OPEN FILE REPORT 75-4

MINERAL RESOURCES AND MINING POTENTIAL IN THE IDAHO SPRINGS VICINITY CLEAR CREEK COUNTY, COLORADO

by

Stephen D. Schwochow

COLORADO GEOLOGICAL SURVEY
DEPARTMENT OF NATURAL RESOURCES
DENVER, COLORADO
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INTRODUCTION

The purpose of this report is to identify mineral resource areas near Idaho Springs for possible designation as matters of state interest under the provisions of HB 1041. This text and maps, prepared for the City of Idaho Springs at the request of Bruce Bartlett, will describe 1) the general geology and mining history of the district, 2) character and occurrence of ore deposits (metals and nonmetals), and 3) possible hazards associate with mining. In addition, a list of published articles and reports dealing with the district's geology, mining, and mineral resources is included.

The Idaho Springs mining district is located approximately 30 miles west of Denver in northern Clear Creek and southern Gilpin Counties. Elevations in the area range from 7,600 ft along Clear Creek to 9,935 ft on Pewabic Mountain. The district is traversed by U.S. 6 and 40 and Interstate 70 from Denver, and Colorado Routes 103 and 279. The rugged topography of the district is drained by Clear Creek, which has as its principal tributaries Chicago Creek from the southwest, Soda Creek from the south, Hukill Gulch and Virginia Gulch from the north, and Fall River and Trail Creek from the west. Other mining districts that border the Idaho Springs district include the Central City district to the north, Chicago Creek district to the southwest, and the Freeland-Lamartine and Lawson-Dumont-Fall River districts to the west.

The geology of this area was examined as early as 1873 (Stevenson, 1875), but during the late 1800's, only brief descriptions of mineral occurrences, processing, and specific mining operations were published in various mining and engineering journals. The U.S. Geological Survey published its first formal report on the area in 1906 (Spurr and Garrey); more detailed reports appeared in 1908 and 1917. Other USGS publications dealing with the ore deposits, petrology, and structure appeared in the 1950's and 1960's.

ACKNOWLEDGEMENTS

I would like to acknowledge the following gentlemen for their assistance in the preparation and review of this report: Robert Moench, U.S. Geological Survey; A. L. Hornbaker and Stephen S. Hart, Colorado Geological Survey; and Bruce Bartlett, City of Idaho Springs.

HISTORY

The first commercial placer-gold deposit in Colorado was discovered in 1859 at the mouth of Chicago Creek by George A. Jackson. Soon thereafter, John H. Gregory made the first lode discovery in the state, east of central City. The ensuing rush of prospectors and fortune-seekers led to a long and profitable period of production in the Idaho Springs and Central City areas.

1) broad north-northeast-trending Precambrian folds that deformed the gneisses,

2) a 2-mile northeast-trending shear zone of probable late Precambrian age in the southeastern part of the district,

3) northwest-trending Precambrian faults reactivated in early Tertiary time,

4) closely spaced, east- and northeast-trending faults of Tertiary age (now inactive, and

5) several prominent networks of joints and fractures of various ages.

ORE DEPOSITS

The ore deposits have been mined from thin veins that occur principally along the faults of Tertiary age. The ore-bearing minerals were precipitated in openings that were formed along the faults during movement of the opposing walls. The wider openings, and thus the wider veins, occur where the faults are curved or sharply deflected or where two or more faults intersect. The principal ore minerals include pyrite (iron sulfide), sphalerite (zinc sulfide), galena (lead sulfide), chalcopyrite (copper-iron sulfide), and tennantite (a copper-iron-arsenic sulfide), small amounts of silver-bearing minerals, and trace amounts of metallic gold. Based on relative amounts of ore minerals, the veins have been classified as pyritic, pyritic copper, pyritic lead-zinc, and lead-zinc. The most economically important veins in the district are of the pyritic lead-zinc type.

PLACER DEPOSITS

A placer is a sand and gravel deposit that contains discrete particles of gold or other valuable minerals. A placer is formed when streams and glaciers remove weathered ore-bearing rocks from the lode areas and concentrate the heavy valuable minerals in the resulting valley-fill and terrace deposits. Gold in the Idaho Springs placers is typically concentrated in the deeper gravel-filled channels or directly on the bedrock surface at the base of the gravel deposit. The more important placers include 1) valley fill deposits between the junction of Fall River and Clear Creek and the junction of Clear Creek and North Clear Creek, and 2) terrace deposits near the mouths of Chicago Creek, Soda Creek, Rosa Gulch, and Gilson Gulch. Most of these deposits were worked extensively from 1859, the year of the first discovery, to the early 1880's.

DISCUSSION TO ACCOMPANY PLATE 1

The country rock of the Idaho Springs district consists of several varieties of ancient gneissic rocks (metamorphosed sedimentary and volcanic rocks) that have been invaded by granitic rocks, all of which have, in turn, been invaded by younger igneous rocks. These younger rocks, the Tertiary porphyries, form a prominent network of northeast-to-southwest-trending veins and dikes characteristic of the Front Range mineral belt.

Plate 1 shows the 4 varieties of veins that are classified according to their dominant ore minerals. The principal pyrite veins, the Clear Creek-Cornucopia vein and those associated with the Idaho Springs fault, trend northwest to southeast or opposite to that of the other veins. Pyritic copper veins are confined generally to the northwestern quarter of the map area. The majority of pyritic lead-zinc veins lie in the southwestern and west-central portions of the area with a few extending into the northeastern quarter. Lead-zinc veins occur in two groups along the northern and southern boundaries of the map area. Some veins are known to change composition at depth, becoming either more barren or richer in ore mineralization. For example, the Big Five Tunnel intersects one vein that is pyritic lead-zinc in composition at the ground surface but pyritic copper in composition at the depth of the tunnel. This geologic phenomenon and the increased costs of mining any vein at depth both serve to control the maximum lateral and vertical extent of mining developments.

The productive mines in the Idaho Springs district were developed by one of four methods:

1) vertical or inclined shafts sunk from the ground surface to the vein (Donna Juanita);

2) portals heading horizontally into the vein directly along strike (Treasure Vault);

3) intersecting the vein in cross-cut and developing it by drifts (Camp Valley); and

4) long cross-cut tunnels intersecting many veins, from which drifts could be started and into which other workings could tie (Argo and Big 5).

Many of the larger mines are developed at several horizontal levels in the same vein, with each pair of levels connected by vertical or inclined shafts called raises (or winzes, in the case of shafts driven from one level <u>down</u> to another). The ore within the vein is extracted by the process of stoping, in which an excavation is developed in a series of steps either below or above a working level. Plate 1 shows the various drifts and tunnels that have been described in the literature. For some mines, the workings at various levels have been projected up to a horizontal plane; therefore, no indication of the depth of workings is given on this map, although the portal elevation is an indication of the elevation of the portal level or main level of the mine. Details of various levels and the position and height of stopes are given in Moench and Drake (1966b). The reader should realize that this map shows only those underground workings for which data is available. Even portions of those shown are incomplete because bad air and caving prevented access to some areas.

The mention of bad air and caving leads to the question of hazards due to mining. Certainly, oxygen-deficient air, flooding, or the possibility of caving may threaten the life of an amateur explorer or an ambitious tourist who ventures underground. Although many deep, vertical shafts are completely unmarked and unprotected, a number of operators in the area have lessened the danger by constructing gates or doors across the mine adits. The fact that some adits have been obscured by tailings, partial caving, vegetation, timbers and rocks does not preclude possible entry. Many portals are generally inaccessible to the casual visitor because of their positions at high elevations on the steep slopes.

Another possible surface hazard is ground subsidence over collapsing tunnels. Although no evidence of subsidence was noted above the mines, collapse of surficial material was seen directly above two adits in Virginia Canyon. The potential for and magnitude of any subsidence would depend on a) condition of supporting structures (typically decayed in old mines), b) depth to the tunnel or various levels, c) height and length of stopes, d) structure of the rock mass above the tunnel, and e) length, width, and intricacy of the workings themselves. Depth to the tunnel is probably the most important factor here in evaluating subsidence potential. Because many mines were driven into steep slopes, the amount of rock directly above the tunnel increases rapidly with distance into the mountain, and caving in a mine would most likely be manifested on the surface near the adit or where the amount of rock above the mine is minimal. The greatest danger appears to be near those tunnels directly beneath the road in Virginia Canyon or in areas where the rock above old mines has been removed during the construction of roads, streets, or buildings. The caving potential in some mines may increase because of possible slippage along nearly vertical fractures and foliation in the roof rock.

Some caving potential may exist in the thick gravel deposits that were placered along Clear Creek in the late 1800's. At the height of placer activity, shafts were sunk and tunnels as long as 900 ft were run at the base of the deposits. Spurr and Garrey (1908, p. 313) noted that unsupported tunnels in the semiconsolidated gravel could still be explored forty or fifty years after their construction. An effort should be made to find records of these mines, to locate the workings, and to determine their condition.

The areas outlined on Plate 1 represents the area in which future mining development most likely will be located in the immediate Idaho Springs vicinity. The boundary was drawn on the basis of 1) abundancy of ore-bearing veins at the surface, 2) location of largest producing mines, 3) access to the veins by principal tunnels, 4) characteristics of the structural framework of the region, and 5) current mining interest. It should be noted that renewed mining could occur beyond this boundary.

Although mining may be renewed under favorable market conditions, public pressures and the costs of energy, labor, supplies, new facilities, renovation of old workings, and reclamation may prohibit many extensive renewed activity. Because further exploration of the know veins may uncover the only new ore deposits, the district is not expected to produce significant quantities of metals in the future.

DISCUSSION OF PLATE 2

Gravel deposits in the Idaho Springs vicinity occur in three basic landforms: 1) valley fill, 2) terrace, and 3) alluvial fan. Valley-fill sediments, derived from glacial outwash and reworked outwash, range in grain size from silt and sand to cobbles and large boulders, and probably exceed 25 ft in thickness. In the Georgetown-Idaho Springs area, Ball (1908) recognized several levels of terraces that contain 5 to 20 ft of silty sand and granitic cobble gravel. Many of these terrace gravels were placered for gold years ago, but most of the barren piles of stones have been obliterated by recent construction. Conspicuous alluvial fans have formed at the mouths of high-gradient streams tributary to Clear Creek. Upon reaching the main valley floor, the tributary streams deposited heterogeneous mixtures of clay, silt, sand, and gravel derived from weathered rock outcrops and slope debris within the tributary valleys. Some alluvial fans have attained thickness greater than 40 ft.

In the mountain environment, alluvial fan deposits generally are not considered important sources of gravel or aggregate because of their high content of fines and their great range in grain sizes. Locally, fans have been mined for fill material. The terrace gravels in the Idaho Springs area cannot be classed as important sources of gravel because of their very limited extent, calcium carbonate accumulation, and their inaccessibility on steep slopes. The principal valley fill deposit of Clear Creek appears to be the most favorable source of gravel in this area, although crushing, screening, and perhaps washing will be required to meet most specifications.

Because urbanization normally spreads over the wider reaches of a typical mountain valley, any potential gravel operation will be severely limited by the width of the valley fill and by adjacent land uses. The costs of overcoming these difficulties and of implementing an effective reclamation plan in the mountain environment may well exceed the cost of importing aggregate from an established gravel-producing district.

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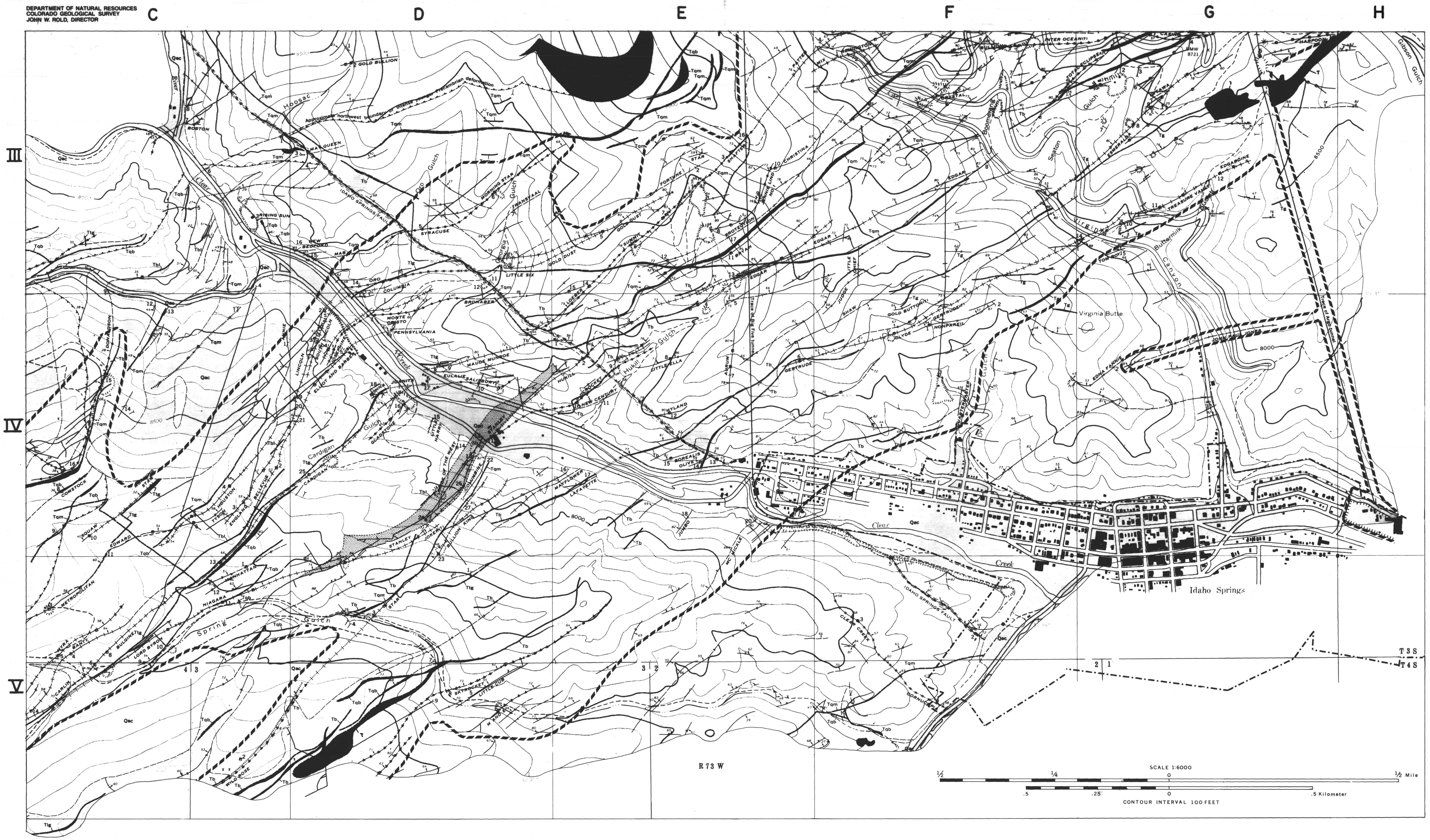
DEPARTMENT OF NATURAL RESOURCES
COLORADO GEOLOGICAL SURVEY
JOHN W. ROLD, DIRECTOR

Plate 1



EXPLANATION

Qac — Alluvium and colluvium (see Plate 2)

Igneous rocks
- Tbl, biotite-quartz latite
- Ttg, trachytic granite porphyry
- Tqb, quartz bostonite porphyry
- Tb, bostonite porphyry
- Tg, granite porphyry
- Tqm, quartz monzonite porphyry
- Tas, alkalic syenite porphyry
- Tag, albite granodiorite porphyry
- Tlg, light-colored granodiorite porphyry

Metamorphic rocks
- biotite gneiss
- granite gneiss
- microcline gneiss

77 — Contact, showing dip
Dashed where approximately located or inferred; dotted where concealed

Fault
Dashed where approximately located or inferred

Fault zone, showing relative horizontal displacement of opposing walls

Ore-bearing veins

58 — Pyrite vein, showing dip

69 — Pyritic copper vein, showing dip

78 — Pyritic lead-zinc vein, showing dip

72 — Lead-zinc vein, showing dip

42 — Unclassified vein, showing dip

All veins dashed where approximately located or inferred and dotted where concealed

4 >— BALD EAGLE
Number is key to shaft, adit, or tunnel listed below. Name is that of vein

Mines

Shaft

Adit or tunnel

Prospect

Tailings, dump

Tunnels, underground workings

Extensive underground workings at multiple levels

Area of most intensive mineralization with greatest potential for mining

Sources of information:
Base map by U. S. Geological Survey
Geology by Moench and Drake (1966a)
Mine workings plotted from Moench and Drake (1966b), Bastin and Hill (1917), and Spurr and Garrey (1908)

Mines Listed by Quadrants

Mine opening or prospect

Quadrant C-III
1 Dubuque shaft
2 Martha Perks adit
3 Hoosac mine
*4 Metropolitan tunnel
*5 Anoka County adit
6 Alpine adit
*7 Lawrence L. (Philadelphia mine
*8 Dover prospect
9 Wheatland adit

Quadrant D-III
1 German adit
2 Gold Bullion shaft
3 May Queen adit
4 May Queen Annex adit
*5 Syracuse mine
6 Morning Star shaft
7 Transvaal adit
8 Wyandotte mine
9 Gold Dust adit
10 Little Six adit
11 Mastedon adit
*12 Bronaber adit
13 Columbia adit
14 Oro adit
15 MAB adit
16 New Bedford adit

Quadrant E-III
1 Star prospect
2 Bortune adit
*3 Shafter adit
4 Fairmount shaft
5 Gold Dust shaft
6 Summit mine
7 Refuge shaft
*8 Great American (Big Chief) adit
*9 Jennie Lind No. 1 adit
10 Christina shaft
11 Bryan adit and shaft
12 Providence shaft
*13 Edgar adit and shaft
14 Loeber shaft
15 Lost Summit shaft
16 Shafter shaft
17 Protection adit

Quadrant F-III
1 MIX adit
2 Remington adit
3 Patten adit
4 Red Jacket adit
*5 Bullion adit
*6 Crystal adit
*7 Idaho tunnel
*8 Edgar Extension adit

Quadrant G-III
1 Eclipse shaft
*2 Foxhall tunnel
*3 Casino adit
*4 Casino shaft
*5 Tropic tunnel
*6 Tigris adit
7 Bell adit
8 Esmaralda shaft
9 Ottawa shaft
*10 Treasure Vault adit
11 Treasure Vault shaft
12 Edgardine shaft
13 Harpoon shaft
*14 Happy Easter (Queen Elizabeth) mine
15 Tom Boy adit

Quadrant C-IV
1 Annie adit
2 Belle Vue shaf.
*3 England adit
4 Houston shaft
5 Edward shaft
6 Tyson shaft
7 Morning Star shaft
8 Comstock shaft
9 Golden Hammer adit
10 Squaw shaft

Quadrant C-IV, cont'd
11 Edward adit
12 Merrimac adit
13 Mount Vesuvius adit
14 Mount Etna adit
*15 Donaldson No. 6 Level adit
*16 Kelley shaft

Quadrant D-IV
*1 Monte Cristo adit
*2 Alma Lincoln mine (adit level)
3 South Lincoln and Ruby adit
*4 Josephine shaft and adit
*5 Elliot and Barber adit
6 Pennsylvania adit
7 Lost Vein adit
*8 Maude Munroe mine
9 Eulalie adit
*10 Salisbury mine
*11 Stanley (Gehrman) shaft
*12 Road Level adit (Stanley mine)
*13 Whale adit (Stanley mine)
14 Pride of the West shaft
15 Little Harry adit
16 Gladstone adit

Quadrant D-IV, cont'd
17 Donna Juanita shaft
*18 Donna Juanita adit
*19 640 Level adit (Alma Lincoln mine)
*20 No. 11 adit (Alma Lincoln mine)
*21 No. 12 adit (Alma Lincoln mine)
22 Columbine adit
23 Bullion King shaft
*24 Golden Link shaft (Stanley mine)
25 Cardigan mine
*26 York adit (Stanley mine)
27 Golden Link adit (Stanley mine)

Quadrant E-IV
1 Atlantic shaft
2 Hukill shaft
3 East Hukill shaft
4 U.S. adit
5 Comstock adit
6 Gertrude shaft
7 Aurum adit
8 Little Ella shaft
*9 G and M (Centennial) adit
10 Crocket shaft

Quadrant E-IV, cont'd
11 New Century adit
12 Hyland shaft
13 Essex shaft
14 Oliver shaft
15 Borealis shaft
*16 Mayflower adit
*17 Lafayette adit
18 Jumbo adit
*19 Big Five (Central) tunnel
20 McMickle adit

Quadrant F-IV
1 Nonpareil shaft
*2 Nonpareil adit
*3 Miami tunnel
4 Quartermaster shaft

Quadrant G-IV
1 John Paul Jones adit
2 Edna Fannie adit
3 Golden Treasure adit

Quadrant H-IV
*1 Argo Tunnel

Quadrant C-V
1 Manhattan shaft
2 Wild Rose shaft

Quadrant C-V cont'd
3 Metropolitan prospect
4 Banty shaft
5 Myra shaft
6 Carlin shaft
7 Lord Byron shaft
8 Bulgine shaft
9 Big 51 shaft
*10 Camp Valley adit
11 Niagara shaft
*12 Manhattan adit
13 Phoenix prospect
14 October shaft

Quadrant D-V
1 Bullion King No. 3 adit
2 Old Stanley shaft
3 Star adit
4 Red Lyon adits
*5 Little Cub adit
*6 M and E adit
7 Irene adit
8 Skyrocket mine
*9 Torpedo mine

Quadrant F-V
*1 Birtley adit
2 Waltham shaft
3 Clear Creek shaft
*4 Cornucopia adit
5 Ward adit

*underground workings plotted on map

Alphabetical List of Mines

Mine opening or prospect	Location
*Alma Lincoln mine (adit level)	D-IV, 2
Alpine adit	C-III, 6
Annie adit	C-IV, 1
*Anoka County adit	C-III, 5
*Argo tunnel	H-IV, 1
Atlantic shaft	E-IV, 1
Aurum adit	E-IV, 7
Banty shaft	C-V, 4
Bell adit	G-III, 7
Belle Vue shaft	C-IV, 2
Big 51 shaft	C-V, 9
*Big Five (Central) tunnel	E-IV, 19
*Birtley adit	F-V, 1
Borealis shaft	E-IV, 15
*Bronaber adit	D-III, 12
Bryan adit and shaft	E-III, 11
Bulgine shaft	C-V, 8
*Bullion adit	F-III, 5
Bullion King No. 3 adit	D-V, 1
Bullion King shaft	D-IV, 23
*Camp Valley adit	C-V, 10
Cardigan mine	D-IV, 25
Carlin shaft	C-V, 6
*Casino shaft	G-III, 4
*Casino adit	G-III, 3
Christina shaft	E-III, 10
Clear Creek shaft	F-V, 3
Columbia adit	D-III, 13
Columbine adit	D-IV, 22
Comstock shaft	C-IV, 8
Comstock adit	E-IV, 5
*Cornucopia adit	F-V, 4
Crocket shaft	E-IV, 10
*Crystal adit	F-III, 6
*Donaldson No. 6 Level adit	C-IV, 15
Donna Juanita shaft	D-IV, 17
*Donna Juanita adit	D-IV, 18
*Dover prospect	C-III, 8
Dubuque shaft	C-III, 1
East Hukill shaft	E-IV, 3
Eclipse shaft	G-III, 1
*Edgar adit and shaft	E-III, 13
Edgardine shaft	G-III, 12
Edgar Extension adit	F-III, 8
Edna Fannie adit	G-IV, 2
Edward shaft	C-IV, 5
Edward adit	C-IV, 11
*Elliot and Barber adit	D-IV, 5
*England adit	C-IV, 3
Esmaralda shaft	G-III, 8
Essex shaft	E-IV, 13
Eulalie adit	D-IV, 9
Fairmount shaft	E-III, 4
Fortune adit	E-III, 2
*Foxhall tunnel	G-III, 2
*G and M (Centennial) adit	E-IV, 9
German adit	D-III, 1
Gertrude shaft	E-IV, 6
Gladstone adit	D-IV, 16
Gold Bullion shaft	D-III, 2
Gold Dust adit	D-III, 9
Gold Dust shaft	E-III, 5
Golden Hammer adit	C-IV, 9
*Golden Link shaft (Stanley mine)	D-IV, 24
Golden Link adit (Stanley mine)	D-IV, 27
Golden Treasure adit	G-IV, 3
*Great American (Big Chief) adit	E-III, 8
Happy Easter (Queen Elizabeth) mine	G-III, 14
Harpoon shaft	G-III, 13
Hoosac mine	C-III, 3
Houston shaft	C-IV, 4
Hukill shaft	E-IV, 2
Hyland shaft	E-IV, 12
*Idaho tunnel	F-III, 7
Irene adit	D-V, 7
*Jennie Lind No. 1 adit	E-III, 9
John Paul Jones adit	G-IV, 1
*Josephine shaft and adit	D-IV, 4
Jumbo adit	E-IV, 18
*Kelly shaft	C-IV, 16
*Lafayette adit	E-IV, 17
*Lawrence L. (Philadelphia) mine	C-III, 7
*Little Club adit	D-V, 5
Little Ella shaft	E-IV, 8
Little Harry adit	D-IV, 15
Little Six adit	D-III, 10
Loeber shaft	E-III, 14
Lord Byron shaft	C-V, 7
Lost Summit shaft	E-III, 15
Lost Vein adit	D-IV, 7
MAB adit	D-III, 15
*M and E adit	D-V, 6
Manhattan shaft	C-V, 1
*Manhattan adit	C-V, 12
Martha Perks adit	C-III, 2
Mastedon adit	D-III, 11
*Maude Munroe Mines	D-IV, 8
*Mayflower adit	E-IV, 16
May Queen Annex adit	D-III, 4
May Queen adit	D-III, 3
McMickle adit	E-IV, 20
Merrimac adit	C-IV, 12
*Metropolitan tunnel	C-III, 4
Metropolitan prospect	C-V, 3
*Miami tunnel	F-IV, 3
MIX adit	F-III, 1
*Monte Cristo adit	D-IV, 1
Morning Star shaft	C-IV, 7
Morning Star shaft	D-III, 6
Mount Etna adit	C-IV, 14
Mount Vesuvium adit	C-IV, 13
Myra shaft	C-V, 5
New Bedford adit	D-III, 16
New Century adit	E-IV, 11
Niagara shaft	C-V, 11
Nonpareil shaft	F-IV, 1
*Nonpareil adit	F-IV, 2
*No. 11 adit (Alma Lincoln mine)	D-IV, 20
*No. 12 adit (Alma Lincoln mine)	D-IV, 21
October shaft	C-V, 14
Old Stanley shaft	D-V, 2
Oliver shaft	E-IV, 14
Oro adit	D-III, 14
Ottawa shaft	G-III, 9
Patten adit	F-III, 3
Pennsylvania adit	D-IV, 6
Phoenix prospect	C-V, 13
Pride of the West shaft	D-IV, 14
Protection adit	E-III, 17
Providence shaft	E-III, 12
Quartermaster shaft	F-IV, 4
Red Jacket adit	F-III, 4
Red Lyon adits	D-V, 4
Refuge shaft	E-III, 7
Remington adit	F-III, 2
*Road Level adit (Stanley mine)	D-IV, 12
*Salisbury mine	D-IV, 10
*640 Level adit (Alma Lincoln mine)	D-IV, 19
*Shafter adit	E-III, 3
Shafter shaft	E-III, 16
Skyrocket mine	D-V, 8
South Lincoln and Ruby adit	D-IV, 3
Squaw shaft	C-IV, 10
*Stanley (Gehrman) shaft	D-IV, 11
Star adit	D-V, 3
Star prospect	E-III, 1
Summit mine	E-III, 6
*Syracuse mine	D-III, 5
*Tigris adit	G-III, 6
Tom Boy adit	G-III, 15
*Torpedo mine	D-V, 9
Transvaal adit	D-III, 7
Treasure Vault shaft	G-III, 11
*Treasure Vault adit	G-III, 10
*Tropic tunnel	G-III, 5
Tyson shaft	C-IV, 6
U.S. adit	E-IV, 4
Waltham shaft	F-V, 2
Ward adit	F-V, 5
*Whale adit (Stanley mine)	D-IV, 13
Wheatland adit	C-III, 9
Wild Rose shaft	C-V, 2
Wyandotte mine	D-III, 8
*York adit (Stanley mine)	D-IV, 26

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by Stephen D. Schwochow

1975

Drafting by: Robert H. Gast

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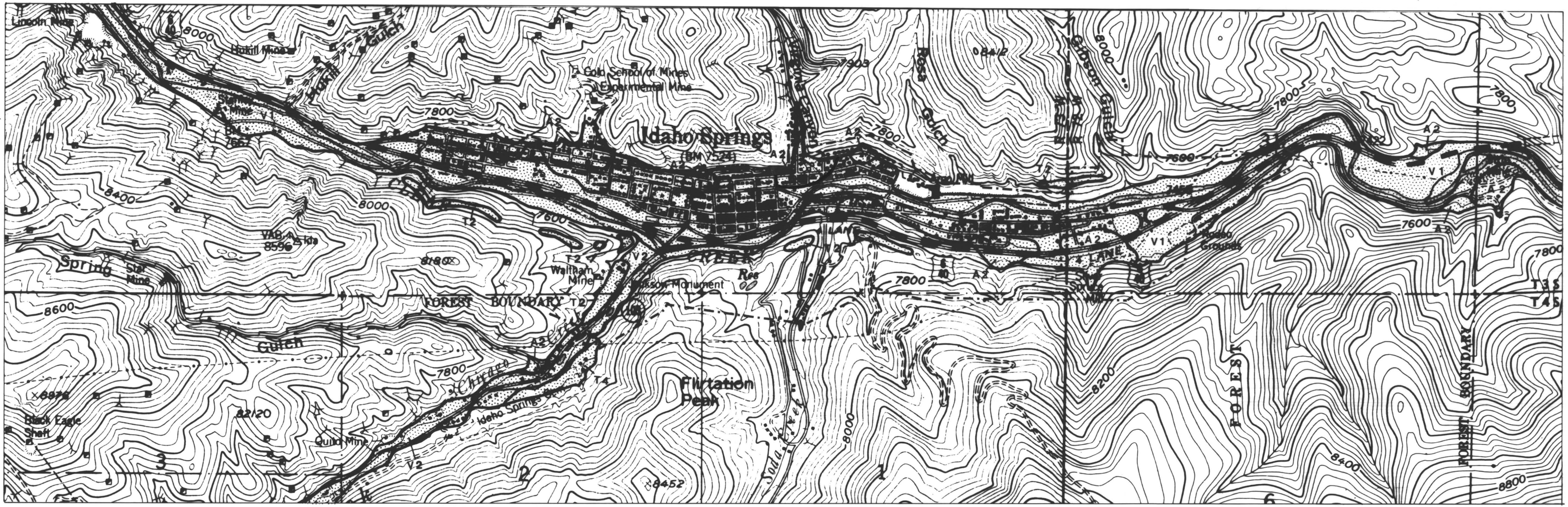
DEPARTMENT OF NATURAL RESOURCES
COLORADO GEOLOGICAL SURVEY
JOHN W. ROLD, DIRECTOR

Plate 2



EXPLANATION

V1 — *Landform unit* / *Resource classification*

LANDFORM UNITS

- T Stream terrace deposit
- V Valley fill
- A Alluvial fan

RESOURCE CLASSIFICATION

Coarse Aggregate
(at least 30% retained on #4 screen, visual estimation)

1 Gravel: relatively clean and sound

2 Gravel: significant fines, decomposed rock, calcium carbonate

Fine Aggregate
(greater than 70% passing #4 screen, 60% retained on #200 screen, visual estimation)

3 Sand

Unevaluated Resource

4 Probable aggregate resource

SCALE 1:12000

1/2 — 1/4 — 0 — 1/2 Mile

.5 — .25 — 0 — .5 Kilometer

CONTOUR INTERVAL 40 FEET

Sources of information

Base map: USGS 7 1/2' topographic maps (1957), Idaho Springs and Squaw Pass Quadrangles

Gravel: AMS air photos (1957)
Field work June 12, 1975
Landform and resource classification from Colorado Geological Survey Special Publication 5-A

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