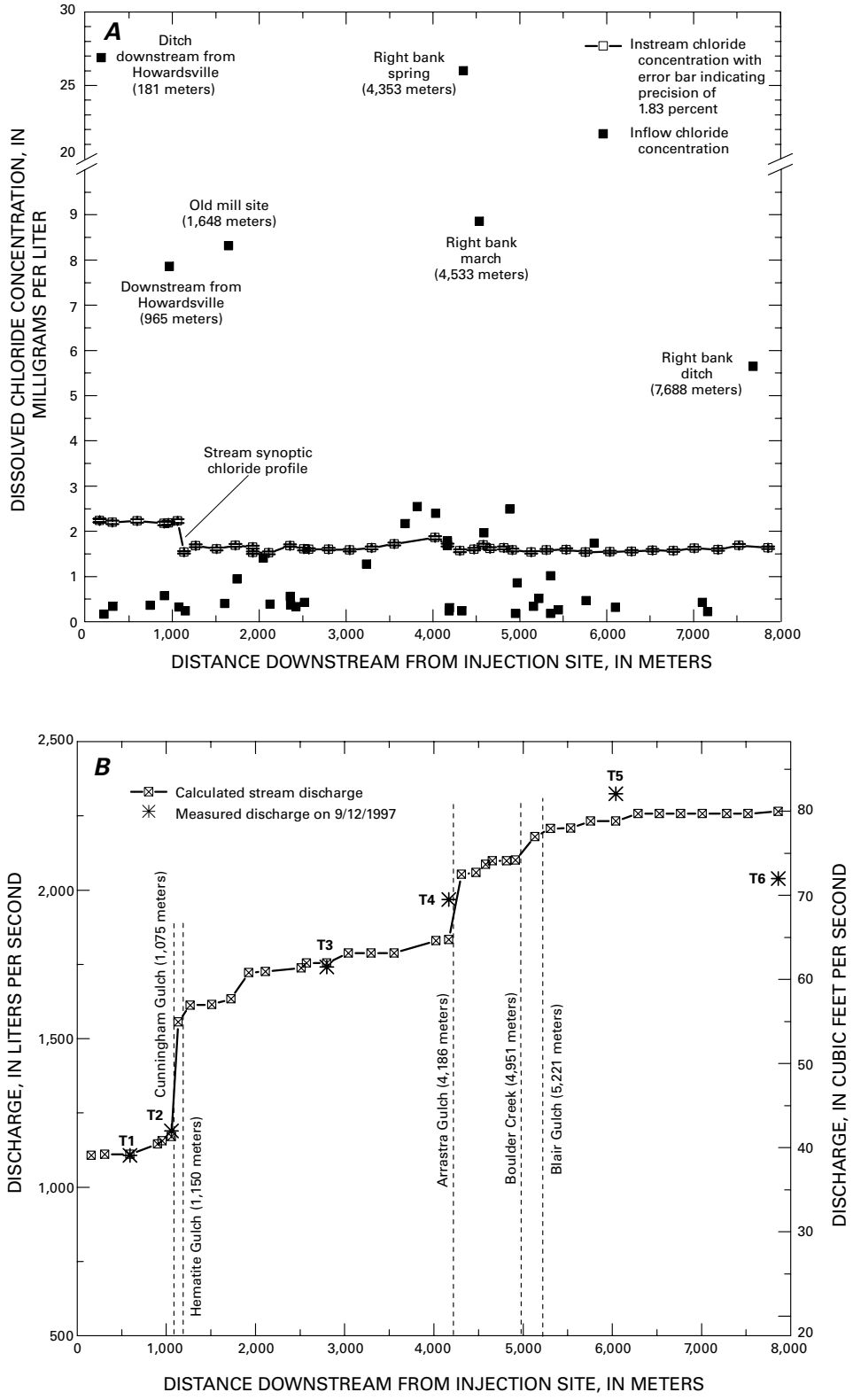


Figure 26. (*A*) Dissolved chloride concentrations, and (*B*) calculated discharge with distance downstream from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

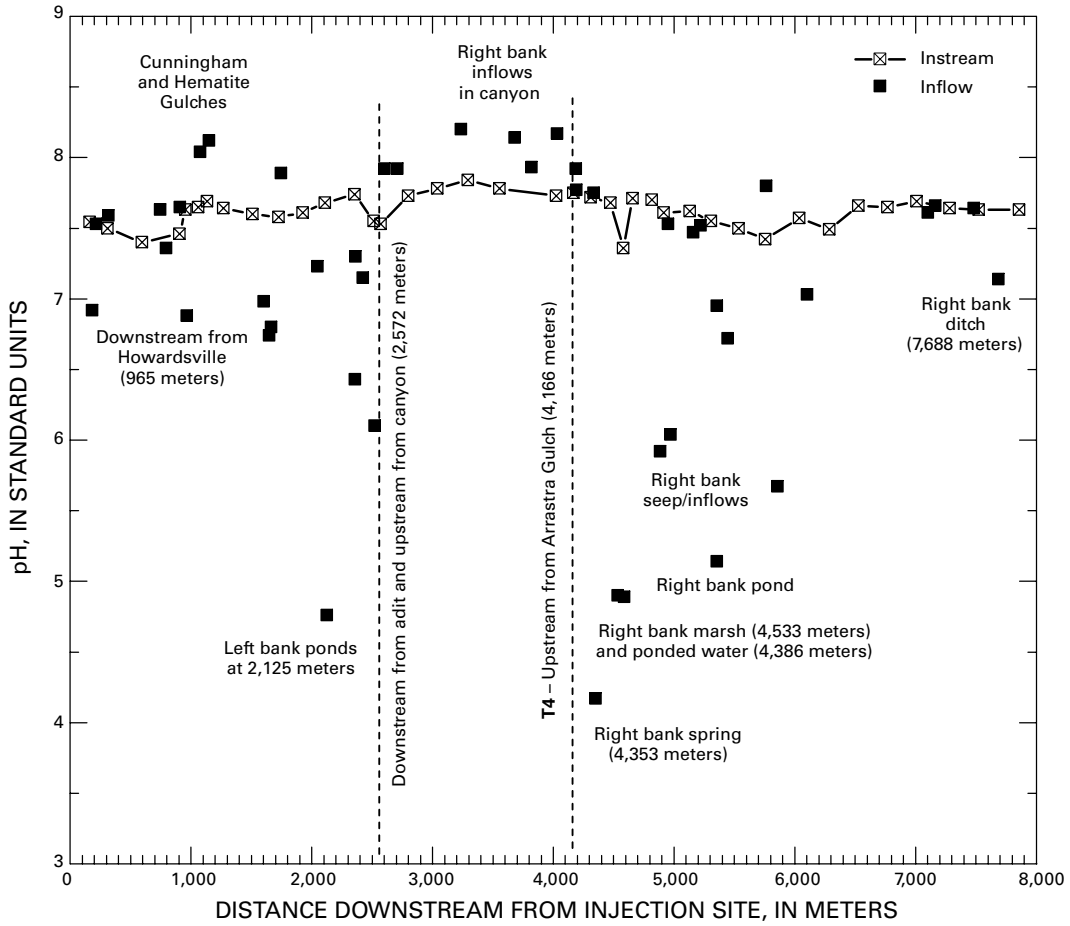


Figure 27. Instream and inflow pH with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

The second area affected by low-pH inflows was from 1,605 to 2,572 m, where inflows with pH values lower than instream values lowered instream pH (fig. 27). The lowest inflow pH in this reach (4.8) was from ponds on the left bank at 2,125 m. Between the site at 2,572 m and site T4 at 4,166 m, the upper Animas River flows through a steep-walled canyon. The visible inflows in this reach are primarily from the right bank, with inflow pH values ranging from a minimum of 7.9 to a maximum of 8.2, and instream pH ranging from 7.7 to 7.8 (fig. 27).

A third area affected by AMD and ARD was downstream from 4,353 m, where a series of low-pH right bank inflows lowered the instream pH. The lowest inflow pH in the entire study reach emanated from a right bank spring at 4,353 m (pH of 4.2), and additional right bank low-pH inflows were at 4,533 m (pH of 4.9) and 4,586 m (pH of 4.9) (fig. 27).

Aluminum

Instream dissolved aluminum concentrations were low and had little variability, although concentrations increased slightly downstream due to inflows with elevated dissolved aluminum concentrations. Instream dissolved aluminum concentrations ranged from less than the method detection limit of 0.01 to 0.98 mg/L. Inflow dissolved aluminum concentrations were more variable than instream concentrations and ranged from less than the method detection limit of 0.01 to 23.5 mg/L. The inflows with elevated dissolved aluminum concentrations included the right bank inflows downstream

from Arrastra Gulch. Dissolved aluminum was not elevated in the ditch upstream from Howardsville (0.060 mg/L at 181 m) or the inflow downstream from Howardsville (0.012 mg/L at 965 m). Instream colloidal aluminum concentrations also appeared to increase slightly in a downstream direction because of the inflow of elevated dissolved aluminum concentrations and the subsequent precipitation of aluminum oxyhydroxide.

Calcium and Magnesium

Calcium and magnesium concentrations in the upper Animas River for 1997 are controlled by the calcium and magnesium concentrations of surface-water inflows. Instream concentrations of calcium ranged from approximately 35 to 40 mg/L with a mean of 37 mg/L, and inflow calcium concentrations ranged from 12 to 344 mg/L with a mean of 81 mg/L. Instream calcium concentrations increased slightly in a downstream direction from about 36 mg/L at Howardsville to about 39 mg/L at gaging station A68 in response to elevated inflow calcium concentrations (fig. 28).

Instream magnesium concentrations had little variability and ranged from about 2.4 to 2.7 mg/L, generally increasing in a downstream direction. Inflow magnesium concentrations varied more than instream concentrations ranging from 0.8 to 35.3 mg/L (fig. 29). The inflows with elevated magnesium concentrations included the ditch upstream from Howardsville (10.6 mg/L), inflow downstream from Howardsville (7.55 mg/L), and a right bank ditch at 7,688 m (14.2 mg/L), as well as four right bank inflows downstream from Arrastra Gulch with magnesium concentrations ranging from 14.4 to 35.3 mg/L.

Copper

Instream dissolved copper concentrations were compared to acute and chronic toxicity standards for aquatic life. Figure 30 presents a graph of instream dissolved copper concentrations for the Howardsville to Silverton study reach 1997 synoptic sampling and the acute and chronic toxicity standards computed for each instream sample. Instream copper concentrations were near or estimated less than the method detection limit of 0.002 mg/L and were lower than the acute and chronic toxicity standards throughout the study reach (fig. 30). The maximum inflow copper concentrations were from the right bank inflows downstream from Arrastra Gulch (5.2 mg/L at 4,353 m; 0.36 mg/L at 4,533 m; 0.20 at 4,586 m; and 2.4 mg/L at 5,356 m).

Iron

Instream dissolved iron concentrations in the Howardsville to Silverton study reach generally were low or not detected except immediately downstream from Howardsville in 1997 (fig. 31). Instream colloidal iron also was not detected upstream from Howardsville (fig. 31). The dissolved iron concentration of inflow downstream from Howardsville (965 m) was 1.2 mg/L in 1997, which was an order of magnitude lower than the inflow dissolved iron concentration in 1998 (11.7 mg/L at 6,438 m in 1998 study). The maximum instream dissolved iron concentrations occurred immediately downstream from Howardsville at 1,059 m (0.13 mg/L) and downstream from Arrastra Gulch at 4,310 m (0.16 mg/L). Instream dissolved iron concentrations decreased and instream colloidal iron concentrations increased downstream from both the Howardsville and Arrastra Gulch inflows probably in response to iron oxyhydroxide precipitation.

The sampled instream, cumulative instream, and cumulative inflow loads for colloidal iron all increased downstream from Howardsville (fig. 32). The colloidal iron loads increased in response to the elevated inflow colloidal iron concentrations downstream from Howardsville (12.4 mg/L at 965 m) and the precipitation of iron oxyhydroxides from the elevated inflow dissolved iron concentrations. Downstream from Howardsville, the cumulative instream colloidal iron load was higher than the cumulative inflow load (fig. 32) indicating that mineral precipitation was a source of instream iron colloids. Downstream from Arrastra Gulch, from approximately 4,166 to 6,000 m, there was an increase of sampled instream colloidal iron load but no increase of cumulative inflow load, which indicates ground-water discharge of dissolved iron, possible precipitation of iron colloids, or both (fig. 32).

Based on synoptic-sampling concentration data and mass-loading calculations, inflow downstream from Howardsville at 965 m was a source of dissolved and colloidal iron to the upper Animas River reach from Eureka to Howardsville in 1998 and from Howardsville to Silverton in 1997. Inflow from a draining adit at 7,008 m in the Eureka to Howardsville study reach (1,605 m in the Howardsville to Silverton study reach) was a secondary source of dissolved and colloidal iron in both studies. The stream reach downstream from Arrastra Gulch and the right bank ditch inflow at 7,688 m were secondary sources of iron (fig. 31). The sampled instream dissolved iron load downstream from each of these inflows first increased in response to the inflow and then decreased as iron oxyhydroxides precipitated in the near-neutral pH stream.

Manganese

Instream manganese concentrations upstream from Howardsville decreased downstream due to dilution in 1998 (fig. 14). In contrast, instream dissolved manganese concentra-

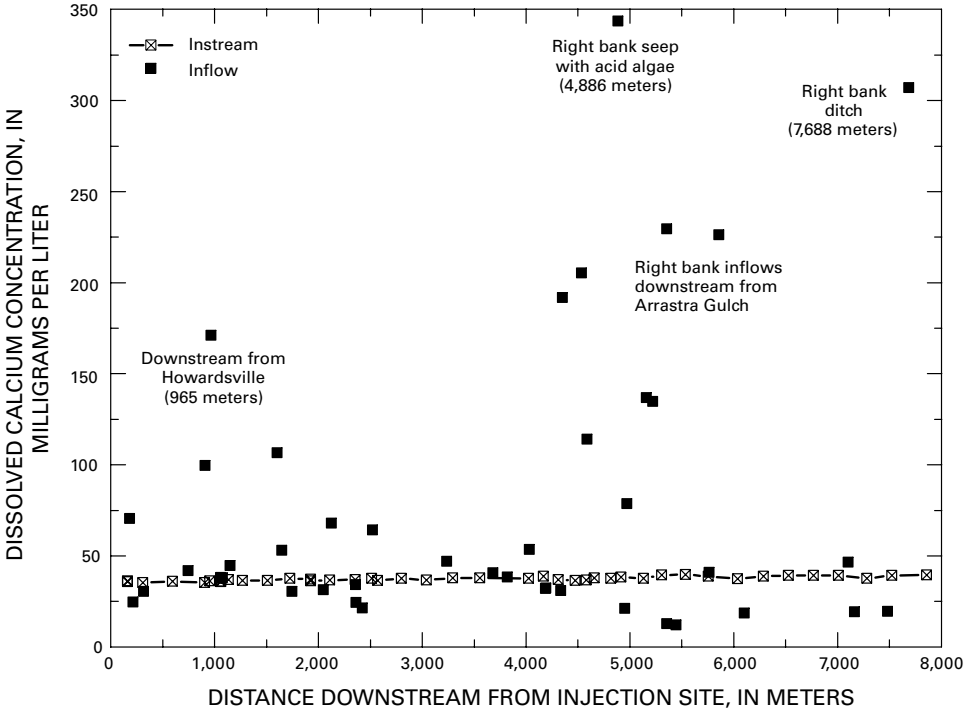


Figure 28. Instream and inflow dissolved calcium concentrations with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

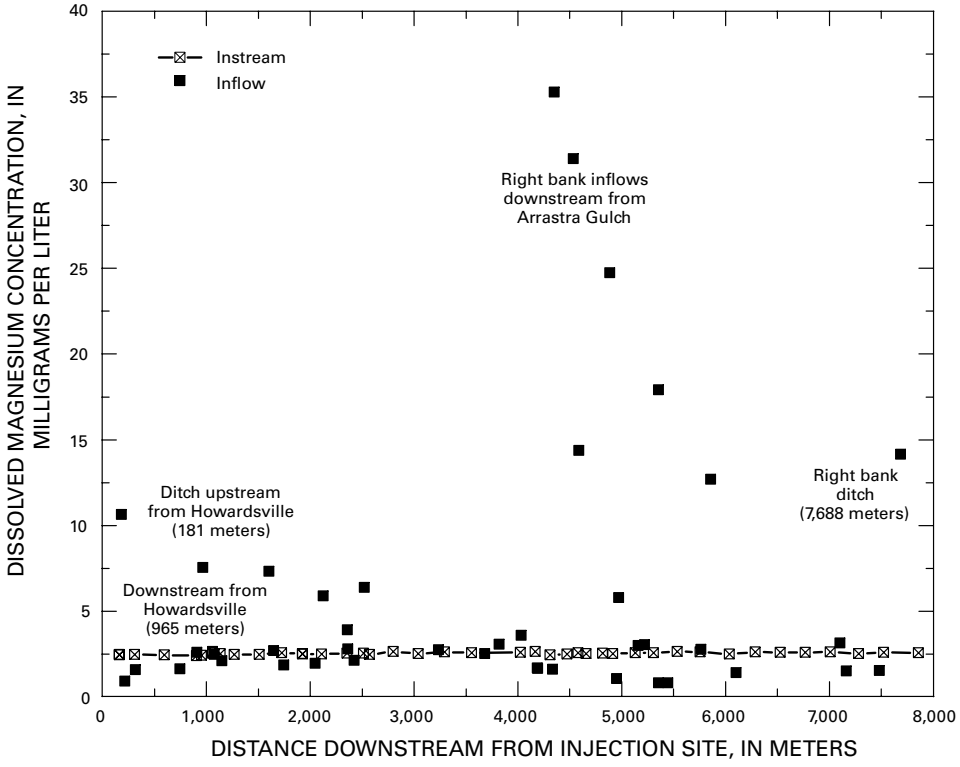


Figure 29. Instream and inflow dissolved magnesium concentrations with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

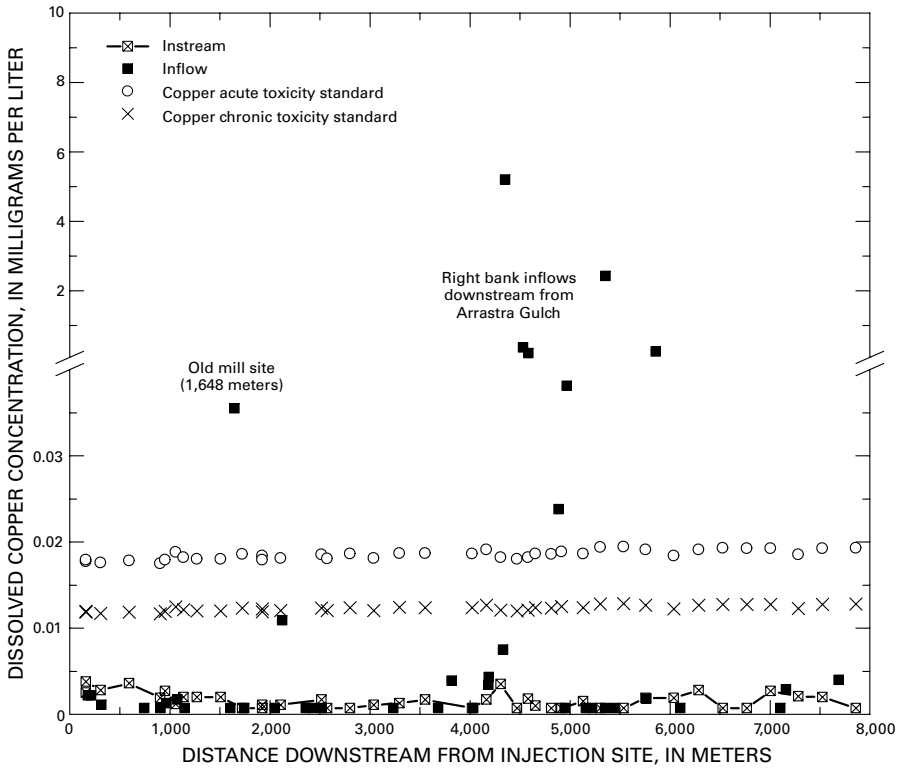


Figure 30. Instream dissolved copper concentrations, copper acute toxicity standard, and copper chronic toxicity standard with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

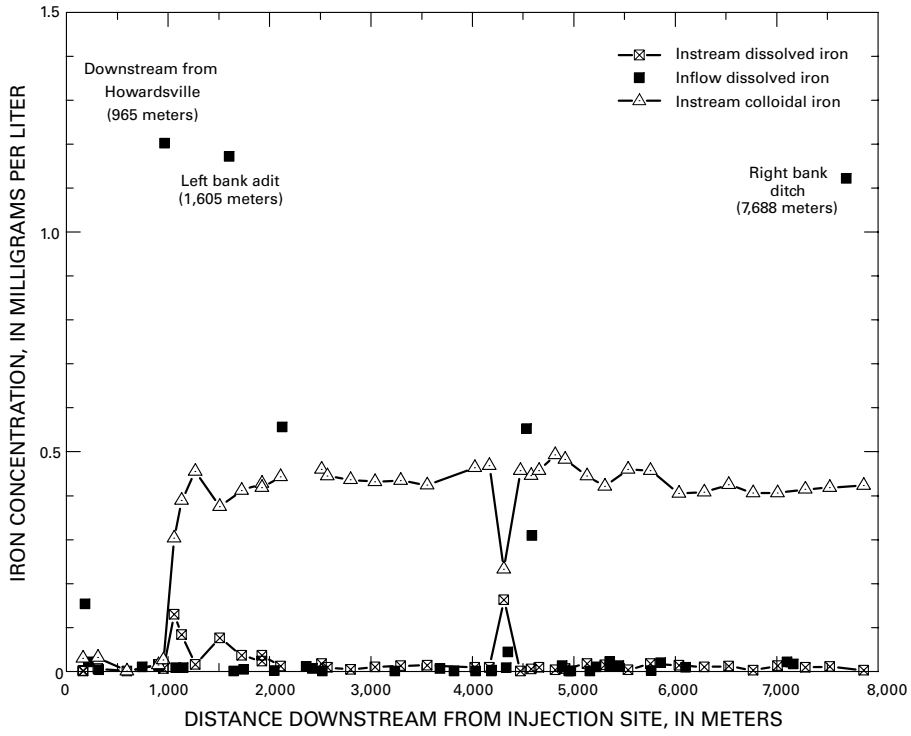


Figure 31. Instream and inflow dissolved iron concentrations and instream colloidal iron concentrations with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

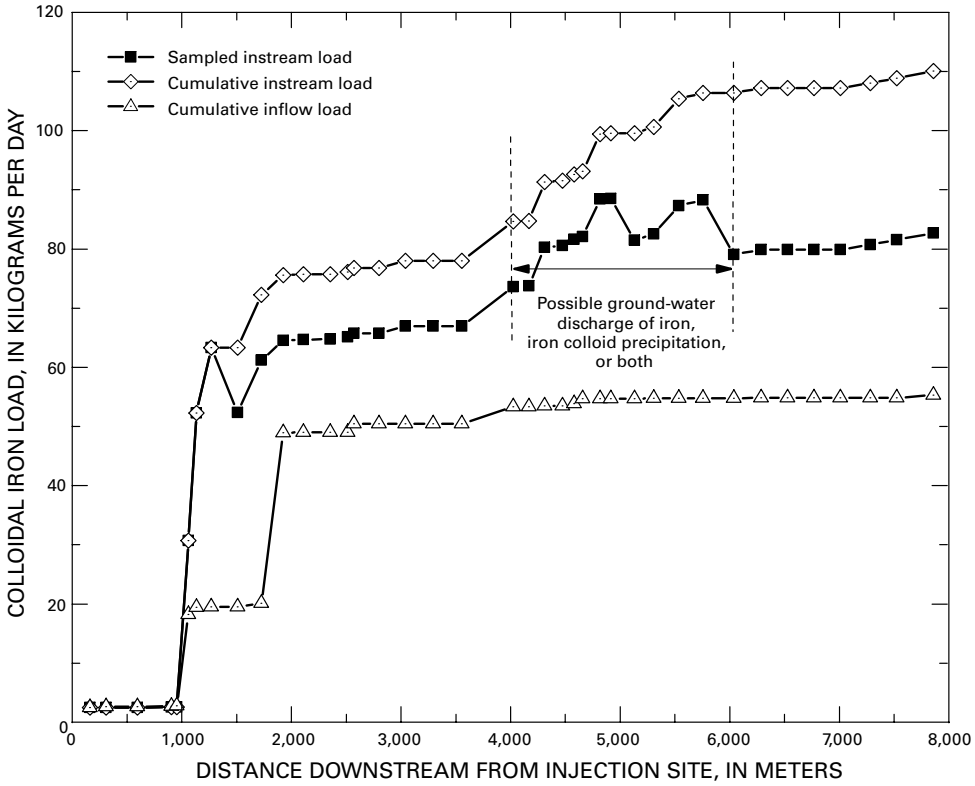


Figure 32. Sampled instream load, cumulative instream load, and cumulative inflow load of colloidal iron with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

tions from the 1997 Howardsville to Silverton study ranged from 0.12 to 1.1 mg/L and generally increased in the downstream direction because of elevated inflow manganese concentrations (fig. 33). Inflow dissolved manganese concentrations ranged from less than the method detection limit of 0.001 to 284 mg/L (right bank marsh at 4,533 m). The dissolved manganese concentration from inflow downstream from Howardsville at 965 m was 15.9 mg/L during 1997, slightly lower than the manganese concentration measured for the inflow in 1998 (18.6 mg/L). Several right bank inflows downstream from Arrastra Gulch also had elevated manganese concentrations (55.5 mg/L at 4,353 m; 4.7 mg/L at 4,586 m; 75.6 mg/L at 4,886 m; 3.1 mg/L at 4,970 m; 34.4 mg/L at 5,858 m; and 39.7 mg/L at 7,688 m).

The mass-loading graphs for dissolved manganese reflect the downstream increase in manganese load caused by inflows with elevated manganese concentrations. Consistent with the Eureka to Howardsville study results for manganese, sampled instream, cumulative instream, and cumulative inflow loads generally did not increase upstream from Howardsville (figs. 15 and 34). All three manganese-loading graphs in figure 34 showed increases downstream from Howardsville. Immediately downstream from Howardsville, the sampled instream and cumulative instream manganese loads increased, and this increase was greater than the cumulative inflow load increase for the same reach, indicating that ground-water inflow possibly contributed to the sampled instream manganese load. The sampled instream and cumulative instream manganese loads remained relatively constant downstream from Howardsville to Arrastra Gulch. A second increase in sampled instream and cumulative instream dissolved manganese loads occurred downstream from Arrastra Gulch where several right bank inflows had elevated manganese concentrations. However, the increases of sampled instream and cumulative instream manganese loads were greater than the increase of cumulative inflow load from approximately 5,000 to 6,500 m, again indicating that ground-water inflow possibly was contributing to the sampled instream manganese load downstream from Boulder Gulch.

Zinc

Instream dissolved zinc concentrations for 1997 were compared to acute and chronic toxicity standards for aquatic life. Instream dissolved zinc concentrations ranged from 0.24 to 0.45 mg/L, and exceeded the acute and chronic aquatic-life standards along the entire study reach (fig. 35). With a spatial distribution similar to manganese, dissolved zinc concentra-

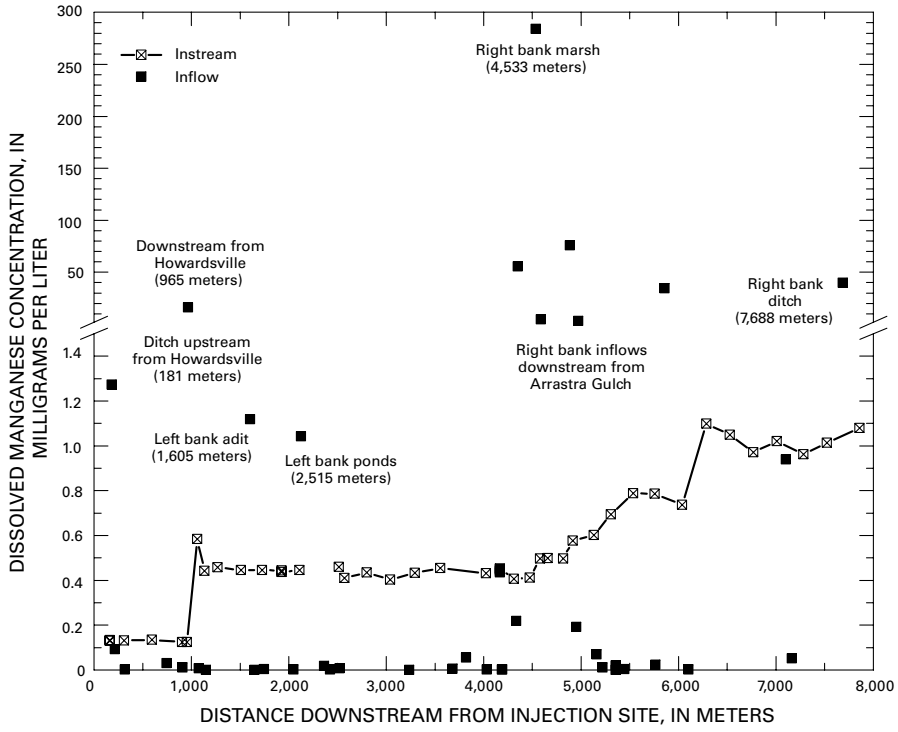


Figure 33. Instream and inflow dissolved manganese concentrations with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

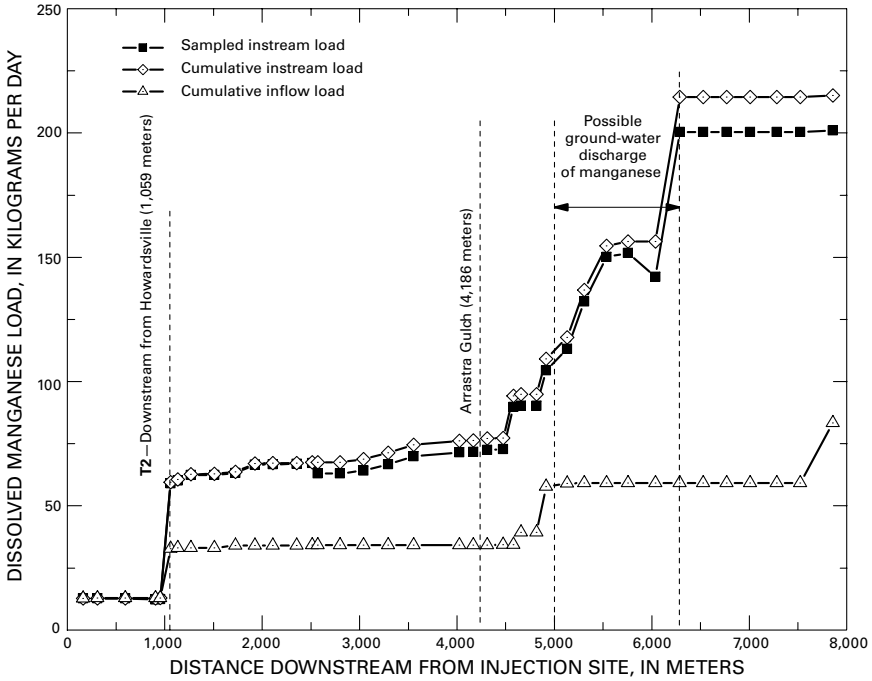


Figure 34. Sampled instream load, cumulative instream load, and cumulative inflow load of dissolved manganese with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

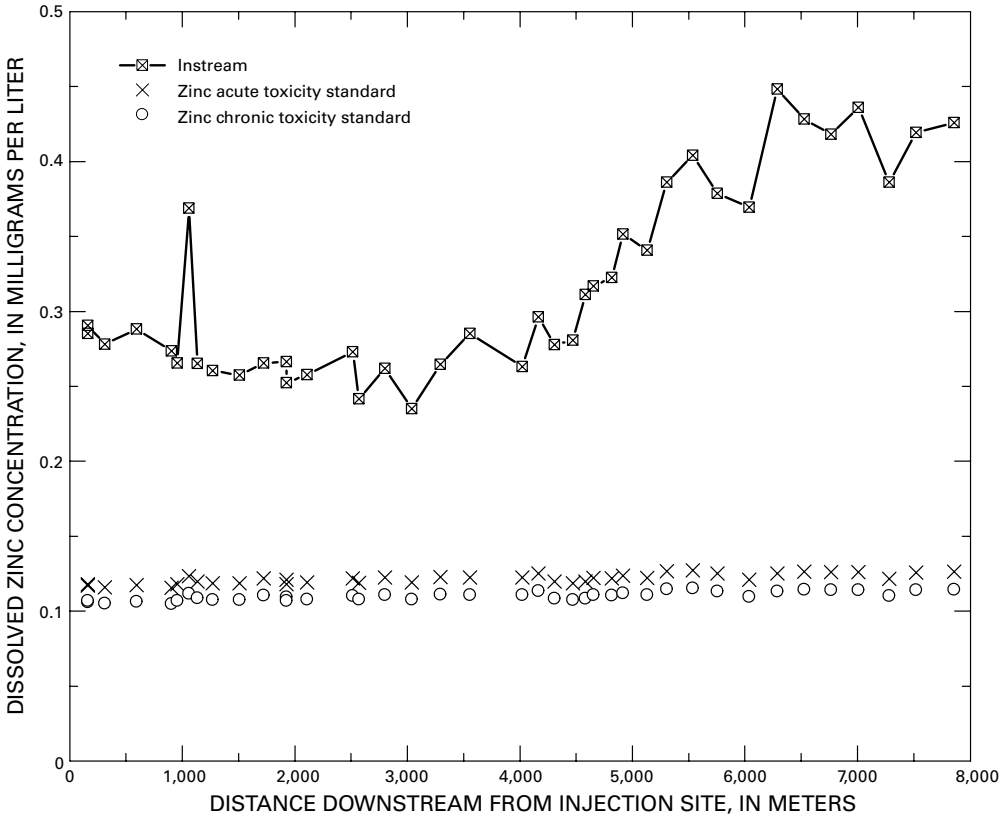


Figure 35. Instream dissolved zinc concentrations, zinc acute toxicity standard, and zinc chronic toxicity standard with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

tions generally increased in a downstream direction because of inflows with elevated zinc concentrations (fig. 36). The highest instream dissolved zinc concentrations were downstream from Howardsville and downstream from Arrastra Gulch.

The variability of zinc concentrations for inflow samples was much higher than for instream samples and ranged from 0.004 to 130 mg/L (right bank inflow at 4,353 m) (fig. 36). The highest inflow dissolved zinc concentrations were from right bank inflows downstream from Arrastra Gulch (130 mg/L at 4,353 m; 53.2 mg/L at 4,533; 9.3 mg/L at 4,586 m; 19.4 mg/L at 4,886 m; 3.8 mg/L at 4,970 m; 39.8 mg/L 5,356 m; and 12.7 mg/L at 5,858 m). The dissolved zinc concentration from inflow downstream from Howardsville (965 m) was 2.5 mg/L during 1997, which was considerably lower than the zinc concentration measured for the inflow in 1998 (7.3 mg/L).

Increases in the dissolved zinc loads corresponded to increases of instream dissolved zinc concentrations. Zinc load increases occurred downstream from Howardsville, through the reach with right bank inflows downstream from Arrastra Gulch, and downstream from Boulder Gulch (4,951 m) (fig. 37). Sampled instream load and cumulative instream load for dissolved zinc were higher than the cumulative inflow load immediately downstream from Howardsville, indicating that ground-water discharge possibly contributed dissolved zinc to the river in this area (table 11). From downstream of Howardsville to the reach immediately upstream from Arrastra Gulch at 4,166 m, the instream zinc load increased 7.6 kg/d from surface inflows and ground-water discharge (table 11 and fig. 37). The largest instream zinc load increase was observed downstream from Arrastra Gulch (4,186 m) from surface inflows and apparent ground-water discharge (table 11). For reaches where the sampled instream load and cumulative instream load increased but cumulative inflow load remained constant, unsampled inflow, possibly from ground-water discharge, is indicated. Possible ground-water discharge is evident for several reaches downstream from 5,131 to 7,523 m (table 11 and fig. 37). The instream zinc load increase of 15.3 kg/d from 6,038 to 6,288 m probably is caused by ground-water discharge with elevated zinc concentrations, because no visible inflows occurred in this reach (table 11 and fig 36). The loading graphs (fig. 37) also indicate locations downstream from Boulder Gulch where the dissolved zinc sampled instream load decreases possibly in response to zinc adsorption onto iron colloids or stream sediment. The total sampled instream load for dissolved zinc was approximately 83 kg/d, and the

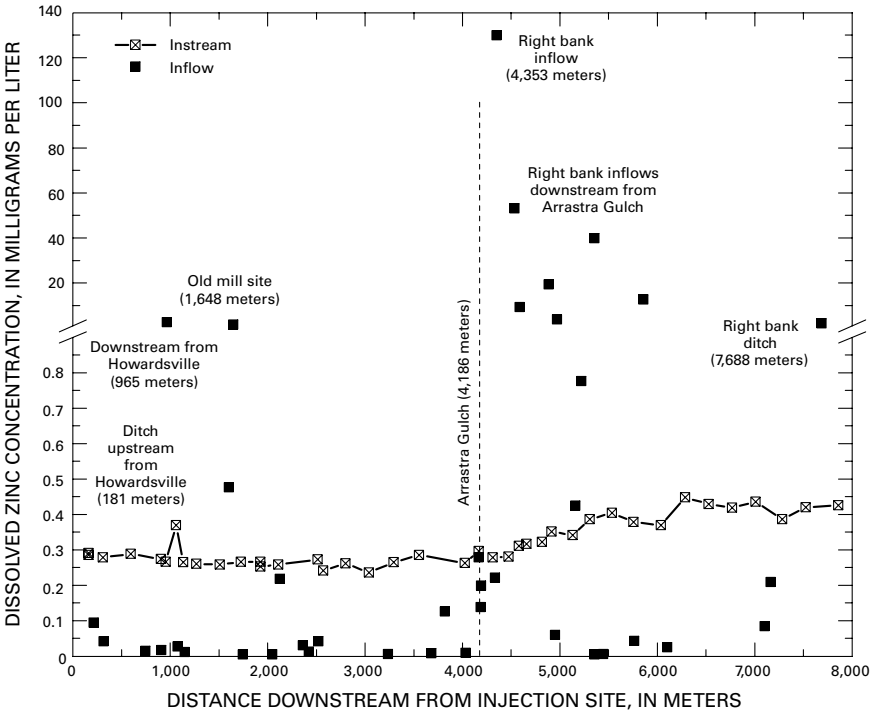


Figure 36. Instream and inflow dissolved zinc concentrations with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

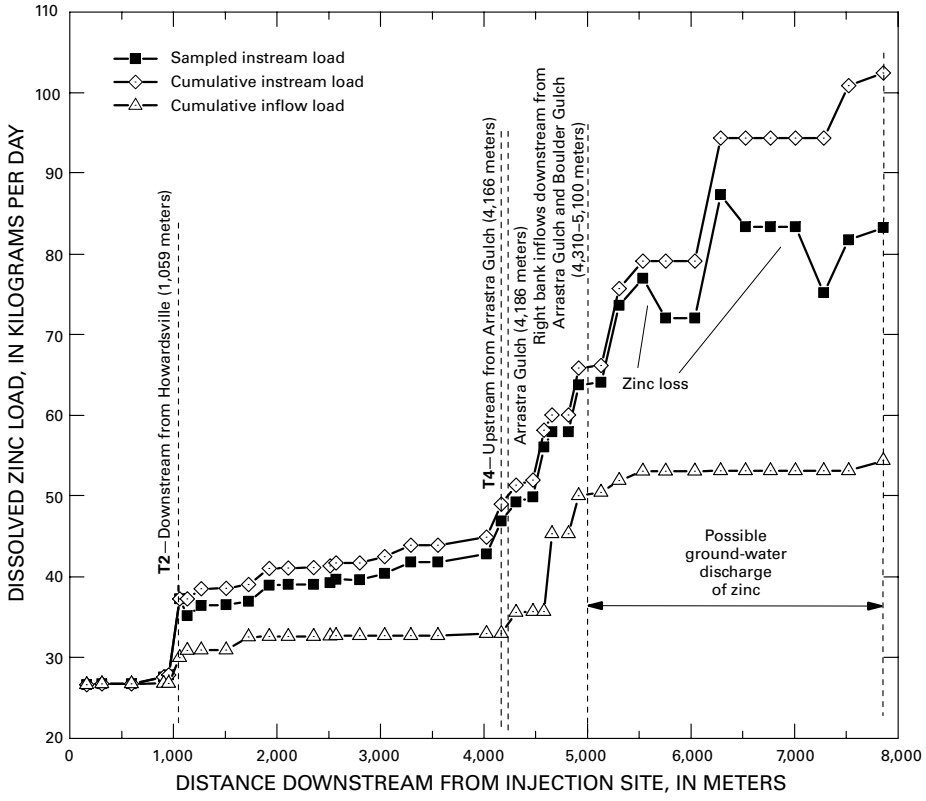


Figure 37. Sampled instream load, cumulative instream load, and cumulative inflow load of dissolved zinc with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

Table 11. Zinc loads calculated from tracer-dilution results, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

[Distance, distance downstream from injection site; kg/d, kilograms per day; RB, right bank; LB, left bank]

Distance (meters)	Stream reach name	Instream zinc load (kg/d)	Cumulative instream zinc load (kg/d)	Cumulative inflow zinc load (kg/d)	Change in instream zinc load (kg/d)	Change in inflow zinc load (kg/d)	Possible explanation
160	Downstream from injection site–B	26.7	26.7	26.7	26.7	0.0	
310	Downstream from RB ponds	26.7	26.7	26.8	0.1	0.1	
595	T1—near construction	26.7	26.7	26.8	0.0	0.0	
905	Upstream from RB inflow	27.6	27.6	26.8	0.8	0.0	
955	Upstream from Howardsville Mill	27.8	27.8	26.8	0.3	0.0	
1,059	T2—Downstream from Howardsville Mill	37.3	37.3	30.0	9.4	3.2	Ground-water discharge
1,135	Downstream from Cunningham Gulch	35.2	37.3	30.9	-2.1	0.9	Zinc loss—adsorption
1,270	Downstream from bridge	36.5	38.6	30.9	1.3	0.1	
1,510	At State gage (A53)	36.5	38.6	30.9	0.1	0.0	
1,725	Downstream from clean/ dirty inflows	37.0	39.0	32.6	0.4	1.7	Surface inflow
1,925	At upper “campground”	39.0	41.1	32.6	2.0	0.0	Unsampled inflow
2,110	Downstream from campground	39.1	41.1	32.6	0.1	0.0	
2,515	Upstream from draining adit	39.3	41.4	32.7	0.2	0.0	
2,572	Downstream from adit	39.7	41.8	32.7	0.4	0.1	
2,800	T3—Truck park	39.7	41.8	32.7	0.0	0.0	
3,040	Narrow chute within canyon	40.4	42.5	32.7	0.8	0.0	
3,295	Downstream from first cableway	41.8	43.9	32.7	1.4	0.0	
3,555	Mid canyon	41.8	43.9	32.7	0.0	0.0	
4,023	Between RB inflows in canyon	42.8	44.9	33.0	1.0	0.2	
4,166	T4—Upstream from Arrastra Gulch	46.9	49.0	33.0	4.1	0.0	
4,310	Downstream from Arrastra Gulch	49.3	51.4	35.6	2.4	2.6	Surface inflow
4,473	Downstream from river level spring	49.9	52.0	35.7	0.7	0.1	
4,581	Downstream from LB abandoned mill	56.1	58.2	35.7	6.2	0.0	Ground-water discharge
4,656	Upstream from Pinnacle Gap	58.0	60.1	45.3	1.9	9.6	Surface inflow
4,816	Upstream from acid inflows	58.0	60.1	45.3	0.0	0.0	
4,916	Downstream from acid inflows	63.8	65.9	50.1	5.8	4.7	Surface inflow
5,131	Downstream from Boulder Gulch	64.1	66.2	50.5	0.3	0.4	Surface inflow
5,306	Downstream from Blair Gulch	73.6	75.7	51.9	9.5	1.5	Ground-water discharge
5,536	Downstream from first of capped tailings	77.0	79.1	53.1	3.4	1.2	Ground-water discharge
5,756	Upstream from drain from tailings	72.1	79.1	53.1	-4.9	0.0	Zinc loss—adsorption
6,038	T5—Downstream from capped tailings	72.1	79.1	53.1	0.0	0.0	
6,288	Downstream from toe of Mayflower	87.4	94.4	53.1	15.3	0.0	Ground-water discharge
6,528	Upstream from Lackawanna Bridge	83.4	94.4	53.1	-4.0	0.0	Zinc loss—adsorption
6,768	Downstream from Lackawanna Bridge	83.4	94.4	53.1	0.0	0.0	
7,008	Upstream from Lackawanna Mill	83.4	94.4	53.1	0.0	0.0	
7,283	Downstream from Lackawanna Mill	75.2	94.4	53.1	-8.2	0.0	Zinc loss—adsorption
7,523	Among braids near town	81.7	100.9	53.1	6.5	0.0	Ground-water discharge
7,858	T6—At bridge/gage A68	83.3	102.4	54.4	1.5	1.3	Surface inflow

total cumulative load for zinc was approximately 102 kg/d at gaging station A68 (table 11).

Sulfate

Dissolved sulfate concentrations in the upper Animas River for 1997 were controlled by the sulfate concentrations of surface-water inflows. Instream sulfate concentrations ranged from 63.5 to 85.3 mg/L and were lower than the USEPA's secondary drinking-water standard of 250 mg/L. Instream sulfate concentrations increased downstream from Howardsville, and concentrations remained relatively constant downstream from Cunningham Gulch (fig. 38).

Inflow sulfate concentrations in the study reach were more variable than instream concentrations and ranged from 12.8 to approximately 1,400 mg/L. Inflows with elevated sulfate concentrations in the upper part of the study reach included the ditch upstream from Howardsville at 181 m (212 mg/L), right bank drainage at 910 m (243 mg/L), inflow downstream from Howardsville at 965 m (549 mg/L), adit inflow at 1,605 m (256 mg/L) (7,008 m in the Eureka to Howardsville study reach), inflow from an old mill site at 1,648 m (116 mg/L) (7,063 m in the Eureka to Howardsville study reach), and abandoned mining sites at 2,125 m (222 mg/L) and 2,522 (224 mg/L) (fig. 38). In the lower part of the study reach, the right bank inflows downstream from Arrastra Gulch contributed elevated sulfate concentrations to the stream. Inflows with the highest sulfate concentrations in this area were the right bank inflows at 4,353 m (1,053 mg/L); 4,533 m (1,353 mg/l); 4,886 m (1,408 mg/L); 5,356 m (1,378 mg/L); 5,858 m (861 mg/L); and the ditch at 7,688 m (1,103 mg/L).

The mass-loading graphs for sulfate show the sampled instream load, the cumulative instream load, and the cumulative inflow load as approximately equal, indicating little to no sulfate loss or gain due to chemical reaction. The sulfate cumulative instream load was approximately equal to the cumulative inflow load upstream from Blair Gulch (5,221 m) indicating that instream concentrations were a result of the measured inflow concentrations (fig. 39). However, downstream from approximately 5,500 m, the sulfate cumulative instream load curve is slightly greater than the cumulative inflow load curve (fig. 39), indicating that the measured inflow load did not account for the entire instream load with the remainder probably resulting from ground-water discharge with elevated sulfate concentrations.

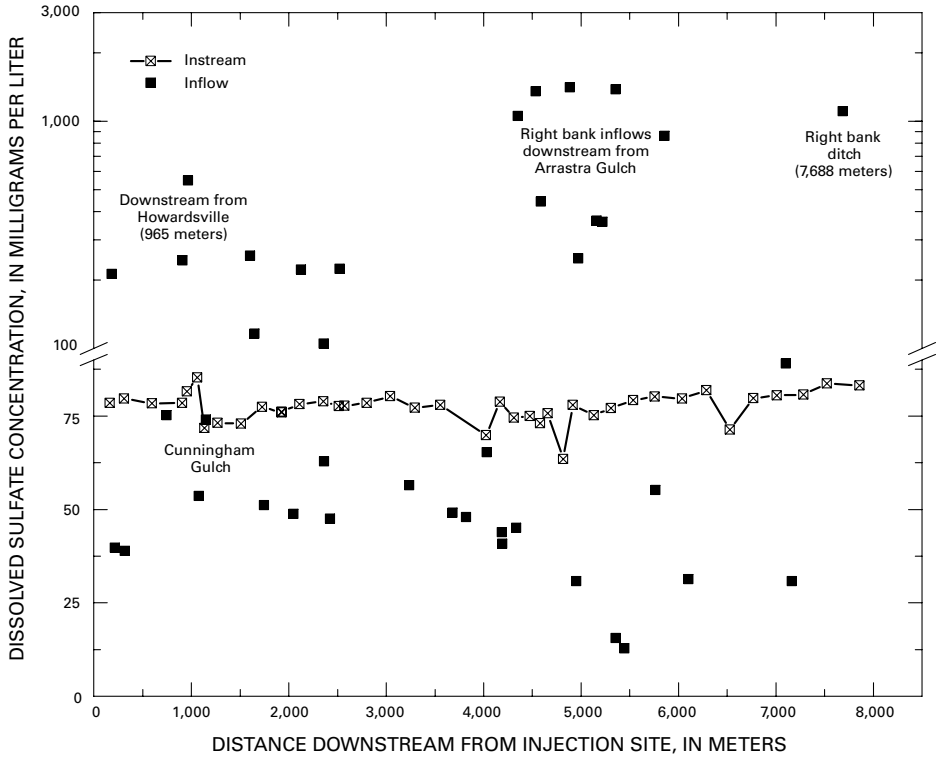


Figure 38. Dissolved sulfate concentrations with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

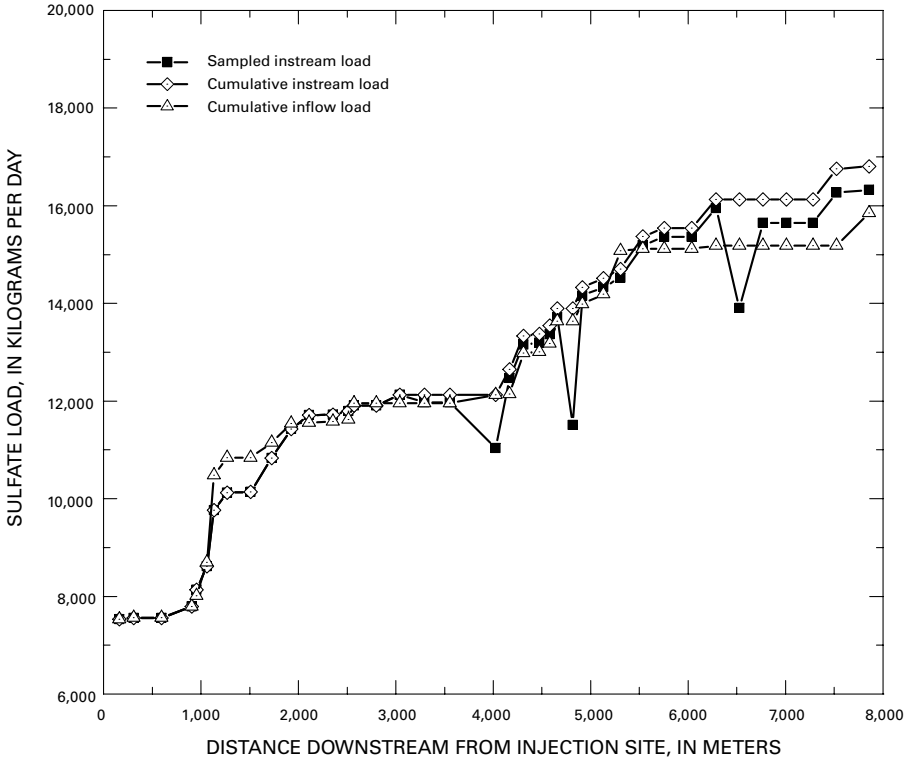


Figure 39. Sampled instream load, cumulative instream load, and cumulative inflow load of dissolved sulfate with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

Discussion of Sources and Loadings Howardsville to Silverton Study Reach

Surface-water drainage in the Howardsville to Silverton study reach contributed aluminum, copper, iron, manganese, zinc, and sulfate to the upper Animas River surface-water system in 1997. Instream dissolved and colloidal aluminum concentrations generally were low and near detection limits. Dissolved iron concentrations and loads increased downstream from Howardsville and Arrastra Gulch, and colloidal iron remained constant at low concentrations downstream from Howardsville. The concentrations and mass loads of instream dissolved manganese and zinc increased substantially downstream from Arrastra Gulch to the end of the study reach from surface and subsurface inflows, and instream dissolved zinc concentrations exceeded acute and chronic aquatic-life standards along the entire reach. Instream dissolved copper concentrations were lower than the acute and chronic toxicity standards throughout the study reach, and instream sulfate concentrations were lower than the USEPA's secondary drinking water standard of 250 mg/L throughout the study reach.

Based on the 1997 synoptic-sampling results and mass-loading graphs, there were four primary areas where metal concentrations and loads increased within the Howardsville to Silverton study reach. The first increase was the reach downstream from Howardsville to downstream from Cunningham Gulch where the sampled instream loads of dissolved and colloidal iron, dissolved manganese, dissolved zinc, and dissolved sulfate all increased in a downstream direction during 1997 and 1998. The second increase was downstream from Arrastra Gulch, from approximately 4,186 to 5,900 m, where sampled instream loads of colloidal iron, dissolved manganese, dissolved zinc, and dissolved sulfate increased. The load increases in this reach appear to result from a series of right bank inflows downstream from the Mayflower Mill tailings with low pH and elevated constituent concentrations. A third increase of sampled instream loads occurred at approximately 6,100 m where load increases were measured for colloidal iron, dissolved manganese, dissolved zinc, and dissolved sulfate. The source of these load increases may have been from discharge of ground water with elevated constituent concentrations, based on mass-loading graphs and the lack of visible inflow in the reach. A fourth but lesser load increase for dissolved zinc and dissolved sulfate occurred at the end of the study reach, near the Lackawanna Mill, from approximately 7,283 to 7,850 m.

Based on the 1997 synoptic-sampling results, dissolved zinc is the primary constituent of concern in the Howardsville to Silverton study reach of the upper Animas River, and the

total cumulative load for zinc was approximately 102 kg/d at gaging station A68. Listed below are locations where instream dissolved zinc load increased and the percentage of the total load attributed to the reach:

- Downstream from tailings near the Mayflower Mill (15 percent),
- Downstream from Blair Gulch (9 percent),
- Downstream from Howardsville (9 percent),
- Downstream from tailings near the Lackawanna Mill (6 percent),
- Downstream from abandoned mill at 4,581 m (6 percent),
- Downstream from acidic inflows at 4,916 m (6 percent), and
- Downstream from Arrastra Gulch (4 percent).

A substantial dissolved zinc load also was contributed from the upper Animas drainage upstream from the study area (26 percent of the total load).

The 1997 Howardsville to Silverton study reach overlaps with the 1998 Eureka to Silverton study reach from a point upstream from Howardsville to a point downstream from Cunningham Gulch. Although seasonal variability was not specifically addressed by the studies, a general relation between constituent concentrations and stream discharge is noted in the overlapping part of the two data sets. Stream discharge near Howardsville was lower in 1998 than in 1997, the pH values were higher in 1997 than in 1998, and dissolved iron, manganese, zinc, and sulfate concentrations were lower in 1997 than in 1998. These observations indicate chemical constituents were diluted in 1997 relative to 1998, and that the effects of metal-rich inflow on water quality were greater at low flow.

Zinc Solute-Transport Simulations

To interpret mass-loading calculations and to evaluate the effects of potential remediation, one-dimensional surface-water transport of dissolved zinc was simulated for the Howardsville to Silverton study reach using OTIS. This section of the report describes the conservative and first-order decay simulations and the remediation simulations for the Howardsville to Silverton reach.

Conservative and First-Order Decay Simulation Results

The Howardsville to Silverton study reach was divided into 15 model reaches based on discharge calculations and mass-loading graphs. Main-channel cross-sectional area, storage-zone cross-sectional area, and storage-zone exchange coefficients were determined using OTIS-P simulations of the transport site data. A uniform dispersion coefficient of 1.0 m was used for all model reaches. For each model reach, a lateral inflow discharge was computed based on the stream discharge profile. Upstream from Arrastra Gulch, lateral inflow concentrations were assigned to model reaches 1 through 7 based on measured inflow concentrations for 1997 (table 12 and fig. 40). Downstream from Arrastra Gulch, lateral inflow concentrations and first-order decay rates were adjusted as discussed herein to obtain a reasonable match between simulated and measured instream zinc concentrations.

Numerous low-pH inflows with elevated zinc concentrations occurred in model reach 8 downstream from Arrastra Gulch (fig. 40), and a flow-weighted average dissolved zinc inflow concentration of 42 mg/L was computed for reach 8. Using a lateral inflow concentration of 42 mg/L also required using a first-order decay constant in reach 8 to achieve a match between simulated and measured instream dissolved zinc concentrations. However, no dissolved zinc loss was indicated for reach 8 based on the sampled instream load graph (fig. 37). Therefore, the lateral inflow concentration for dissolved zinc in reach 8 was adjusted by trial-and-error to a value of 4.5 mg/L, and first-order decay was not simulated for this reach, to achieve a match between simulated and measured instream dissolved zinc concentrations (figs. 40 and 41).

Model reach 9 represents Boulder Gulch inflow. Using the lateral inflow rate and lateral inflow concentration representative of Boulder Gulch (0.06 mg/L), simulated zinc concentrations for reach 9 matched the measured instream zinc concentrations, so first-order decay was not simulated for this reach (table 12, fig. 41).

Instream concentrations and sampled instream load for dissolved zinc increased through model reaches 10, 12, and 14; however, there was little to no increase in the cumulative inflow load through these reaches (fig. 37). Unsampled inflow is indicated in these reaches, and the increase in instream zinc concentrations in this stream reach may be attributed to ground-water discharge with elevated zinc concentrations. Lateral inflow concentrations for model reaches 10, 12, and 14 therefore were increased by trial-and error to obtain a match between simulated and measured instream zinc concentrations. For model reach 10, a flow-weighted average inflow zinc concentration of 1.04 mg/L was computed for the visible inflows in the reach. However, using a lateral inflow concentration of 1.04 mg/L in reach 10 resulted in simulated zinc concentrations for the reach that were lower than the measured instream zinc concentrations. Consistent with the mass-loading graphs, this result indicates that effective lateral inflow zinc concentrations in reach 10 were higher than measured inflow concentrations. A lateral inflow concentration of 5.0 mg/L was used for model reach 10 to obtain a match between simulated and measured instream zinc concentrations (table 12 and fig. 40). The only visible inflow in model reach 12 had a low zinc concentration of 0.024 mg/L. However, measured instream zinc concentrations increased through reach 12. Ground-water discharge with elevated zinc concentrations again is indicated, and a lateral inflow concentration of

Table 12. OTIS setup and input parameters for zinc solute-transport model, upper Animas River, Howardsville to Silverton, Colorado.

[m, meters; m^2, square meters; m^3/s-m, cubic meters per second per meter; mg/L, milligrams per liter; /s, per second; --, not applicable]

Model reach	Distance from injection site (m)	Reach length (m)	Main channel cross-sectional area (m^2)	Lateral inflow rate (m^3/s-m)	Lateral inflow concentration simulation (mg/L)	First-order decay rate (/s)	Description
1	595	595	1.713	5.24×10^{-6}	0.94	--	T1
2	955	360	1.730	1.25×10^{-4}	0.02	--	Upstream from Howardsville
3	1,059	104	1.730	1.39×10^{-4}	5.00	--	T2 — Downstream from Howardsville
4	1,135	76	2.816	5.08×10^{-3}	0.03	--	Downstream from Cunningham Gulch
5	2,800	1,665	2.816	1.19×10^{-4}	0.48	--	T3
6	4,166	1,366	2.740	5.76×10^{-5}	0.01	--	T4 — Upstream from Arrastra Gulch
7	4,310	144	2.851	1.53×10^{-3}	0.20	--	Downstream from Arrastra Gulch
8	4,916	606	2.851	7.99×10^{-5}	4.50	--	Downstream from right bank acid inflows and Boulder Gulch
9	5,131	215	2.851	3.68×10^{-4}	0.06	--	Downstream from Boulder Gulch
10	5,536	405	2.851	6.99×10^{-5}	5.00	--	Downstream from Blair Gulch
11	6,038	502	2.851	4.74×10^{-5}	6.38	4.0×10^{-4}	T5
12	6,288	250	3.188	9.74×10^{-5}	7.20	--	Downstream from zinc concentration increase
13	7,283	995	3.188	8.54×10^{-8}	0.20	1.0×10^{-4}	Downstream from zinc loss
14	7,858	575	3.188	1.23×10^{-6}	10.0	--	T6 — End of study reach
15	7,958	100	3.188	--	--	--	Downstream boundary

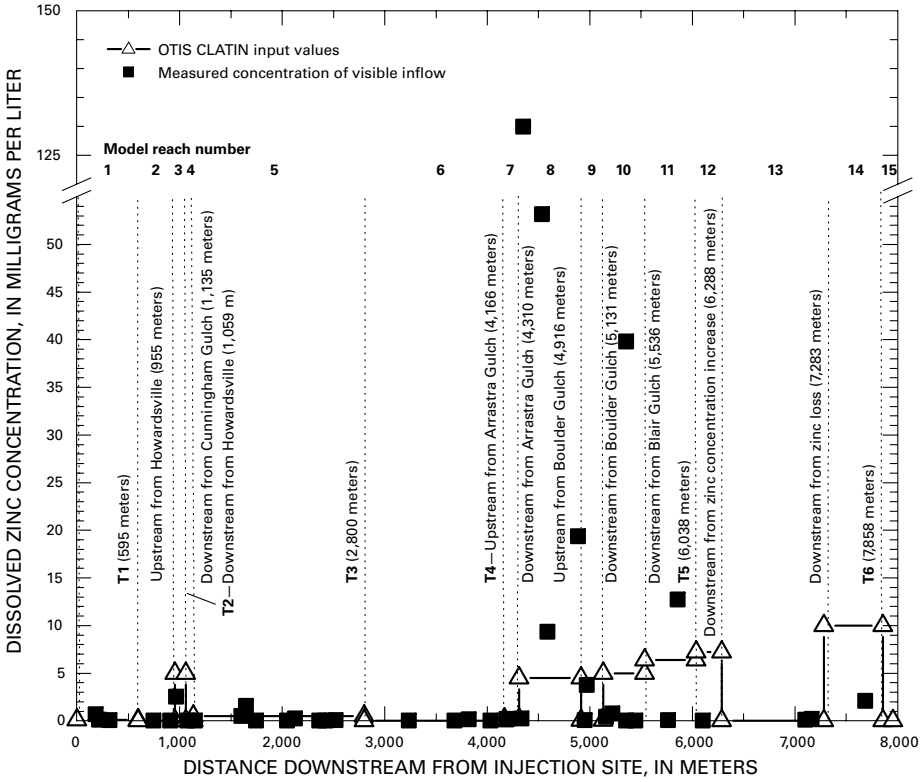


Figure 40. OTIS lateral inflow concentrations and measured inflow concentrations for dissolved zinc with distance from the injection site, upper Animas River, Howardsville to Silverton, Colorado.

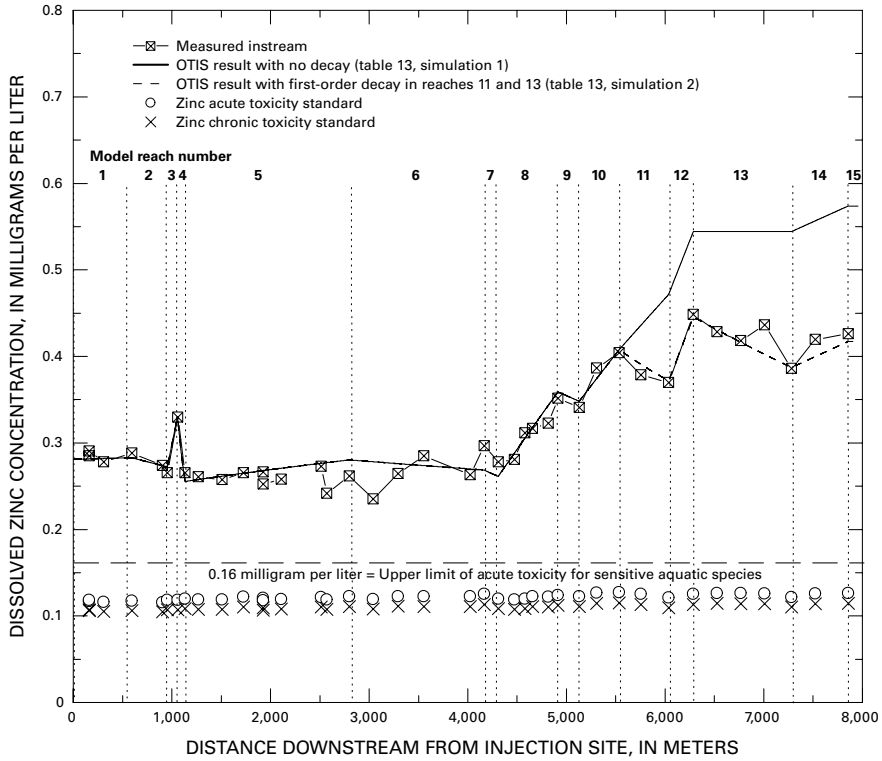


Figure 41. OTIS results for conservative and first-order decay simulations, upper Animas River, Howardsville to Silverton, Colorado.

7.2 mg/L was used for model reach 12 to obtain a match between simulated and measured instream zinc concentrations (table 12 and fig. 40). In model reach 14, a lateral inflow concentration of 10.0 mg/L was used to obtain a match between simulated and measured instream zinc concentrations (table 12 and fig. 40).

Using the lateral inflow concentrations listed in table 12, the conservative OTIS simulation computed instream zinc concentrations higher than the measured instream concentrations downstream from Blair Gulch (model reach 10) (fig. 41). Consistent with the mass-loading graphs, this simulation result indicates that chemical removal of dissolved zinc from some stream reaches likely is caused by zinc adsorption onto iron colloids or streambed sediment. Loss of a dissolved constituent is represented as a first-order process in OTIS, and first-order decay rates were assigned to model reaches 11 and 13 to represent the decrease of sampled instream zinc load through these reaches (table 12). The flow-weighted average zinc concentration of the two visible inflows in model reach 11 was 6.38 mg/L (table 12 and fig. 40). A first-order decay rate of 4.0×10^{-4}/s was assigned to model reach 11 to obtain a match between simulated and measured instream zinc concentrations (table 12 and fig. 41). In model reach 13, the flow-weighted average zinc concentration for the two inflows was 0.20 mg/L, and a first-order decay rate of 1.0×10^{-4}/s was assigned to obtain a match between simulated and measured instream zinc concentrations (table 12 and fig. 41).

Remediation Simulations

Two remediation alternatives were evaluated for the Howardsville to Silverton study reach using the first-order decay zinc transport simulation described in the previous section. To simulate remediation of stream reaches, the zinc lateral inflow concentrations were reduced from the model inflow concentrations to hypothetical concentrations representative of inflow after remediation. Because these post-remediation concentrations are uncertain, remediation for the Howardsville to Silverton study reach was simulated using a 50-percent reduction and then a 75-percent reduction in zinc lateral inflow concentrations of remediated reaches. A list of remediation simulations, zinc lateral inflow concentrations, and simulation results are presented in table 13.

The first set of remediation simulations addresses reducing zinc inflow concentrations in the model reach representing the inflow downstream from Howardsville (model reach 3). The zinc lateral inflow concentration for reach 3 (5.0 mg/L) was reduced by 50 percent and by 75 percent, and the simulations were run with first-order decay (table 13, simulations 3 and 4). A third simulation evaluated reducing the dissolved zinc upstream boundary condition from 0.28 to 0.19 mg/L to represent a 75-percent reduction in zinc concentrations from the Forest Queen mine and Kittimack tailings inflows (table 13, simulation 5). This simulation is similar to those presented for the Eureka to Howardsville 1998 study (table 7, simulations 5 and 6) and is repeated here for the 1997 data set to examine the effects of remediation on stream reaches downstream from Howardsville. Results from simulations 3, 4, and 5 indicate that instream zinc concentrations downstream from Howardsville to upstream from Arrastra Gulch would approach concentrations near 0.16 mg/L if zinc inflow concentrations were reduced by 75 percent in the stream reaches receiving inflow from the Forest Queen mine, the Kittimack tailings, and downstream from Howardsville (fig. 42).

For the second set of remediation simulations, the anticipated effects of reducing zinc inflow concentrations in model reach 12 in addition to the upstream model reaches were evaluated (table 13, simulations 6 and 7). Remediation of the upstream inflows was represented using an upstream boundary condition of 0.19 mg/L zinc, a 75-percent reduction in zinc lateral inflow concentration for model reach 3, and then a 50- and a 75-percent reduction in zinc lateral inflow concentration for model reach 12. These simulations represent the effects of remediating reaches receiving inflow from the Forest Queen mine, Kittimack tailings, inflow downstream from Howardsville, presumed ground-water discharge in model reach 12, and include first-order decay in model reaches 11 and 13. Results of simulations 6 and 7 indicate that instream zinc concentrations would be higher than approximately 0.20 mg/L downstream from Arrastra Gulch because of visible inflows and ground-water discharge with elevated zinc concentrations in the lower part of the study reach (fig. 43).

SUMMARY

Drainage from abandoned and inactive mines and naturally mineralized areas in the San Juan Mountains of southern Colorado contributes metals to the upper Animas River near Silverton, Colorado. The Bureau of Land Management (BLM) and the Animas River Stakeholders Group (ARSG) are planning possible remedial actions along the upper Animas River to alleviate water-quality degradation, and tracer-injection studies and associated synoptic sampling were performed along two reaches of the upper Animas River to locate and quantify the sources of metal loading. One tracer-injection study was performed in September 1997 on the Animas River reach from Howardsville to Silverton, and a second study was performed in August 1998 on the stream reach from Eureka to Howardsville. Detailed profiles of stream discharge and chemical mass loading were obtained from the tracer-injection and synoptic-sampling studies. The one-dimensional stream transport computer code OTIS was used to evaluate results of the tracer-injection studies and to evaluate potential effects of remediation.

Tributary drainage in the upper Animas River study reaches contributed aluminum, calcium, copper, iron, magnesium, manganese, sulfate, and zinc to the surface-water system in 1997 and 1998. Based on the 1998 synoptic-sampling results and mass-loading graphs, sources upstream from

Table 13. OTIS results for zinc solute-transport and remediation simulations, upper Animas River, Howardsville to Silverton, Colorado.

[CLATIN, OTIS input parameter for lateral inflow concentrations; m, meters; mg/L, milligrams per liter; %, percent]

Simulation number	OTIS CLATIN (mg/L)		OTIS result —computed instream zinc concentration (mg/L)		Description
	Reach 3	Reach 12	End of reach 6 (4,166 m)	End of study reach 6 (4,166 m)	
1	5.0	7.2	0.269	0.574	Zinc CLATIN represents measured inflows with adjusted values in reaches 10, 11, 12 and 14 for ground-water discharge and no decay.
2	5.0	7.2	0.269	0.417	Zinc CLATIN represents measured inflows with adjusted values in reaches 10, 11, 12 and 14 for ground-water inflow and first-order decay in reaches 11 and 13.
3	2.5	7.2	0.249	0.406	Howardsville remediation. 50% reduction in zinc CLATIN in reach 3 and first-order decay in reaches 11 and 13.
4	1.25	7.2	0.239	0.401	Howardsville remediation. 75% reduction in zinc CLATIN in reach 3 and first-order decay reaches 11 and 13.
5	1.25	7.2	0.184	0.371	Howardsville remediation. 75% reduction in zinc CLATIN in reach 3 with first-order decay in reaches 11 and 13 and upstream boundary = 0.19 mg/L.
6	2.5	3.6	0.194	0.343	Reach 12 remediation. 50% reduction in zinc CLATIN in reaches 3 and 12 with first-order decay in reaches 11 and 13 and upstream boundary = 0.19 mg/L.
7	1.25	1.8	0.184	0.321	Reach 12 remediation. 75% reduction in zinc CLATIN in reaches 3 and 12 with first-order decay in reaches 11 and 13 and upstream boundary = 0.19 mg/L.

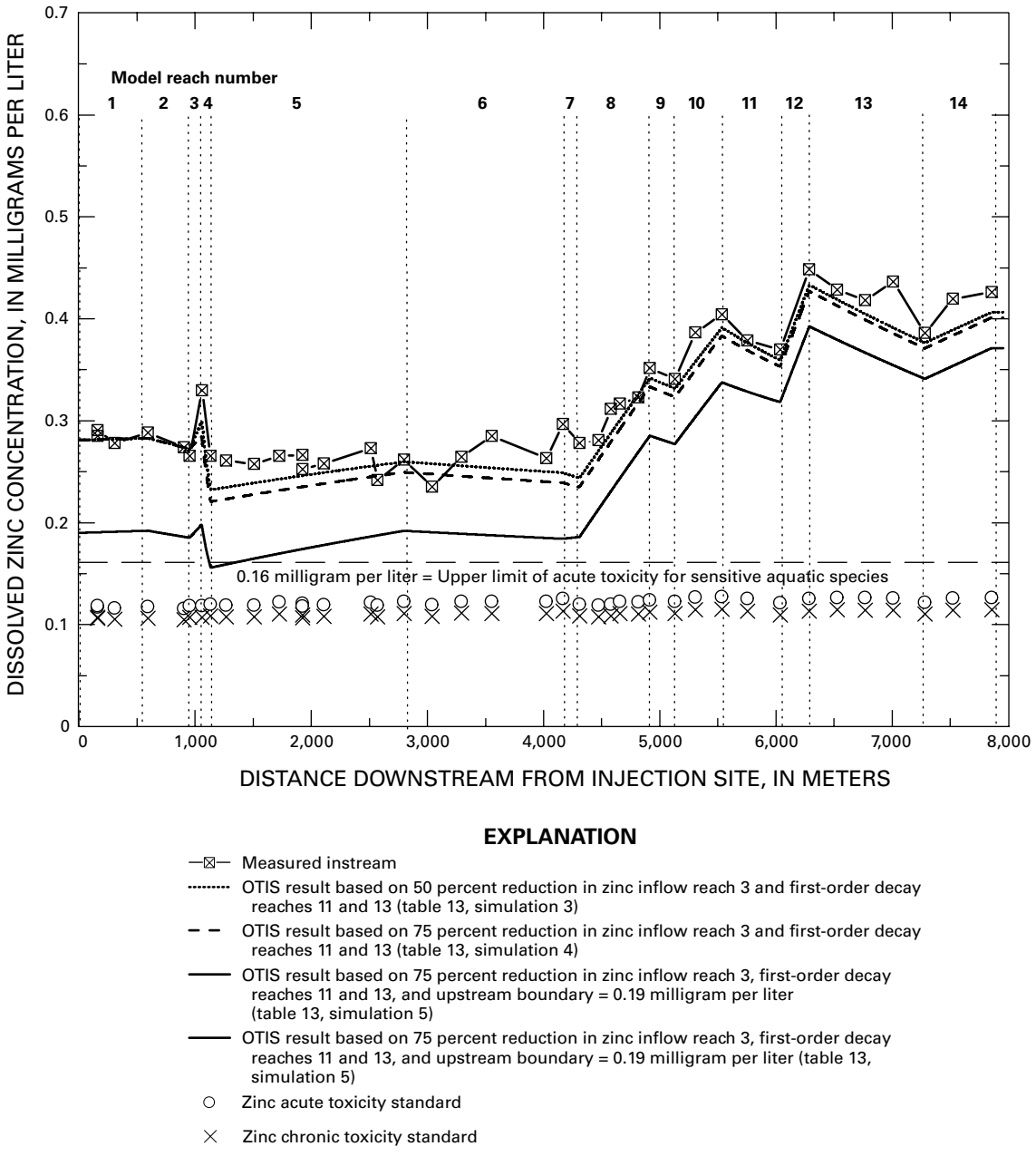


Figure 42. OTIS results for remediation simulations, 3, 4, and 5, upper Animas River, Howardsville to Silverton, Colorado.

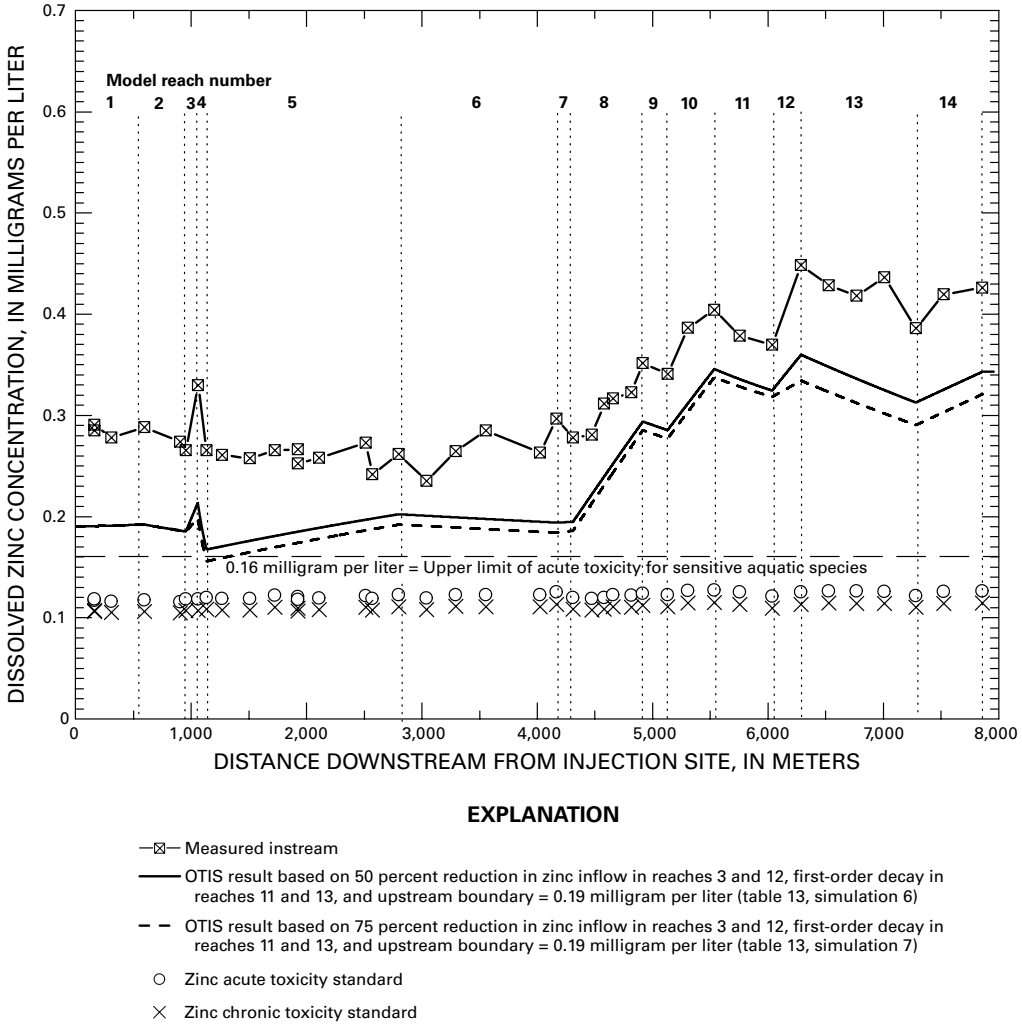


Figure 43. OTIS results for remediation simulations 6 and 7, upper Animas River, Howardsville to Silverton, Colorado.

Eureka contributed aluminum, copper, manganese, and zinc to the upstream end of the study reaches. Colloidal aluminum, dissolved copper, and dissolved zinc were attenuated through a braided reach downstream from Eureka. Instream copper concentrations were lower than the State of Colorado acute and chronic toxicity standards downstream from the braided reach to Silverton. Dissolved iron load and concentrations increased downstream from Howardsville and Arrastra Gulch, and colloidal iron remained constant at low concentrations downstream from Howardsville. Dissolved manganese was diluted by inflows downstream from Eureka, but the sampled instream manganese load increased downstream from Howardsville and downstream from Arrastra Gulch to Silverton. Instream sulfate concentrations were lower than the U.S. Environmental Protection Agency's secondary drinking-water standard of 250 milligrams per liter (mg/L) throughout the study reaches.

Elevated zinc concentrations are the primary concern for aquatic life in the upper Animas River. In the Eureka to Howardsville 1998 study, the sampled instream dissolved zinc load increased downstream from the Forest Queen mine, the Kittimack tailings, and Howardsville. In the Howardsville to Silverton 1997 study, there were four primary areas where zinc load increased. First was the increase downstream from Howardsville and abandoned mining sites downstream from Cunningham Gulch, which also was measured during the 1998 study. The second increase was downstream from Arrastra Gulch, from approximately 4,186 meters (m) to downstream from the 1997 injection site at 5,900 m where the sampled instream zinc load increased because of a series of right bank inflows with pH values lower and dissolved zinc concentrations higher than those of the stream. A third increase of sampled instream dissolved zinc load occurred at approximately 6,100 m and may have been from ground-water discharge with elevated zinc concentrations, based on mass-loading graphs and the lack of visible inflow in the reach. A fourth but lower zinc load increase occurred near the end of the study reach

and downstream from tailings near the Lackawanna Mill, from approximately 7,283 to 7,850 m.

The 1997 Howardsville to Silverton study reach overlaps with the 1998 Eureka to Silverton study reach from a point upstream from Howardsville to a point downstream from Cunningham Gulch. Although seasonal variability was not specifically addressed by these studies, a general relation between constituent concentrations and stream discharge was noted in the overlapping part of the two data sets. River discharge near Howardsville was lower in 1998 than in 1997, instream pH values were higher in 1997 than in 1998, and instream dissolved iron, manganese, sulfate, and zinc concentrations were lower in 1997 than in 1998. These observations indicate that instream chemical constituents were diluted in 1997 relative to 1998, and that the effects of metal-rich inflow on water quality were greater at low flow.

Zinc solute transport in the river was simulated for both study reaches to interpret mass-loading calculations and to evaluate potential effects of remediation. Using lateral inflow concentrations representative of measured inflow concentrations, the conservative simulations computed instream zinc concentrations higher than the measured instream concentrations downstream from Eureka Gulch and downstream from Arrastra Gulch. Consistent with the mass-loading graphs, these simulation results indicate chemical removal of dissolved zinc from some stream reaches. The loss of dissolved zinc likely was caused by zinc adsorption onto iron oxyhydroxide colloids or streambed sediment and was represented as a first-order decay process using OTIS. First-order decay rates were assigned to selected reaches in both simulations to represent zinc adsorption, and lateral inflow zinc concentrations were adjusted to represent ground-water discharge of elevated zinc concentrations downstream from Arrastra Gulch in the Howardsville to Silverton simulations. The simulated results for instream zinc concentrations provided reasonable matches to the measured instream zinc concentrations for both study reaches.

Two remediation alternatives were evaluated for each study reach using the first-order decay zinc transport simulations. For the Eureka to Howardsville study reach, one set of simulations evaluated remediation of model reaches representing the Forest Queen mine inflow and inflow downstream from the Kittimack tailings, and the second set of simulations evaluated remediation of the model reach representing inflow downstream from Howardsville in addition to the Forest Queen mine inflow and inflow downstream from the Kittimack tailings. For the Howardsville to Silverton study reach, one set of simulations evaluated remediation of the model reach representing the inflow downstream from Howardsville, and the second set of simulations evaluated remediation of ground-water inflow in model reach 12. Based on simulation results, instream zinc concentrations downstream from the Kittimack tailings to upstream from Arrastra Gulch might approach 0.16 mg/L (the upper limit of acute toxicity for some sensitive aquatic species) if zinc inflow concentrations were reduced by 75 percent in the stream reaches receiving inflow from the Forest Queen mine, the Kittimack tailings, and downstream from Howardsville. However, simulated zinc concentrations downstream from Arrastra Gulch were higher than approximately 0.20 mg/L because of numerous visible inflows and assumed ground-water discharge with elevated zinc concentrations in the lower part of the study reach. Removal of zinc from discrete visible inflows such as the Forest Queen mine discharge seems a viable approach to reducing zinc inflow loads to the upper Animas River. Remediation downstream from Arrastra Gulch is more complicated because ground-water discharge with elevated zinc concentrations seems to contribute to the instream zinc load.

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APPENDIXES

Appendix 1. Field measurements and major ion concentrations for synoptic water samples, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

[Source, 0=stream, 1=inflow; Distance, distance downstream from injection site; Temp, water temperature in degrees Celsius; pH, in standard units; SC, specific conductance, in microsiemens per centimeter at 25 degrees Celsius; Alkalinity, in milligrams per liter calcium carbonate; all major ion concentrations in milligrams per liter; method detection limits in milligrams per liter listed in parentheses below constituent names; 1,618A, 1,618B, 1,618C, and 1,618D, instream samples collected from individual braids listed from left bank to right bank of main channel looking downstream; --, not measured]

Source	Distance (meters)	Time	Temp	pH	SC	Calcium (0.02)	Magnesium (0.001)	Sodium (0.20)	Chloride (0.30)	Sulfate (0.09)	Alkalinity
0	0	--	12.0	7.35	165	26.4	2.18	0.92	0.20	54.7	21.7
0	80	1855	12.5	7.34	210	25.8	2.14	8.72	13.35	55.2	34.4
0	282	1845	13.1	7.41	210	25.2	2.16	7.35	11.24	55.2	22.5
0	586	1830	11.9	7.21	220	30.9	2.23	5.44	7.43	66.4	20.5
0	786	1825	11.9	7.28	205	30.7	2.23	5.46	7.41	66.5	20.0
0	906	1820	12.1	7.44	225	28.8	2.23	5.49	7.44	66.0	21.3
0	1,061	1815	15.9	7.36	215	28.2	2.23	5.42	7.41	65.5	21.6
0	1,411	1800	14.9	7.27	185	29.8	2.32	5.60	7.34	66.5	--
0	1,618A	1740	13.0	6.98	210	30.0	2.20	5.30	7.35	66.1	36.8
0	1,618B	1750	12.9	7.45	225	29.1	2.25	5.92	9.02	66.1	20.2
0	1,618C	1750	12.8	7.27	210	30.4	2.31	5.74	7.40	66.1	35.7
0	1,618D	1755	14.4	7.17	210	28.5	2.21	5.25	7.27	66.1	23.0
0	1,918	1720	14.0	6.59	220	29.1	2.15	4.98	6.96	65.9	37.0
0	2,030	1700	11.7	7.13	185	27.6	2.04	4.03	5.00	61.3	--
0	2,240	1640	11.9	6.78	145	27.9	2.03	3.35	4.45	62.2	33.2
0	2,420	1630	12.2	6.65	145	26.9	1.95	4.14	4.51	61.8	30.8
0	2,620	1605	13.0	7.03	145	29.0	2.04	3.44	3.93	61.9	20.7
0	2,620	1610	12.7	7.16	150	29.6	2.07	3.55	3.93	61.9	20.9
0	2,860	1555	13.4	7.34	185	28.0	2.05	4.56	4.00	62.2	24.5
0	3,150	1540	13.8	7.30	190	29.3	2.13	4.67	3.72	61.7	20.0
0	3,400	1513	13.5	7.05	195	27.8	2.08	2.78	3.33	64.0	36.6
0	3,435	1505	13.4	6.88	195	29.7	2.14	3.90	2.94	63.5	35.0
0	3,665	1450	12.5	7.22	195	29.8	2.17	3.96	2.77	62.6	23.8
0	3,905	1435	12.0	7.64	190	27.8	2.07	2.53	3.11	62.2	22.5
0	4,164	1415	11.9	6.89	150	30.6	2.20	2.46	2.64	63.4	22.1
0	4,430	1400	11.6	7.05	200	30.4	2.21	3.12	2.51	65.3	23.8
0	4,670	1345	12.1	6.79	155	32.2	2.26	2.31	2.33	67.9	22.6
0	4,970	1333	12.5	7.04	210	33.4	2.28	2.71	2.33	69.3	23.4
0	5,190	1320	12.4	7.00	215	34.3	2.31	2.77	2.30	68.9	23.0
0	5,467	1240	11.1	7.37	210	31.6	2.24	2.85	2.30	70.6	24.6
0	6,038	1215	11.4	7.14	215	31.6	2.22	2.41	2.26	70.7	24.3
0	6,528	1145	10.7	7.33	220	35.3	2.34	2.73	2.26	74.0	23.9
0	6,618	1135	10.9	6.98	220	35.0	2.37	2.29	2.08	70.7	24.3
0	6,753	1115	10.5	7.09	145	33.3	2.28	2.40	1.80	70.4	29.2
0	6,993	1105	10.5	6.86	220	35.3	2.35	2.14	1.76	70.4	27.7
0	7,250	1024	9.4	7.13	235	37.0	2.35	2.77	1.84	71.0	31.1
1	347	1845	12.3	7.38	230	38.0	2.34	1.23	0.27	90.7	37.6
1	2,090	1705	10.5	7.22	175	26.9	2.32	1.47	1.35	63.6	32.7
1	2,465	1625	11.2	7.93	225	36.5	2.91	2.40	0.21	61.0	47.6
1	3,165	1540	12.4	6.32	240	49.5	3.72	2.24	0.24	128	24.3
1	3,405	1525	8.0	7.11	175	30.7	1.99	1.60	0.65	58.9	20.6
1	3,450	1500	13.5	7.95	195	33.4	2.84	2.60	0.19	43.8	52.8
1	3,954	1426	10.8	6.51	245	38.9	2.54	1.76	0.27	94.9	34.6
1	4,189	1415	12.0	6.99	165	33.5	2.14	1.45	0.36	77.1	11.7
1	5,210	1317	15.4	7.74	315	54.8	2.45	3.33	0.28	85.8	65.7
1	5,407	1307	17.9	6.83	210	32.5	1.93	2.07	1.58	58.9	28.8
1	5,648	1235	13.7	7.30	210	32.4	2.55	2.79	2.52	73.8	20.9
1	6,438	1151	15.5	5.68	610	77.5	8.78	2.77	5.17	307	--
1	6,558	1140	10.5	7.60	210	36.2	2.16	1.79	0.28	54.1	46.4
1	6,633	1128	9.3	7.81	245	43.6	2.02	2.44	0.25	69.3	50.7
1	7,008	1052	7.9	7.09	540	95.7	6.14	5.21	0.30	266	23.1
1	7,013	1045	10.1	7.25	185	30.9	1.96	2.48	3.79	46.6	27.1
1	7,063	1038	9.6	6.90	300	52.7	2.61	3.43	4.79	108	30.3

Appendix 2. Inductively coupled plasma-atomic emissions spectrometry (ICP-AES) results for synoptic water samples, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.

[Source, 0=stream, 1=inflow; Distance, distance downstream from injection site; Silica as SiO2; all concentrations in milligrams per liter; method detection limits in milligrams per liter listed in parentheses below constituent names; 1,618A, 1,618B, 1,618C, and 1,618D, instream samples collected from individual braids listed from left bank to right bank of main channel looking downstream; < constituent not detected; E, estimated concentration less than method detection limit]

Source	Distance (meters)	Aluminum, dissolved (0.01)	Aluminum, colloidal (0.01)	Barium, dissolved (0.002)	Cadmium, dissolved (0.001)	Copper, dissolved (0.002)	Copper, colloidal (0.002)	Iron, dissolved (0.003)	Iron, colloidal (0.003)
0	0	0.066	0.222	0.0119	0.0021	0.0232	<0.002	<0.003	0.085
0	80	0.060	0.225	0.0114	0.0030	0.0845	<0.002	0.008	0.075
0	282	0.074	0.226	0.0116	0.0026	0.0170	<0.002	<0.003	0.088
0	586	0.084	0.155	0.0117	0.0024	0.0068	0.0037	<0.003	0.078
0	786	0.065	0.172	0.0119	0.0018	0.0201	<0.002	<0.003	0.078
0	906	0.053	0.180	0.0112	<0.001	0.0330	<0.002	0.006	0.073
0	1,061	0.053	0.180	0.0120	0.0024	0.0063	0.0058	<0.003	0.081
0	1,411	0.065	0.159	0.0121	0.0018	0.0334	<0.002	0.005	0.072
0	1,618A	0.076	0.134	0.0113	0.0021	0.0060	0.0030	<0.003	0.062
0	1,618B	0.079	0.130	0.0125	0.0035	0.141	<0.002	0.014	0.049
0	1,618C	0.053	0.014	0.0118	0.0028	0.0046	<0.002	0.005	<0.003
0	1,618D	0.077	0.117	0.0112	0.0020	0.0078	<0.002	<0.003	0.049
0	1,918	0.083	0.103	0.0109	0.0019	0.0040	0.0036	<0.003	0.055
0	2,030	0.059	0.077	0.0116	0.0017	0.0062	<0.002	<0.003	0.032
0	2,240	0.039	0.081	0.0118	<0.001	0.0065	<0.002	<0.003	0.029
0	2,420	0.048	0.070	0.0110	<0.001	0.0044	<0.002	<0.003	0.032
0	2,620	0.067	0.053	0.0152	<0.001	0.0036	<0.002	<0.003	0.048
0	2,620	0.058	0.098	0.0161	0.0015	0.0036	<0.002	<0.003	0.061
0	2,860	0.055	0.065	0.0162	<0.001	0.0038	<0.002	<0.003	0.044
0	3,150	0.037	0.088	0.0168	<0.001	0.0030	<0.002	<0.003	0.045
0	3,400	0.035	0.062	0.0157	0.0020	0.0040	<0.002	<0.003	0.034
0	3,435	0.053	0.036	0.0185	<0.001	0.0031	<0.002	<0.003	0.031
0	3,665	0.035	0.037	0.0199	<0.001	0.0037	<0.002	<0.003	0.023
0	3,905	0.021	0.059	0.0189	<0.001	0.0038	<0.002	<0.003	0.021
0	4,164	0.032	0.014	0.0195	<0.001	0.0046	<0.002	<0.003	<0.003
0	4,430	0.031	0.054	0.0199	<0.001	0.0045	<0.002	<0.003	0.023
0	4,670	0.028	0.049	0.0196	<0.001	0.0032	<0.002	<0.003	0.021
0	4,970	0.053	0.014	0.0195	<0.001	0.0020	<0.002	<0.003	0.015
0	5,190	0.046	0.014	0.0197	<0.001	0.0023	<0.002	<0.003	0.019
0	5,467	0.024	0.055	0.0184	<0.001	0.0050	<0.002	<0.003	0.023
0	6,038	0.014	0.058	0.0184	0.0017	0.0022	<0.002	<0.003	0.031
0	6,528	0.040	0.059	0.0183	<0.001	0.0015E	<0.002	0.059	0.240
0	6,618	0.036	0.034	0.0242	<0.001	0.0023	<0.002	0.013	0.213
0	6,753	0.014	0.076	0.0237	<0.001	0.0060	<0.002	0.008	0.152
0	6,993	0.026	0.049	0.0236	0.0015	0.0109	<0.002	0.020	0.121
0	7,250	0.041	0.033	0.0232	0.0017	0.0018E	0.0012E	<0.003	0.171
1	347	0.064	0.071	0.0121	0.0017	0.0144	<0.002	<0.003	0.076
1	1,940	0.154	0.014	0.0150	0.0020	0.0070	<0.002	0.029	<0.003
1	2,090	0.025	0.035	0.0093	0.0031	0.0060	0.0034	0.130	0.163
1	2,465	0.057	0.079	0.0485	<0.001	0.0018E	<0.002	0.049	0.144
1	3,165	0.085	0.014	0.0161	0.0028	0.0019E	<0.002	<0.003	0.008
1	3,405	0.028	0.014	0.0267	0.0018	0.0025	<0.002	<0.003	0.019
1	3,450	0.014	0.021	0.0468	<0.001	0.0023	<0.002	<0.003	<0.003
1	3,954	0.023	0.014	0.0247	0.0019	0.0043	<0.002	<0.003	<0.003
1	4,189	0.014	0.014	0.0182	<0.001	0.0013E	<0.002	<0.003	0.796
1	5,210	0.014	0.043	0.0105	<0.001	0.0010E	0.0015E	0.037	0.070
1	5,407	0.014	0.383	0.0110	<0.001	0.0027	0.0251	<0.003	0.796
1	5,648	0.031	0.073	0.0167	<0.001	0.0036	<0.002	0.036	0.041
1	6,438	0.563	0.141	0.0298	0.0091	<0.002	0.0225	11.7	3.87
1	6,558	0.023	0.014	0.0434	<0.001	<0.002	<0.002	<0.003	0.024
1	6,633	0.014	0.014	0.0019E	<0.001	0.0011E	<0.002	<0.003	<0.003
1	7,008	0.023	0.024	0.0093	0.0021	<0.002	<0.002	1.03	1.13
1	7,013	0.026	0.014	0.0043	0.0034	0.0399	0.0048	<0.003	0.040
1	7,063	0.032	0.014	0.0101	0.0100	0.0254	0.0018E	<0.003	<0.003

Appendix 2. Inductively coupled plasma-atomic emissions spectrometry (ICP-AES) results for synoptic water samples, upper Animas River, Eureka to Howardsville, Colorado, August 14, 1998.—Continued

[Source, 0=stream, 1=inflow; Distance, distance downstream from injection site; Silica as SiO2; all concentrations in milligrams per liter; method detection limits in milligrams per liter listed in parentheses below constituent names; 1,618A, 1,618B, 1,618C, and 1,618D, instream samples collected from individual braids listed from left bank to right bank of main channel looking downstream; < constituent not detected; E, estimated concentration less than method detection limit]

Source	Distance (meters)	Manganese, dissolved (0.001)	Manganese, colloidal (0.001)	Silica, dissolved (0.009)	Silica, colloidal (0.009)	Strontium, dissolved (0.0005)	Strontium, colloidal (0.0005)	Zinc, dissolved (0.003)	Zinc, colloidal (0.003)
0	0	0.779	<0.001	3.94	0.449	0.172	<0.0005	0.467	<0.003
0	80	0.754	0.005	4.03	0.227	0.165	<0.0005	0.541	<0.003
0	282	0.766	0.016	4.01	0.436	0.167	0.0049	0.391	0.0270
0	586	0.576	0.006	4.11	0.689	0.241	0.0035	0.365	0.0185
0	786	0.574	0.013	4.25	0.604	0.244	0.0029	0.382	<0.003
0	906	0.566	0.012	4.54	0.215	0.239	0.0088	0.418	<0.003
0	1,061	0.567	0.007	4.69	0.058	0.244	<0.0005	0.335	0.0293
0	1,411	0.583	<0.001	4.67	0.136	0.248	<0.0005	0.414	<0.003
0	1,618A	0.552	0.013	4.49	0.021	0.238	0.0022	0.302	0.0217
0	1,618B	0.582	<0.001	4.71	0.021	0.248	<0.0005	0.339	<0.003
0	1,618C	0.562	0.018	4.61	0.156	0.242	0.0067	0.651	<0.003
0	1,618D	0.564	0.023	4.41	0.383	0.237	0.0069	0.326	0.0233
0	1,918	0.527	<0.001	4.35	0.269	0.232	0.0011	0.301	0.0130
0	2,030	0.377	0.007	4.90	0.160	0.232	0.0042	0.347	0.0136
0	2,240	0.343	<0.001	5.13	0.031	0.242	<0.0005	0.353	0.0019E
0	2,420	0.327	0.018	4.95	0.176	0.227	0.0117	0.332	0.0266
0	2,620	0.301	0.059	4.81	1.23	0.265	0.0528	0.292	0.0679
0	2,620	0.290	0.010	4.60	0.662	0.254	0.0097	0.284	0.0189
0	2,860	0.299	0.004	5.08	0.258	0.263	0.0048	0.294	0.0134
0	3,150	0.296	<0.001	5.23	0.021	0.276	<0.0005	0.302	0.0078
0	3,400	0.242	0.008	5.33	0.152	0.261	0.0081	0.304	0.0132
0	3,435	0.222	<0.001	5.61	0.134	0.284	<0.0005	0.337	<0.003
0	3,665	0.210	<0.001	5.52	0.076	0.290	<0.0005	0.291	0.0107
0	3,905	0.196	0.015	5.25	0.505	0.270	0.0216	0.286	0.0265
0	4,164	0.192	<0.001	5.62	0.021	0.288	0.0037	0.288	<0.003
0	4,430	0.172	0.003	5.65	0.021	0.292	0.0039	0.286	0.0071
0	4,670	0.158	0.004	5.86	0.021	0.305	0.0046	0.278	0.0159
0	4,970	0.154	<0.001	5.87	0.050	0.311	<0.0005	0.286	<0.003
0	5,190	0.149	<0.001	5.77	0.292	0.318	<0.0005	0.284	<0.003
0	5,467	0.137	0.004	5.90	0.021	0.306	0.0069	0.276	0.0087
0	6,038	0.135	0.004	5.94	0.178	0.312	0.0045	0.272	0.0186
0	6,528	0.365	0.011	5.82	0.561	0.324	0.0079	0.364	0.0238
0	6,618	0.292	0.005	5.99	0.033	0.341	<0.0005	0.298	0.0118
0	6,753	0.279	0.011	5.95	0.021	0.345	0.0034	0.282	0.0130
0	6,993	0.284	<0.001	5.95	0.021	0.346	<0.0005	0.321	<0.003
0	7,250	0.287	<0.001	5.68	0.483	0.348	<0.0005	0.286	0.0103
1	347	0.118	0.005	5.58	0.228	0.398	0.0197	0.299	0.0095
1	1,940	0.562	<0.001	6.15	0.021	0.281	<0.0005	0.728	<0.003
1	2,090	0.193	0.005	6.79	0.146	0.228	<0.0005	0.483	0.0094
1	2,465	0.021	0.008	6.44	0.413	0.504	0.0161	0.008	<0.003
1	3,165	0.073	0.003	11.9	0.021	0.405	0.0046	0.879	0.0027E
1	3,405	0.003	0.006	6.39	0.344	0.304	0.0014	0.325	<0.003
1	3,450	<0.001	<0.001	4.99	0.021	0.378	<0.0005	0.008	<0.003
1	3,954	0.122	0.002	8.38	0.021	0.367	0.0039	0.456	<0.0
1	4,189	0.038	0.002	6.90	0.245	0.328	0.0084	0.222	0.0063
1	5,210	0.056	0.013	6.62	0.058	0.646	<0.0005	0.012	0.0059
1	5,407	0.100	0.314	9.24	5.10	0.336	0.0085	0.218	0.0732
1	5,648	0.259	<0.001	6.69	0.085	0.304	<0.0005	0.308	<0.003
1	6,438	18.6	0.419	15.0	0.363	0.516	<0.0005	7.28	0.4317
1	6,558	0.005	0.001	5.23	0.200	0.363	0.0090	0.026	<0.003
1	6,633	<0.001	0.001	5.99	0.139	0.596	0.0086	0.013	<0.003
1	7,008	1.04	<0.001	20.9	0.021	0.885	<0.0005	0.368	<0.003
1	7,013	0.011	0.009	7.47	0.120	0.307	<0.0005	0.298	<0.003
1	7,063	0.001	<0.001	10.1	0.168	0.596	0.0192	1.37	0.0232

Appendix 3. Field measurements and major ion concentrations for synoptic water samples, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

[Source, 0=stream, 1=inflow; Distance, distance downstream from injection site; Temp, water temperature, in degrees Celsius; pH, in standard units; SC, specific conductance, in microsiemens per centimeter at 25 degrees Celsius; Alkalinity, in milligrams per liter calcium carbonate; all major ion concentrations in milligrams per liter, method detection limits in milligrams per liter listed in parentheses below constituent names; --, not measured]

Source	Distance (meters)	Sample Time	Temp	pH	SC	Calcium (0.20)	Magnesium (0.001)	Sodium (0.20)	Chloride (0.30)	Sulfate (0.09)	Alkalinity
0	160	1815	9.5	7.55	203	35.9	2.44	2.53	2.24	78.6	21.8
0	310	1755	10.0	7.50	228	35.4	2.47	2.30	2.20	79.7	--
0	595	1735	11.0	7.40	230	36.0	2.45	2.53	2.23	78.4	23.0
0	905	1710	11.8	7.46	229	35.3	2.40	2.48	2.17	78.5	21.4
0	955	1701	12.0	7.63	232	36.3	2.41	10.2	2.18	81.5	23.3
0	1,059	1645	12.0	7.65	244	37.6	2.62	2.15	2.41	89.6	0.00
0	1,135	1630	12.5	7.69	229	36.9	2.52	2.32	1.53	71.8	29.0
0	1,270	1615	--	7.64	235	36.4	2.48	2.29	1.68	73.2	32.8
0	1,510	1610	--	7.60	234	36.5	2.47	2.31	1.61	73.0	30.4
0	1,725	1555	--	7.58	235	37.6	2.56	2.31	1.69	77.4	28.0
0	2,110	1525	--	7.68	235	36.6	2.49	2.79	1.52	78.2	28.1
0	2,515	1450	--	7.55	237	37.6	2.54	2.21	1.61	77.6	--
0	2,572	1442	--	7.53	240	36.6	2.47	2.13	1.60	77.7	27.8
0	2,800	1430	12.5	7.73	239	37.7	2.64	2.32	1.60	78.5	29.7
0	3,040	1420	12.5	7.78	238	36.6	2.52	2.12	1.58	80.4	29.9
0	3,295	1410	--	7.84	237	37.8	2.62	2.24	1.63	77.2	38.4
0	3,555	1405	11.5	7.78	238	37.8	2.58	3.22	1.72	78.0	29.8
0	4,023	1335	--	7.73	237	37.7	2.61	2.19	1.86	69.9	28.2
0	4,166	1320	--	7.75	238	38.8	2.65	2.93	1.69	78.8	22.7
0	4,310	1300	9.5	7.72	232	36.9	2.46	2.56	1.57	74.6	--
0	4,473	1240	9.0	7.68	232	36.4	2.48	2.15	1.60	75.0	29.6
0	4,581	1200	8.0	7.36	232	36.8	2.56	3.30	1.70	73.1	31.1
0	4,656	1150	--	7.71	234	37.8	2.52	2.32	1.62	75.7	2.62
0	4,816	1145	8.0	7.70	233	37.6	2.56	2.15	1.63	63.5	23.7
0	4,916	1125	8.0	7.61	236	38.4	2.52	2.18	1.59	78.0	30.2
0	5,131	1115	7.5	7.62	231	37.7	2.58	2.11	1.54	75.2	26.4
0	5,306	1100	7.5	7.55	237	39.5	2.58	3.48	1.58	77.2	32.8
0	5,536	1040	7.0	7.50	239	39.6	2.64	3.64	1.60	79.2	31.9
0	5,756	1030	7.0	7.42	239	38.8	2.61	3.50	1.54	80.2	31.9
0	6,038	1018	7.0	7.57	239	37.4	2.49	2.18	1.54	79.7	26.2
0	6,288	1005	7.0	7.49	244	38.8	2.61	4.78	1.56	81.9	33.1
0	6,528	1000	7.0	7.66	245	39.3	2.60	2.11	1.58	71.3	29.8
0	6,768	948	7.0	7.65	244	39.3	2.59	2.20	1.57	79.7	26.0
0	7,008	938	7.0	7.69	243	39.2	2.62	2.34	1.63	80.6	30.0
0	7,283	925	7.0	7.64	243	37.6	2.52	2.10	1.60	80.7	32.7
0	7,523	915	7.0	7.63	243	39.2	2.61	4.60	1.69	83.7	32.9
0	7,858	900	7.0	7.63	250	39.4	2.57	1.91	1.64	83.2	35.0
1	181	1805	18.0	6.92	443	70.4	10.6	2.10	26.9	212	3.73
1	213	1800	12.5	7.53	134	24.5	0.93	2.21	0.17	39.8	29.6
1	315	1750	6.5	7.59	183	30.5	1.59	2.32	0.34	38.9	44.6
1	745	1730	9.5	7.63	245	41.8	1.62	2.32	0.36	75.3	33.8
1	795	1725	12.0	7.36	--	--	--	1.59	78.0	21.1	--
1	910	1710	9.0	7.65	482	99.6	2.60	2.42	0.58	243	54.4
1	965	1700	18.0	6.88	839	171	7.55	1.25	7.86	549	22.9
1	1,075	1645	--	8.04	211	37.9	2.47	2.42	0.32	53.6	44.4
1	1,150	1620	9.5	8.12	259	44.6	2.10	2.35	0.23	74.1	52.8
1	1,605	1605	11.0	6.98	456	107	7.33	4.79	0.40	256	22.4
1	1,648	1605	9.5	6.74	297	52.9	2.69	2.35	8.31	116	31.5
1	1,665	1600	9.5	6.80	267	--	--	--	1.76	80.5	29.1
1	1,745	1550	11.0	7.89	191	30.4	1.85	1.86	0.94	51.1	40.7
1	2,050	1535	8.5	7.23	194	31.4	1.94	2.38	1.40	48.7	34.6
1	2,125	1520	11.0	4.76	354	67.8	5.87	4.65	0.39	222	0.00
1	2,360	1510	11.0	6.43	246	34.1	3.91	3.30	0.56	105	4.34
1	2,361	1510	9.5	7.30	177	24.4	2.80	2.43	0.37	62.9	24.1
1	2,425	1500	10.0	7.15	152	21.3	2.14	2.29	0.33	47.5	29.0

Appendix 3. Field measurements and major ion concentrations for synoptic water samples, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.—Continued

[Source, 0=stream, 1=inflow; Distance, distance downstream from injection site; Temp, water temperature, in degrees Celsius; pH, in standard units; SC, specific conductance, in microsiemens per centimeter at 25 degrees Celsius; Alkalinity, in milligrams per liter calcium carbonate; all major ion concentrations in milligrams per liter, method detection limits in milligrams per liter listed in parentheses below constituent names; --, not measured]

Source	Distance (meters)	Sample Time	Temp	pH	SC	Calcium (0.20)	Magnesium (0.001)	Sodium (0.20)	Chloride (0.30)	Sulfate (0.09)	Alkalinity
1	2,522	1445	9.0	6.10	383	64.2	6.38	2.21	0.42	224	3.08
1	2,605	1440	14.5	7.92	291	--	--	--	1.63	77.2	63.1
1	2,709	1430	14.0	7.92	315	--	--	--	1.58	80.4	66.6
1	3,235	1415	12.5	8.20	276	46.9	2.75	2.24	1.28	56.4	78.5
1	3,682	1400	15.5	8.14	245	40.8	2.53	2.41	2.17	49.1	64.2
1	3,820	1350	13.0	7.93	240	38.3	3.06	2.24	2.54	48.0	64.5
1	4,033	1325	9.5	8.17	295	53.4	3.59	2.34	2.39	65.3	72.8
1	4,186	1310	--	7.92	184	32.1	1.68	9.31	0.23	43.9	41.6
1	4,190	1305	6.5	7.77	187	32.2	1.65	2.39	0.31	40.8	32.4
1	4,334	1255	--	7.75	187	30.8	1.62	2.54	0.23	45.0	40.8
1	4,353	1245	12.0	4.17	1,543	192	35.3	1.20	26.0	1,053	0.00
1	4,533	1225	14.5	4.90	1,929	205	31.4	6.83	8.85	1,353	0.00
1	4,586	1200	10.5	4.89	710	114	14.4	5.28	1.96	442	0.00
1	4,886	1135	12.5	5.92	1,824	344	24.7	6.65	2.49	1,408	18.0
1	4,951	1120	8.5	7.53	126	21.1	1.07	2.25	0.18	30.8	27.1
1	4,970	1125	9.5	6.04	478	78.7	5.78	5.23	0.85	249	10.8
1	5,161	1110	9.5	7.47	687	137	3.00	7.26	0.33	364	44.6
1	5,221	1107	8.0	7.52	673	135	3.04	2.43	0.51	360	50.0
1	5,355	1055	7.0	6.95	80	12.8	0.81	2.44	0.18	15.5	30.3
1	5,356	1055	11.0	5.14	691	230	17.9	1.01	1.01	1,378	0.00
1	5,446	1045	7.0	6.72	75	12.1	0.81	1.88	0.26	12.8	23.1
1	5,766	1045	8.0	7.80	236	40.8	2.77	2.24	0.47	55.2	59.9
1	5,858	1025	11.0	5.67	242	226	12.7	1.25	1.74	861	8.85
1	6,105	1010	6.5	7.03	120	18.5	1.41	2.34	0.32	31.3	21.9
1	7,103	935	9.0	7.61	272	46.4	3.13	4.45	0.42	89.1	44.8
1	7,163	935	6.0	7.66	123	19.3	1.50	2.27	0.22	30.8	26.4
1	7,483	915	7.5	7.64	129	19.6	1.54	1.20	0.30	33.5	26.8
1	7,688	905	10.5	7.14	1,522	307	14.2	1.22	5.64	1,103	35.2

Appendix 4. Inductively coupled plasma-atomic emissions spectrometry (ICP-AES) results for synoptic water samples, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.

[Source, 0=stream, 1=inflow; Distance, distance downstream from injection site; Silica as SiO2; all concentrations in milligrams per liter; method detection limits in milligrams per liter listed in parentheses below constituent names; <, constituent not detected; E, estimated concentration less than method detection limit; --, not measured]

Source	Distance (meters)	Aluminum, dissolved (0.01)	Aluminum colloidal (0.01)	Barium, dissolved (0.002)	Cadmium, dissolved (0.001)	Copper, dissolved (0.002)	Copper, colloidal (0.002)	Iron, dissolved (0.003)	Iron, colloidal (0.003)
0	160	0.006E	0.083	0.0208	0.0018	0.0038	0.0020E	0.002E	0.030
0	310	0.031	0.036	0.0207	0.0014	0.0028	0.0006E	0.006	0.032
0	595	0.009E	0.001E	0.0205	0.0018	0.0036	<0.002	<0.003	<0.003
0	905	0.036	0.026	0.0203	0.0013	0.0019E	<0.002	0.016	0.015
0	955	0.005E	0.057	0.0198	0.0018	0.0027	0.0012E	0.007	0.026
0	1,059	0.017	0.039	0.0200	0.0012	0.0012E	0.0031	0.130	0.304
0	1,135	0.015	0.040	0.0304	0.0012	0.0020E	0.0021	0.084	0.389
0	1,270	0.011	0.051	0.0276	0.0013	0.0020E	0.0014E	0.016	0.455
0	1,510	0.012	0.062	0.0277	0.0012	0.0020E	0.0012E	0.076	0.375
0	1,725	0.010E	0.064	0.0278	0.0018	<0.002	0.0025	0.036	0.412
0	1,925	0.011	0.051	0.0272	0.0013	<0.002	0.0029	0.023	0.428
0	1,925	0.022	0.036	0.0267	0.0011	0.0011E	0.0028	0.037	0.419
0	2,110	0.025	0.042	0.0269	0.0012	0.0011E	0.0023	0.012	0.443
0	2,515	0.024	0.065	0.0268	0.0014	0.0017E	0.0020E	0.017	0.460
0	2,572	0.033	0.033	0.0261	0.0018	<0.002	0.0035	0.009	0.445
0	2,800	0.022	0.070	0.0275	0.0012	<0.002	0.0030	0.005	0.436
0	3,040	0.035	0.039	0.0255	0.0016	0.0011E	0.0029	0.010	0.431
0	3,295	0.035	0.048	0.0268	<0.001	0.0013E	0.0025	0.013	0.434
0	3,555	0.017	0.069	0.0265	0.0017	0.0017E	0.0027	0.014	0.424
0	4,023	0.038	0.075	0.0260	0.0012	<0.002	0.0016E	0.009	0.464
0	4,166	0.023	0.087	0.0272	0.0014	0.0017E	0.0022	0.009	0.468
0	4,310	0.027	0.069	0.0262	0.0017	0.0035	0.0050	0.163	0.233
0	4,473	0.009E	0.098	0.0257	0.0016	<0.002	0.0041	<0.003	0.457
0	4,581	0.017	0.102	0.0264	0.0020	0.0018E	0.0020E	0.005	0.446
0	4,656	0.039	0.057	0.0262	0.0012	0.0010E	0.0030	0.009	0.457
0	4,816	0.049	0.092	0.0260	0.0013	<0.002	0.0021	0.004	0.493
0	4,916	0.041	0.065	0.0263	0.0011	<0.002	0.0034	0.007	0.482
0	5,131	0.021	0.079	0.0267	0.0015	0.0015E	0.0024	0.018	0.445
0	5,306	0.041	0.072	0.0264	0.0018	<0.002	0.0037	0.015	0.421
0	5,536	0.052	0.095	0.0265	0.0011	<0.002	0.0027	0.004	0.460
0	5,756	0.021	0.109	0.0261	0.0015	0.0019E	0.0038	0.018	0.457
0	6,038	0.040	0.070	0.0244	0.0015	0.0019E	0.0028	0.014	0.406
0	6,288	0.041	0.083	0.0261	0.0016	0.0028	0.0034	0.010	0.409
0	6,528	0.054	0.071	0.0253	0.0018	<0.002	0.0057	0.012	0.425
0	6,768	0.055	0.056	0.0260	0.0015	<0.002	0.0049	0.002E	0.406
0	7,008	0.043	0.079	0.0261	0.0021	0.0027	0.0021	0.013	0.406
0	7,283	0.034	0.106	0.0247	0.0015	0.0021	0.0028	0.009	0.414
0	7,523	0.041	0.101	0.0260	0.0017	0.0020E	0.0020E	0.011	0.419
0	7,858	0.058	0.081	0.0249	0.0017	<0.002	0.0047	0.003E	0.423

Appendix 4. Inductively coupled plasma-atomic emissions spectrometry (ICP-AES) results for synoptic water samples, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.—Continued

[Source, 0=stream, 1=inflow; Distance, distance downstream from injection site; Silica as SiO2; all concentrations in milligrams per liter; method detection limits in milligrams per liter listed in parentheses below constituent names; <, constituent not detected; E, estimated concentration less than method detection limit; --, not measured]

Source	Distance (meters)	Aluminum, dissolved (0.01)	Aluminum colloidal (0.01)	Barium, dissolved (0.002)	Cadmium, dissolved (0.001)	Copper, dissolved (0.002)	Copper, colloidal (0.002)	Iron, dissolved (0.003)	Iron, colloidal (0.003)
1	181	0.060	0.698	0.0211	0.0045	0.0022	0.0149	0.154	0.925
1	213	0.018	0.003E	0.0057	<0.001	0.0022	0.0020E	0.021	0.054
1	315	<0.01	0.003E	0.0039	0.0011	0.0011E	0.0012E	0.003	0.007
1	745	0.006E	0.014	0.0042	<0.001	<0.002	0.0006E	0.010	0.024
1	910	0.002E	0.079	0.0032	0.0013	<0.002	<0.002	0.011	0.074
1	965	0.012	0.329	0.0286	0.0038	0.0013E	0.0070	1.202	12.382
1	1,075	0.017	0.026	0.0508	<0.001	0.0017E	<0.002	0.008	0.038
1	1,150	0.013	0.011	0.0023	<0.001	<0.002	<0.002	0.008	0.011
1	1,605	0.051	0.010E	0.0111	0.0031	<0.002	<0.002	1.172	0.732
1	1,648	0.002E	0.016	0.0108	0.0122	0.0355	0.0068	<0.003	0.006
1	1,745	0.007E	3.975	0.0029	<0.001	<0.002	0.0092	0.004	3.775
1	2,050	0.002E	0.001E	0.0031	<0.001	<0.002	<0.002	0.001E	<0.003
1	2,125	1.323	0.001E	0.0111	<0.001	0.0109	0.0070	0.556	0.036
1	2,360	0.329	--	0.0140	0.0040	0.0180	--	0.222	--
1	2,361	0.060	0.064	0.0106	0.0018	<0.002	<0.002	0.011	<0.003
1	2,425	<0.01	0.031	0.0131	<0.001	<0.002	<0.002	0.007	0.048
1	2,522	0.565	0.454	0.0101	0.0035	<0.002	0.0008E	<0.003	1.016
1	3.235	<0.01	0.190	0.0035	<0.001	<0.002	<0.002	<0.003	0.225
1	3,682	0.035	0.001E	0.0071	<0.001	<0.002	<0.002	0.006	<0.003
1	3,820	0.020	1.392	0.0080	0.0021	0.0039	0.0056	<0.003	1.54
1	4,033	0.022	0.071	0.0068	0.001E	<0.002	<0.002	<0.003	0.119
1	4,186	0.021	0.020	0.0254	0.0016	0.0034	<0.002	<0.003	0.006
1	4,190	0.016	0.004E	0.0315	0.0021	0.0043	0.0012E	0.002E	0.011
1	4,334	0.026	0.001E	0.0304	0.0025	0.0075	<0.002	0.008	<0.003
1	4,353	23.5	11.695	0.0153	0.610	5.20	0.0604	0.044	9.81
1	4,533	9.76	0.403	0.0162	0.188	0.358	0.0677	0.552	0.170
1	4,586	2.43	0.524	0.0190	0.0370	0.203	0.0454	0.309	0.776
1	4,886	0.394	0.001E	0.0209	0.0458	0.0238	<0.002	0.013	0.006
1	4,951	0.046	0.001E	0.0077	<0.001	<0.002	0.0020E	<0.003	0.009
1	4,970	0.145	0.001E	0.0088	0.0131	0.0381	0.0040	<0.003	0.025
1	5,161	0.004E	0.018	0.0257	0.0021	<0.002	0.0010E	<0.003	0.026
1	5,221	0.030	0.001E	0.0251	0.0029	<0.002	<0.002	0.010	0.025
1	5,355	0.046	0.023	0.0151	<0.001	<0.002	<0.002	0.011	0.050
1	5,356	20.0	0.001E	0.0193	0.1244	2.42	<0.002	0.023	0.084
1	5,446	0.037	0.200	0.0133	<0.001	<0.002	<0.002	0.013	0.523
1	5,766	0.055	0.226	0.0052	0.0013	0.0018E	0.0069	0.002E	0.388
1	5,858	1.74	0.892	0.0156	0.0555	0.248	0.0460	0.020	0.957
1	6,105	0.015	0.015	0.0080	<0.001	<0.002	<0.002	0.009	0.013
1	7,103	<0.01	0.035	0.0299	0.0017	<0.002	0.0017E	0.022	0.112
1	7,163	0.025	0.032	0.0257	0.0017	0.0029	0.0010E	0.017	0.135
1	7,483	0.015	--	0.0290	0.0020	0.0020E	--	0.009	--
1	7,688	0.067	0.170	0.0306	0.0144	0.0040	0.0107	1.12	0.772

Appendix 4. Inductively couple plasma-atomic emissions spectrometry (ICP-AES) results for synoptic water samples, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.—Continued

[Source, 0=stream, 1=inflow; Distance, distance downstream from injection site; Silica as SiO2; all concentrations in milligrams per liter; method detection limits in milligrams per liter listed in parentheses below constituent names; <, constituent not detected; E, concentration estimated less than method detection limit; --, not measured]

Source	Distance (meters)	Manganese, dissolved (0.001)	Manganese, colloidal (0.001)	Silica, dissolved (0.009)	Silica, colloidal (0.009)	Strontium, dissolved (0.0005)	Strontium, colloidal (0.0005)	Zinc, dissolved (0.003)	Zinc, colloidal (0.003)
0	160	0.134	0.0010E	6.56	<0.009	0.354	<0.0005	0.291	<0.003
0	310	0.131	0.0060	6.38	0.205	0.348	0.3562	0.278	0.0158
0	595	0.135	<0.001	6.55	<0.009	0.352	--	0.288	<0.003
0	905	0.124	<0.001	6.23	0.778	0.353	<0.0005	0.274	0.0079
0	955	0.125	0.0005E	6.35	0.158	0.363	0.366	0.266	0.0062
0	1,059	0.585	<0.001	6.67	<0.009	0.370	0.3700	0.369	0.0298
0	1,135	0.442	0.0020	6.20	0.052	0.371	0.371	0.265	0.0276
0	1,270	0.458	0.0076	6.08	0.163	0.371	0.375	0.261	0.0436
0	1,510	0.446	0.0040	6.06	0.255	0.371	0.376	0.258	0.0444
0	1,725	0.446	0.0040	6.27	<0.009	0.385	0.374	0.266	0.0379
0	1,925	0.444	<0.001	6.30	<0.009	0.380	0.375	0.266	0.0345
0	1,925	0.437	0.0115	5.90	0.377	0.367	0.383	0.252	0.0556
0	2,110	0.446	<0.001	6.16	0.235	0.373	0.375	0.258	0.0492
0	2,515	0.459	0.0157	6.63	0.335	0.381	0.387	0.273	0.0558
0	2,572	0.410	0.0301	5.96	0.705	0.374	0.383	0.242	0.0620
0	2,800	0.435	0.0034	6.62	<0.009	0.386	0.380	0.262	0.0410
0	3,040	0.403	0.0338	6.26	0.254	0.364	0.385	0.235	0.0642
0	3,295	0.433	0.0146	6.60	0.200	0.382	0.381	0.265	0.0443
0	3,555	0.454	<0.001	6.68	0.178	0.384	0.383	0.285	0.0139
0	4,023	0.431	0.0193	6.52	0.467	0.379	0.385	0.263	0.0586
0	4,166	0.453	<0.001	6.76	<0.009	0.389	0.387	0.296	0.0268
0	4,310	0.407	<0.001	6.25	0.732	0.390	<0.0005	0.278	<0.003
0	4,473	0.412	0.0288	6.21	0.622	0.387	0.385	0.281	0.0635
0	4,581	0.497	<0.001	6.54	0.034	0.388	0.384	0.311	0.0223
0	4,656	0.499	0.0030	6.42	0.080	0.389	0.382	0.317	0.0402
0	4,816	0.497	0.0252	6.26	0.446	0.387	0.392	0.323	0.0555
0	4,916	0.576	0.0220	6.23	0.376	0.392	0.395	0.352	0.0437
0	5,131	0.601	0.0501	5.94	0.593	0.397	0.395	0.341	0.0569
0	5,306	0.693	<0.001	6.69	<0.009	0.409	0.388	0.386	0.0152
0	5,536	0.787	<0.001	6.58	0.091	0.412	0.401	0.404	0.0371
0	5,756	0.786	<0.001	6.52	0.456	0.407	0.402	0.379	0.0685
0	6,038	0.737	0.0224	6.39	0.260	0.387	0.399	0.370	0.0498
0	6,288	1.10	<0.001	6.67	<0.009	0.410	0.407	0.448	0.0217
0	6,528	1.05	0.0339	6.35	0.441	0.400	0.407	0.428	0.0550
0	6,768	0.972	0.0184	6.38	0.231	0.399	0.400	0.418	0.0375
0	7,008	1.02	0.0020	6.60	0.354	0.410	0.407	0.436	0.0427
0	7,283	0.962	0.0515	6.10	0.707	0.389	0.409	0.386	0.0735
0	7,523	1.01	<0.001	6.36	0.262	0.410	0.398	0.420	0.0398

Appendix 4. Inductively couple plasma-atomic emissions spectrometry (ICP-AES) results for synoptic water samples, upper Animas River, Howardsville to Silverton, Colorado, September 14, 1997.—Continued

[Source, 0=stream, 1=inflow; Distance, distance downstream from injection site; Silica as SiO2; all concentrations in milligrams per liter; method detection limits in milligrams per liter listed in parentheses below constituent names; <, constituent not detected; E, concentration estimated less than method detection limit; --, not measured]

Source	Distance (meters)	Manganese, dissolved (0.001)	Manganese, colloidal (0.001)	Silica, dissolved (0.009)	Silica, colloidal (0.009)	Strontium, dissolved (0.0005)	Strontium, colloidal (0.0005)	Zinc, dissolved (0.003)	Zinc, colloidal (0.003)
0	7,858	1.08	0.0584	6.33	0.478	0.403	0.421	0.426	0.0591
1	181	1.27	0.0583	21.9	1.29	0.652	0.645	0.645	0.0424
1	213	0.092	0.0183	4.29	<0.009	0.278	0.275	0.094	0.0033
1	315	0.003	0.0029	7.24	0.101	0.303	0.305	0.0411	0.0062
1	745	0.030	0.0022	7.79	0.075	0.472	0.474	0.0142	0.0017E
1	910	0.011	<0.001	12.8	0.551	1.49	1.55	0.0161	<0.003
1	965	15.9	0.5434	6.83	3.43	0.592	0.591	2.53	2.37
1	1,075	0.007	<0.001	5.51	<0.009	0.399	0.369	0.0267	<0.003
1	1,150	<0.001	0.0013	6.11	0.259	0.622	0.619	0.0106	0.0017E
1	1,605	1.12	<0.001	26.4	<0.009	0.992	0.792	0.476	<0.003
1	1,648	<0.001	<0.001	9.99	0.131	0.653	0.656	1.54	0.0173
1	1,745	0.003	0.1647	7.80	16.8	0.332	0.351	0.0040	0.0446
1	2,050	0.0010E	<0.001	7.63	<0.009	0.332	--	0.0043	<0.003
1	2,125	1.04	<0.001	30.9	<0.009	<0.0005	0.551	0.218	<0.003
1	2,360	0.249	--	21.2	--	0.0010	--	0.533	--
1	2,361	0.0181	0.0140	17.9	0.380	0.205	0.0010	0.0293	<0.003
1	2,425	0.0021	0.0066	16.0	<0.009	0.161	0.165	0.0115	0.0024E
1	2,522	0.0072	0.0158	25.1	2.26	0.704	0.711	0.0409	0.0024E
1	3,235	<0.001	0.0117	9.59	0.75	0.488	0.503	0.0056	0.0080
1	3,682	0.0054	<0.001	7.80	<0.009	0.373	--	0.0078	<0.003
1	3,820	0.0556	0.0152	8.12	5.76	0.344	0.353	0.126	<0.003
1	4,033	0.0025	0.0014	9.41	<0.009	0.526	0.488	0.0089	<0.003
1	4,186	0.0018	0.0006E	4.69	<0.009	0.457	0.449	0.138	0.0087
1	4,190	0.0021	<0.001	4.69	<0.009	0.457	0.435	0.199	<0.003
1	4,334	0.218	<0.001	4.53	0.171	0.441	0.447	0.221	<0.003
1	4,353	55.5	2.09	38.5	40.6	1.23	1.24	130	8.15
1	4,533	284	<0.001	33.8	0.292	0.989	0.971	53.2	<0.003
1	4,586	4.70	<0.001	31.0	0.921	0.564	0.557	9.32	<0.003
1	4,886	75.6	<0.001	16.5	0.093	2.04	2.02	19.4	<0.003
1	4,951	0.193	0.0115	3.98	0.092	0.211	0.210	0.0594	0.0109
1	4,970	3.11	<0.001	6.60	<0.009	<0.0005	<0.0005	3.77	<0.003
1	5,161	0.070	0.0007E	13.0	<0.009	1.23	1.21	0.424	0.0167
1	5,221	0.012	<0.001	12.3	0.075	1.16	1.15	0.776	0.0247
1	5,355	0.019	<0.001	5.83	0.279	<0.0005	<0.0005	0.0041	<0.003
1	5,356	<0.001	210	30.5	<0.009	<0.0005	2.08	39.8	<0.003
1	5,446	0.0032	0.131	5.98	1.02	<0.0005	<0.0005	0.0047	0.0098
1	5,766	0.0231	0.0120	10.4	0.532	0.455	0.429	0.0425	0.0181
1	5,858	34.4	0.960	24.6	4.18	2.13	2.19	12.7	0.6015
1	6,105	0.0012	0.0017	8.09	0.213	<0.0005	<0.0005	0.0239	0.0019E
1	7,103	0.940	<0.001	11.5	<0.009	<0.0005	<0.0005	0.0835	0.0037
1	7,163	0.0510	0.0094	4.86	0.226	<0.0005	<0.0005	0.2087	0.0240
1	7,483	0.0070	--	4.92	--	0.0010	--	0.395	--
1	7,688	39.7	1.07	15.5	0.087	3.75	3.79	2.08	0.0142