

LANDER COUNTY
MINERAL RESOURCES INVENTORY
1994

By:

Ann S. Carpenter
Consulting Geologist
5445 Goldenrod Drive
Reno, Nevada 89511
(702) 849-9707

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1. 0 SUMMARY

1.1 Summary

Mineral resources in Lander County were first discovered, and subsequently mined, starting in the mid-1800's with production in some districts continuing to the present. Much of the information on the mines and mining districts is compiled from previously published work of the U. S. Geological Survey, the Nevada Bureau of Mines and Geology, and U.S. Bureau of Mines. According to Stager (1977), mines in Lander County produced in excess of \$110 million between 1862 and 1969, based on commodity prices for these respective years. One-third of this production is credited to the years of 1967-1969. Of the 31 mining districts located in Lander County, the Battle Mountain district has yielded the largest value; production from this district together with the Reese River, Cortez, and Bullion districts accounts for approximately 95% of the total metals production in this county (Stager, 1977).

Initial prospecting started in the mid-1800's and mining commenced in mid-1862 with the discovery of silver ore in the Reese River district near the present townsite of Austin. Following closely on the heels of this rush, prospectors spread out in all directions, discovering numerous mineralized areas. Mineral resources were discovered and mining districts organized as a result. Most of the value in the produced ore up through 1969 was in silver, gold, and copper, with additional production in barite and turquoise and small quantities of antimony, arsenic, fluor spar, lead, manganese, mercury, tungsten, uranium, and zinc (Stager, 1977). The Battle Mountain district, originally in Humboldt County, was organized in 1867 and ceded to Lander County in 1873. This has historically been a very rich district, with mining related activity relatively steady from the time of discovery through to the present. In addition to the Battle Mountain district, other districts active today with significant mining and exploration ventures include: Argenta (barite); Buffalo Valley (Au); Bullion (Au, Ag); Cortez (Au, Ag); Hilltop (Au, Ag); Kingston (Au, Ag); and McCoy (Au, Ag, Cu).

1.2 Proposed Work Outline

A review of the Lander County mineral resources was initiated as a means of updating the current understanding of the known and potential resources. This evaluation summarized both historic and recent information relative to exploration and mining activities. The historic data was summarized, from when minerals were first discovered to when the related mining districts were organized, on to what the historic production figures were from the mid-1860's through to 1969. In addition, the recent exploration discoveries and new and/or expanding mining ventures were compiled and summarized. Reviews of published information on mining districts and mineral deposits in Lander County, as well as reviewing the records at the county courthouse and local BLM and US Forest Service field offices were completed as a

part of this study. This study focused on reviewing precious and base metal deposits, as well as some industrial mineral mines. No attempt was made to compile information on sand and gravel occurrences as these are difficult to characterize and quantify.

The studies completed with respect to this report are not conclusive, due mainly to the dynamic and evolving nature of the exploration and mining industries. This information should be considered preliminary, and should be used as a guide to expanding this study as the need arises.

2.0 INTRODUCTION

2.1 Introduction

A request was made by Lander County officials to summarize the mineral resources within its boundaries as part of an evaluation of proposed rail routes to the Yucca Mountain high level nuclear waste repository site. The work completed includes literature research, held and courthouse examinations of active mining and exploration ventures, and records reviews in the BLM and U.S. Forest Service field offices. This review serves as a preliminary summary of the mineral exploration and mining projects in Lander County, as part of an effort to quantify the mineral resources. Because mining and exploration related technologies are constantly changing and advancing, search for and development of mineral resources is a continually evolving process. Technological breakthroughs contribute to resurgences of exploration and milling activities in previously explored districts, as well as in virgin territory. Because of the dynamic nature of the mining industry, this study does not represent a final, conclusive summary. Instead, the information in this report should be used as a guide to expanding the understanding of mineral occurrences in Lander County.

2.2 Location

Lander County, located in central and north-central Nevada (Figure 2.1), covers an area of 5,621 square miles. This region is typical of the Great Basin, characterized by north, northeast trending mountain ranges separated by alluvium-filled valleys. Approximate high and low elevations are 11,500 and 4,500 feet, respectively.

2.3 Previous Work

Lander County and Nevada in general, has been the focus both of the search for and the research of mineral resources over time. The mineral resources of Lander County (with Eureka and portions of Nye counties) were previously researched and summarized in a relatively comprehensive report by J.V. Tingley and P.L. Smith (Nevada Bureau of Mines and Geology Open-File Report 83-3). Additionally, Nevada Bureau of Mines and Geology Open-File Report 83-8 discusses some southern Lander County mineral resources. Another source of information on mining districts and mineral occurrences in Lander County is Nevada Bureau of Mines and Geology Bulletin 88. Additional references are listed in the bibliography at the back of this report.

2.4 Historic and Recent Mining Activities

The search for minerals in Nevada has been on-going, certainly from the onslaught of initial exploration and milling activities in the mid-1800's. The intensity at which

minerals were, and are, explored for and subsequently developed is guided by market price and by technological developments. Through time, mining districts as well as areas immediately surrounding these districts have been witness to resurgences in mining and exploration activities as technologies and economic viabilities change. As a direct result of this increase in mining related activities, Nevada has become the key producer of gold and silver in the United States, as well as a vital contributor to the overall world production of these two commodities. In Nevada, Lander County has become a major contributor to the production of gold and silver.

The scope of this work included reviewing current, recently discovered, and on-going exploration and mining activities located within the county borders, with references to past activities. Some properties outside of the county lines are briefly referred to due to their close proximity.

3.0 MINERAL RESOURCES

3.1 Mining Districts and Associated Mineral Resources - Lander County

Approximately thirty-one (31) milling districts are referred to within the boundaries of Lander County (Tingley 1992; and Stager, 1977). Generally, most mining districts were formally organized in Lander County following a brief period of regional exploration activity in the mid-1860's. District boundaries and names summarized in this report were determined using historic data tempered by current usage. These boundaries are based mainly on recent literature (Tingley, 1992), and generally coincide with key topographic features such as mountains, crests, and streams, and include the centers of the mining activity. Figure 3.1 illustrates the location of these districts in Lander County, and Appendix A summarizes each of these districts and the associated commodities discovered, and (some), ultimately, mined.

In the following subsections are brief descriptions of the 31 mining districts within Lander County. Information on these districts came primarily from Stager (1977), Tingley and Smith (1983), Tingley (1992), and Bonham and others (1993).

The mineral resources discussed and summarized with respect to Lander County include metals and some industrial minerals, exclusive of sand and gravel deposits. Production figures discussed in these subsections represent mining efforts from the mid-1860's to 1969, and reflect commodity market prices for these respective years. According to Stager (1977), production records for the years 1862 to 1903 are incomplete; the figures used for this period are estimates based on company records and the best available information. Some of the county's early production figures include ores from mines outside of the county, and, consequently, these figures are considered compromised. Recent production figures are discussed in Section 4.0.

3.1.1 Argenta

The Argenta district is located in the northern Shoshone Range, approximately 14 miles east of Battle Mountain. Silver was discovered in the area about 1867, with a small town developed by 1868. The entire town, buildings and all, was moved in 1870 to the more advantageously located Battle Mountain Station. Argenta continues to be a siding on the Southern Pacific Railroad and a loading point for much of the barite now mined in the district.

Three major barite mines, several smaller mines, and numerous prospects were developed and explored in the district. At Argenta, thin to thick beds

of massive barite occur interbedded with chert beds of the Slavers Chert. Most of the barite mined is utilized for high-density drilling muds in California and in the Gulf Coast area.

EXPLANATION

- 1 Izenhood
- 2 North Battle Mountain
- 3 Argenta
- 4 Battle Mountain
- 5 Buffalo Valley
- 6 Lewis
- 7 Hilltop
- 8 Bateman
- 9 Bullion
- 10 Mountain Springs
- 11 McCoy
- 12 Warm Springs
- 13 Jersey
- 14 Cortez
- 15 Carico Lake
- 16 Steiner Canyon
- 17 Wild Horse
- 18 Ravens Wood
- 19 Iowa Canyon
- 20 Callaghan Ranch
- 21 Reese River
- 22 Skookum
- 23 New Pass
- 24 Spencer Hot Springs
- 25 Birch Creek
- 26 Big Creek
- 27 Kingston
- 28 Washington
- 29 Gold Basin
- 30 Aspen
- 31 Jackson

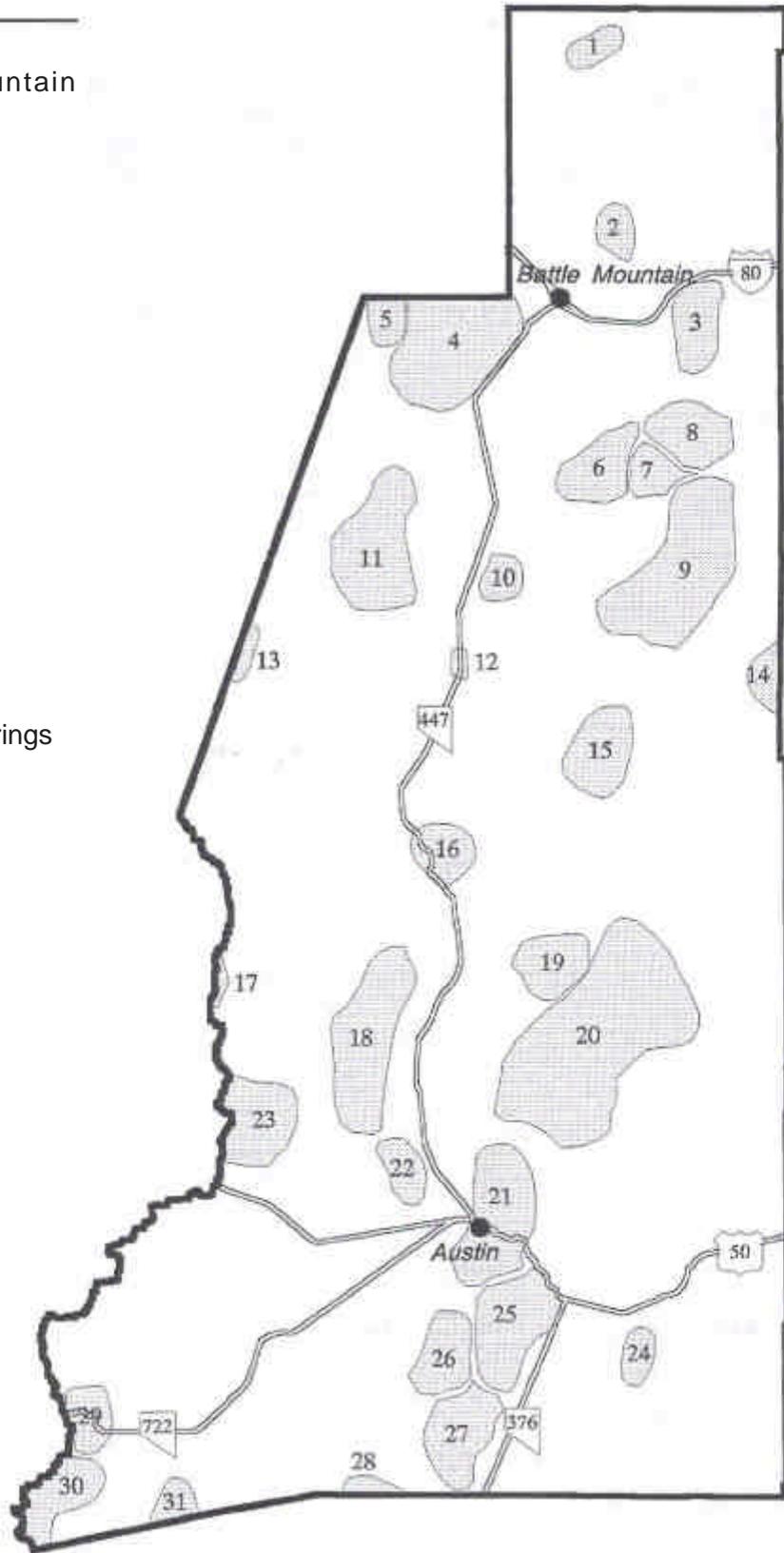


FIGURE 3.1 Mining Districts in Lander County



The largest mine in the district, the Argenta, also known in the past as the Barium King or Nevada Barite, has produced more than 100,000 tons of barite from several large open pits totaling more than \$1 million (Stager, 1977). The nearby Shelton mine, or Barite (Baryte) No. 1 and No. 3 mine, has not been worked since the mid-1960's. This deposit yielded in excess of 50,000 tons of barite totaling more than \$100,000 according to past production figures (Stager, 1977). These production figures represent mining through 1969, based on barite values for this time.

Recently, gold mineralization has been discovered on the southern fringes of the Argenta district at Mule Canyon. This deposit is discussed in more detail in Section 3.3.

3.1.2 Aspen

The Aspen district is located in the southern Desatoya Mountains in the southwest corner of the county, approximately 45 miles south and west of Austin, on the Lander-Churchill county line. This district adjoins the Eastgate district, located just to the northwest. The majority of the production from this area probably was from the Churchill County part of the area. Gold was probably discovered in the early 1900's when the nearby Gold Basin (Lander County) and Eastgate (Churchill County) districts were active. Some prospecting and small-scale production occurred in 1935 and again in 1955-1956.

The ore deposits consist principally of epithermal gold-silver-bearing quartz veins in dacite. These veins range from several inches to a few feet thick, although where mined probably averaged less than a foot (Stager, 1977). There was some small-scale mining and prospecting in the 1930's and 1950's, otherwise the district has remained relatively inactive. Appendix A summarizes the commodities associated with this district.

3.1.3 Bateman Canyon

This district borders the Hilltop district on the northeast, and includes both Bateman and Slaven canyons. This area was originally considered part of the Hilltop district, with past production yielding more than 50,000 tons of barite. The deposits in Bateman and Slaven canyons are similar to those found in the Argenta district (Tingley, 1992).

3.1.4 Battle Mountain

The Battle Mountain district, including the subdistricts of Copper Canyon, Bannock, Copper Basin, Cottonwood Creek, and Galena, is located about 10 miles southwest of the town of Battle Mountain. Appendix A summarizes the commodities associated with this district.

Initially, silver was discovered in 1863 near the head of Galena Canyon; discoveries of copper and silver followed in the vicinity of Copper Canyon in 1864, which led to the formation of the Battle Mountain district in 1866. This district, originally located in Humboldt County, was ceded to Lander County after a change in the county boundaries (Stager, 1977; and Tingley, 1992). The north section of the district including Copper Basin, the old camp of Battle Mountain, and Cottonwood Creek are sometimes considered to be Battle Mountain district proper. Exploration and mining activities have continued relatively uninterrupted since the district was first organized in 1866. Initially, silver and copper-silver ores were mined relatively continuously until about 1900. In 1909, rich gold ores were discovered at Bannock, signaling the resumption of mining activity within the district, which has continued until the present at varying levels of intensity. In 1935, the Copper Canyon Mining Co. started a development program, and over the next 50+ years the copper mines have exchanged ownership and experienced various stages of exploration and development through to the present. In 1985, Battle Mountain Gold Co. (BMG) became the owners/operators in this district of the Battle Mountain Complex mines, which have remained active, and with recent discoveries and planned expansions, will continue to produce well into the next century (BMG Annual Report, 1993). This recent activity is discussed in more detail in Section 3.3.

The total value of mineral production from the district from about 1868 to 1969 is estimated at \$50 million (Tingley and Smith, 1983). Most of this value is credited to copper, with lesser amounts to gold, silver, lead, zinc, antimony, arsenic, and turquoise.

3.1.5 Big Creek

Located on the west side of the central Toiyabe Range about 12 miles south of Austin is the Big Creek district. This district includes the northern part of the historic Big Canyon district which extends south into Nye County. Big Creek was organized in 1863 closely following the Reese River district located a short distance to the north. The total value of production for the district is probably less than \$500,000 (Stager, 1977), mostly attributed to antimony production.

Silver-bearing veins marked the initial discovery in this district, although the high content of copper and antimony in this ore made it sub economic to extract the metals, and consequently the early mines and towns were abandoned. Although large amounts of antimony in the veins were noted about 1870, interest in this metal was not significant until approximately 1890 when the Pine (Antimony King) mine was discovered at the north end of the district. Interest was rekindled during World War I when demand for antimony was high.

The Quito, or Austin Gold Venture, mine located in the general vicinity of the Dry Canyon antimony mine in Big Creek district (Tingley and Smith, 1983) was active approximately from 1986 to 1989. It was recently (1993-1994) drilling in the main mine area, drilling deep mineralization targets (+2000 feet). This drilling program experienced difficult drilling, and was abandoned sometime in 1994 (personal communication, Austin USFS Ranger District).

3.1.6 Birch Creek

The Birch Creek mining district is located on the east side of the Toiyabe Range approximately 10 miles south of Austin. Silver was discovered near the mouth of Birch Creek in 1863 with initial mining activity lasting though 1867. Production of silver during this period was insignificant. The silver ores were reworked between 1910-1912, with the discovery of gold mineralization following in 1916. Production from several of the old mines was reported during the 1940's and 1950's, but only in small quantities. Tungsten was discovered in 1942, and a small production was reported for the period 1952 to 1955. Uranium was discovered in 1955, and small productions resulted. Total production of all mines in the district for the period 1863 to 1969 is estimated to have a value less than \$100,000 (Stager, 1977).

3.1.7 Buffalo Valley

The Buffalo Valley district includes the Mill. Canyon district and is about 15 miles west side of the town of Battle Mountain. This district was probably first prospected in 1866 or 1867, when the nearby Battle Mountain district was being organized. The first significant discovery was made in 1912 when gold deposits were located at the Buffalo Valley gold mine. As a result, the Buffalo Valley Mines Co. was organized in 1916, and the first shipment of ore was made in 1924. The mine remained active from 1924 to 1941, and again in 1951, but only approximately 3,000 tons of ore averaging less than 0.50 oz Au/ton were produced. Production for this district through 1969 (Stager, 1977) totaled about 21,000 tons of ore with a total value around 5300,000. Although the district appeared inactive in 1982 (Tingley and Smith, 1983),

exploration activity has increased recently with the discovery of gold mineralization by Fairmile Acquisitions Inc. (discussed in more detail in Section 3.3).

3.1.8 Bunion

The Bullion district is located on the east side of the Shoshone Range about 25 miles southeast of Battle Mountain. The first silver discoveries were made in 1869, followed by gold discoveries in 1905 in the Tenabo area. Gold mining in this area decreased sometime around 1910-1911 due to the high cost of processing the ores. Development at the Gold Acres mine started about 1935 with production following in 1936. In 1942, mining methods changed to an open-pit operation that continued until 1961. Over 90 percent of the production of gold came from the Gold Acres mine, now part of the Cortez Joint Venture. The Bullion district is additionally one of the most extensive turquoise-producing areas in Nevada, with the production of solid ore and gem quality spider-web turquoise (Tingley and Smith, 1983).

The total value of production (related to pre-1969 dollar values) from the district through 1969 (Stager,1977) is estimated at about \$16 million: 300,000 ounces of gold (predominantly from the Gold Acres mine); 1 million ounces of silver; 1.3 million pounds of copper; 1.3 million pounds of lead; 500,000 tons of barite; and turquoise valued at several million dollars. Appendix A summarizes the commodities found within the district.

Recent activity in the Bullion district includes continued mining at Gold Acres, as well as development of the Pipeline gold deposits (located to the southeast of the Gold Acres mine) This recent activity is discussed in Section 3.3 in more detail.

3.1.9 Callaghan Ranch

The Callaghan Ranch district is located 12-16 miles north of Austin in the vicinity of Mount Callaghan. This district incorporates the Mount Hope and Indian districts. Silver, tungsten, and mercury were discovered in the area after 1866.

3.1.10 Calicos Lake

This district is located south of Carico Lake, in the vicinity of Red Mountain. Turquoise, manganese, and possibly gold were discovered in the district. Recent (pre-1983, from Tingley and Smith, 1983) drilling and road building has obliterated the earlier workings. Most of the observed activity was centered around occurrences of various grades of turquoise formed in vugs

and fractures. The recent exploration activity may have been for uranium (Tingley and Smith, 1983).

3.1.11 Cortez

The Cortez district is located on the southwest end of the Cortez Mountains, about 30 miles south of Beowawe. The Eureka County line dissects the district in two, dividing the old silver-producing mines in Eureka County from the presently active Cortez gold mine in Lander County.

The silver ores of the Cortez district were first found in the early 1800's by Indians and Mexicans. Ore as float at the base of the mountains was located in 1862, with discovery of the lode deposits closely following in 1863. The Cortez Co. was formed, a stamp mill was built in Mill Canyon in 1864, and mining and milling continued over the next 30 years at various levels of intensity. This area was the site of additional exploration and mining activity through the 1950's. Total production for the period 1862 through 1958 was valued at about \$14 million in gold, silver, copper, lead, and zinc. The U.S. Geological Survey (USGS) completed studies on the west side of the district in 1960, outlining anomalous areas of lead, molybdenum, silver, zinc, arsenic, bismuth, and manganese. Additional geochemical sampling in 1966 by the USGS revealed high gold values northeast of the original area samples. Thus began the initial definition and mining outline of the Cortez gold deposit(s).

The Valley View mine is the only other property active historically in the district. This was an underground mine approximately 100 feet deep developed on a quartz vein with the ore consisting of galena, cerargyrite, and pyrite containing some gold in quartz gangue. Production was small and not recorded. Turquoise mines (Fox and White Horse) are in the immediate area.

3.1.12 Gold Basin

The Gold Basin district is located on the east side of the Desatoya Mountains near the Churchill-Lander county line, approximately 40 miles southwest of Austin. The discovery of gold in 1911 led to extravagant publicity that triggered a small rush to the area. The gold found did not support the original excitement, and the camp died within a year of the discovery. Total production was only about 100 tons of ore with a value less than \$20,000.

3.1.13 Hilltop

This district is in the central part of the northern Shoshone Range, approximately 20 miles southeast of Battle Mountain. The Hilltop area was first prospected in the 1860's when miners were prospecting radically outward

from Austin. In 1882, gold was discovered in Maysville Canyon as a result of prospectors from the Lewis district exploring in the area. The Pittsburg mine and mill was established in about 1887. The district was formally established in 1906 when significant gold mineralization was discovered. Additional mines were founded (Morning Star), as well as high-grade gold ore discovered. Sporadic activity from 1908 to 1951 produced over \$800,000 from gold, silver, copper, and lead ores (Stager, 1977). Accurate records of the early production are rare, and production did not probably exceed \$200,000 in silver and gold. For the period 1909 to 1951, approximately 18,000 oz of gold; 358,000 oz of silver; 400,000 pounds of copper; and 540,000 pounds of lead were produced. Recent exploration activity has outlined additional gold resources (Section 3.3).

Antimony, barite, and manganese mineralization are also present in the district. During World War I, about 100 tons of 60-percent antimony ore were mined and shipped from the Blue Dick mine. An additional 12 tons were shipped in 1941. There are no records from the early years. Manganese was mined from 1942 to 1945, and about 214 tons of ore containing 20 to 30 percent manganese were shipped. Barite mine production between 1930-1969 totaled more than 50,000 tons with a value in excess of \$300,000.

3.1.14 Iowa Canyon

The Iowa Canyon district is located about 20 miles north of Austin on the western slope of the Toiyabe Range, and was previously referred to as the Columbus district. Fluorspar and barite were discovered in this area, although no production figures were cited in the references.

3.1.15 Izenhood

The Izenhood district is on the west side of the Sheep Creek Range, approximately 25 miles north of Battle Mountain. Tin was discovered in 1914 on the Izenhood Ranch, although no commercial deposit was found. Renewal in interest resulted in 1928 to 1938, and in 1952. There is no recorded production from this district, but small quantities of hand sorted and concentrated ore may have been shipped.

3.1.16 Jackson

Most of the Jackson district is in Nye County, although the north end of the district (previously referred to as the Gold Park district) spills over into Lander County. The district as a whole is on the west side of the Shoshone Mountains, about 35 miles southwest of Austin. Gold was discovered in 1864, and the name Jackson applied when the district was organized in 1878.

Most of the production probably came during the late 1800's and early 1900's. The main value of production, possibly \$500,000 to \$1 million (Tingley and Smith, 1983), is in gold, with lesser amounts of silver, lead, and copper. Recorded production for the district is about \$40,000, although several additional reports suggest total production worth \$500,000 to \$1,000,000 for the periods 1882 to 1911 and 1921 to 1925 (Stager, 1977). There has been little activity in the main district since the early 1900's.

3.1.17 Jersey

The Jersey district is located on the Pershing-Lander county line, approximately 50 miles southwest of Battle Mountain. This district was discovered in 1873, with the discoveries of one or more of these commodities: silver, lead, zinc, copper, gold, manganese, and zeolite. Very little data was found in the reference materials.

3.1.18 Kingston

The Kingston district is located on the east side of the Toiyabe Range, about 20 miles south of Austin. Gold- and silver-bearing quartz veins were discovered in the early 1860's at several localities, including the Victorine and Mother Lode mines, and by 1875, four amalgamating mills were in operation. The low-grade and refractory nature of the ore made mining and milling sub-economic. Major production from the mines came between 1865 to 1871 and from 1937 to 1941. Total recorded production (1860's to 1969) according to Tingley and Smith (1983) for the district is less than \$100,000. The Victorine mine was active in the mid 1980's (Nevada Bur. Mines and Geol., Map 84 and 91), although production from this mine has since halted.

Recent work at the Victorine Mine has outlined additional ounces of gold, discussed in Section 3.3.

3.1.19 Lewis

The Lewis district is about 15 miles from the town of Battle Mountain on the west side of the Shoshone Range. Silver was discovered in Lewis Canyon in 1867, and by 1876 several stamp mills were constructed. The Beatty O'Neal mine, discovered in 1880, remained active intermittently through 1929 (1880-1882 and 1922-1929). This mine is responsible for most of the production in the district. Total production is estimated to be about 5 million oz of silver, 20,000 oz of gold, 2 million pounds of lead, 330,000 pounds of copper, and 13,000 pounds of zinc totaling approximately \$4 million (Tingley and Smith, 1983).

3.1.20 McCoy

This district is near the northeast end of the Fish Creek Mountains, about 30 miles southwest of Battle Mountain. Gold was first discovered in the district in 1914 in the area of what is now known as the Iron King mine. No significant activity occurred until 1928 with the discovery of high-grade gold ore at the Gold Dome mine. Mining activity continued until about 1938. The district remained idle until about 1941, when high-grade iron ore was discovered, and subsequently mined and shipped until about 1943. Mining of this iron ore resumed in the periods 1951 to 1954 and 1961 to 1964. Value of the iron ore greatly exceeds the gold ore value, although total value of all production totaled less the \$1 million.

Recent activity in the district is summarized in Section 3.3.

3.1.21 Mountain Springs

This district is located on the west side of the Shoshone Range, about 25 miles south of Battle Mountain. Barite mining began in the 1930's in Lander County, particularly in the north end of the Shoshone Range in the Argenta district. The Mountain Springs barite deposit was not developed until 1948, with production following in 1952. Total production of barite ore for the period 1952 through 1969 (Stager, 1977) exceeded 500,000 tons. This mine does not appear to be active at present (Major Mines of Nevada, 1993, 1992, and 1991).

3.1.22 New Pass

The New Pass district is in the New Pass Range, about 25 miles northwest of Austin. The Churchill County boundary passes through the middle of the district, and the associated major production comes from the mines in Churchill County. Gold was discovered and the district organized in 1864 or 1865. A stamp amalgamation mill was built in 1868 and operated for several years. The camp was intermittently active on a small scale until about 1941. Total production from the district is estimated to be about 35,000 tons of ore that averaged slightly less than 1 ounce of gold and silver per ton. Manganese ore was discovered in the district about 1918, and during the period from about 1941 to 1953 (Tingley and Smith, 1983) approximately 5,000 tons averaging 30 percent manganese was produced.

3.1.23 North Battle Mountain

This milling district is located at the southwest end of the Sheep Creek Range,

about 6 miles Northeast of Battle Mountain. Silver-lead ore was discovered in the area in 1906, and intermittent exploration and mining activity followed until about 1938. Total production from the area is estimated at 1,500 tons of silver-lead ore, although the average grade of this material is unknown.

3.1.24 Ravenswood

This district is located on the west side of the Shoshone Mountains about 25 miles north of Austin. Silver-lead-copper-bearing quartz veins were discovered southwest of Ravenswood Peak in 1863 with the district organized the same year. Although this district was one of the first to be organized in Lander County, interest in the ores was short-lived and the mines were abandoned a few years later. A relatively extensive uranium exploration program was conducted in the northeast corner of the district, though ore-grade material was not defined or shipped. Tungsten and molybdenum mineralization was discovered just south of the silver properties in the 1960's, and extensive exploration was completed in the Reward claims area by several companies in the 1970's. The area also received attention for disseminated gold mineralization after the publication of the U. S. G. S. Circular 563 in 1968 (Tingley and Smith, 1983). Barite has been mined from one occurrence in the southern portion of the district, and small turquoise prospects are mentioned south of the Reward area (Tingley and Smith, 1983). The total value of mineral production through 1969 from this district is less than \$10,000.

3.1.25 Reese River

The Reese River district contains the town of Austin and is located in the Toiyabe Range. Silver ore was discovered in May of 1862, with the district organized in the following July, and Lander County subsequently organized and separated from Humboldt and Churchill Counties in December of that same year. When originally organized, the district was 20 miles wide and 75 miles long, but was reduced to an area 1 mile wide and 8 miles long. Most of the production came from mines on Lander Hill, and the greatest production was reached in 1868, when about 5,400 tons of ore were milled yielding about \$1,240,000 in bullion (as per 1868 commodity market values). There are no accurate production records from the district, and the most liberal estimates for which there is any support indicate a total value less than \$26 million for the period 1863 to 1903 (related to market values for this period). Production from the district from 1903 to 1969 (Stager, 1977) is valued at less than \$500,000. Most of the value has been in silver, and only small amounts of gold, copper, lead, antimony, and zinc have been recovered and/or reported.

Turquoise was discovered about 10 miles northeast of Austin in 1930, and the

resulting value in production was probably less than \$50,000 (1930-1969). Uranium was discovered in 1953, and several thousand tons of uranium ore were mined and shipped, resulting in a value of more than \$100,000.

3.1.26 Skookum

The Skookum district is located in the low rolling hills of Vigus Butte in the Reese River Valley, about 8 miles northwest of Austin. The district was discovered in 1907 when mineralized gold- and silver-bearing quartz fragments were noted in float. Operations commenced in 1908 with rich silver and gold ore being produced. A rush ensued to the area, although it was short-lived and only lasted a few months. By the fall of 1908, most of the miners were gone and by 1912 the hills were as bare as before (Tingley and Smith, 1983). The district was revisited in the late 1960's when Humble Oil (Exxon) staked the district and explored for disseminated gold (Tingley and Smith, 1983). Past production figures indicate that early production ran 750 oz silver to 1 oz of gold, with the Greenah mine having the largest production in the district with values up to \$100,000 in gold and silver (Tingley and Smith, 1983).

3.1.27 Spencer Hot Springs

The Spencer Hot Springs area is located on the northeast end of Big Smoky Valley about 20 miles southeast of Austin. Tungsten was discovered in the low hills in this area in 1941. Exploration followed with the first ore shipment resulting in 1943. Two properties were active intermittently over the next thirteen years, and included the Peer (Conquest) mine and the Linka mine. These mines were active in 1945, and again in 1955-56. About 66,420 tons of ore averaging 0.45% WO_3 were produced during this period (Tingley and Smith, 1983).

3.1.28 Steiner Canyon

This district is located approximately 35 miles north of Austin, virtually dissected by highway 305. Gold placer and zeolites are the commodities recognized in this district (Tingley, 1992). Information on the district is sparse.

3.1.29 Warm Springs

The Warm Springs district is located in the Reese River Valley, about 35 miles south of Battle Mountain. Mercury was probably discovered during the 1930's, and a small production was reported for the period 1939 to 1941 and 1955 to 1956. Total recorded production was less than 20 flasks of mercury valued at less than \$4,000.

3.1.30 Washington

This district is dissected by the Nye-Lander county line, and is located on the western slope of the Toiyabe Range about 25 miles south of Austin. This district was organized in 1863, and recognized commodities include silver, lead, zinc, antimony, tungsten, and arsenic. The recorded production in the district is only about \$30,000, but the amount of workings suggests that there could be considerable unrecorded production (Tingley and Smith 1983). The district has been intermittently active in the 1920's and 194's; some claim staking and chilling was done in the late 1970's and early 1980's (Tingley and Smith, 1983).

The mineral deposits of the Washington district consist predominantly of two types: silver-lead bearing quartz veins in Paleozoic rocks; and tungsten in tactites. The silver-lead veins have reported grades of 20-30% lead, 10-20% zinc, 0-2% arsenic, and 8-15 oz/ton silver.

3.1.31 Wild Horse

The Wild Horse district is located in the low rolling hills of the Augusta Mountains, approximately 30 miles northwest of Austin. Originally, this district was formed when mercury was discovered in 1916, and consequently, was produced over the next 20 years from two mines. About 110 flasks were produced during the first 20 years of operation. In 1939 the Wild Horse mine was discovered, and 883 flasks were produced from this mine until about 1942. Total production for the district is about 1,200 flasks of mercury. With the realignment of Churchill and Lander counties, the new county line passes through the district and most of these older workings fall in Churchill County. Manganese was discovered in 1954 at the Black Devil mine in the southern portion of the district. Production of manganese totaled between \$5,000 and \$100,000 worth of 47.6% manganese ore (Stager, 1977).

3.2 Recent Metals Exploration, Development, and Mining

Grassroots exploration for gold and other metals in Nevada continued the decline that started in 1989 (Bonham and others, 1993). Exploration for precious metals in Nevada continued to emphasize deep and/or concealed (pediment) targets in known districts rather than in frontier areas. Examples of some of the successful exploration programs include new discoveries in the Independence Range, continued expansion of reserves in the South Pipeline area of the Cortez-Gold Acres gold trend, as well as newly discovered concealed mineralization near-by, and Kennecott's Gemfield

discovery in the Goldfield district.

Some of the most recent exploration and development activity in Lander County is summarized below for those districts witnessing recent exploration, development, and mining activities. Information was compiled from Bonham and others (1993), as well as from annual reports from Placer Dome U.S. Inc., Battle Mountain Gold Co., and Santa Fe Pacific Gold Corporation. Additional references are cited. Figure 3.2 illustrates the location of the active milling ventures, as well as the recent advanced exploration and development projects. In addition, the various proposed Yucca Mountain rail routes are illustrated in this figure. Recent claim staking activities are summarized in Appendix B, which includes xerox copies of the Lander County Courthouse log book filings for 1992 through October 1994.

Argenta

Approximately 12 miles east of Battle Mountain and 6 miles south of Argenta in the general vicinity of the Argent district is Santa Fe Pacific Gold Corporation's (SFPGC) Mule Canyon project. This project has a drill indicated resource of 10.1 million tons grading 0.13 oz Au/ton. Most of the mineralization discovered to date is refractory in nature, ultimately requiring a more expensive and complicated process to extract the gold (SFPGC Annual Report, 1993). A feasibility study evaluating the viability of the project is nearing completion with a decision expected by the end of 1994 (SFPGC 1994 2nd Quarter Report).

Battle Mountain

Additional reserves at the Reona heap leach project and gold mineralization at the Phoenix project are expected to extend the life of the Battle Mountain Complex into the early part of the next century (The Mining Record, vol 105, no. 17). Feasibility and design work on the Phoenix milling project (formally referred to as the Fortitude Extension) was expected to be completed in early August 1994, with a Plan of Operation submitted to the Bureau of Land Management soon after (Battle Mountain Gold Co. (BMG) 2nd quarter report and personal communication). This deposit is estimated to contain approximately 900,000 ounces of gold, and is projected to average about 120,000 ounces of gold production per year. Because a complete Environmental Impact Statement will be required for this project, start-up of the facility is anticipated in 1997 (BMG 2nd quarter report).

Work is also progressing on the design and permitting of the Reona heap-leach project. Start-up of the crushing facility for this 50,000 oz Au per year project is expected by August 1994, with fluids circulated on the leach pads by mid-August (BMG 2nd quarter report). The first gold is anticipated by early September. Reona

reserves are approximately 370,000 ounces of gold and 600,000 ounces of silver. Current studies indicate that there may be additional leach ounces at Reona, as well as additional mineralization at the Phoenix project.

Big Creek

Austin Gold Ventures (AGV) mined this property from 1986 through 1989. AGV is currently reclaiming the pits and roads in the area. FMC was recently (1993) conducting deep drilling in the area. This exploration program proved difficult and unsuccessful, and all exploration activities in the area by FMC have ceased (personal communication, Austin US Forest Service office).

Buffalo Valley

Fairmile Acquisitions Inc. has entered into an agreement with Repadre Capital Corporation to put in place a two stage financing of Fairmile's Buffalo Valley Project outside of Battle Mountain, in close proximity to the historic Buffalo Valley Mine. Past production figures indicate that in excess of 60,000 oz of gold were produced during the period 1987 to 1990. An underground resource of 250,000 oz of gold is presently recognized with significant potential for further development. Drilling in 1994 has established significant mineralization along a second structure. A proven and probable reserve in excess of 1 million oz of gold appears reasonably achievable as a result of the next planned phase of drilling (The Mining Record, vol. 105, no. 37, pg. 9).

Santa Fe Pacific Gold Corporation is currently exploring on their Trenton Canyon Project on the western flank of Battle Mountain. This is considered an advanced stage exploration project, and SFPGC is currently grid drilling in the area, with drilling densities ranging from 400- to 100 foot centers.

Bullion

Tidal drilling in 1993 (Bonham and others, 1993) on the Bru-Lovie project (Akiko Gold Resources Ltd., Bradner Resources, and Ramrod Gold) totaled about 5,000 feet. Six of the eight holes completed yielded encouraging gold intercepts. The Colorback target within this project area is where most of the encouraging results are concentrated, where low-grade, thick intercepts of gold mineralization have been encountered through previous drilling (Bonham and others, 1993). This project is not located in Figure 3.2 due to lack of data.

Initial phase exploration completed on the E & E claims (First International Metal Corp.) in 1993 included geologic mapping and geochemical sampling to identify targets for follow-up trenching and drilling.

Consolidated Ramrod Gold Corp. had optioned to buy 100% interest in the Mud Springs gold prospect (Bonham and others, 1993). Alteration and mineralization indicators are suggestive of a large hydrothermal system. Previous drilling on targets within the Mud Springs project area (Bald Mountain) have defined gold mineralization (42,000 oz Au; Appendix B).

Placer Dome is continuing exploration, development and production activities on its 60%-owned Pipeline gold deposit. The ore reserves are estimated at 35.3 million tons grading 0.120 oz Au/ton. Approximately 3,697,000 ounces of gold will be produced over a 12-year mine life (Bonham and others, 1993). The Cortez Joint Venture complex will play a key roll in the development and production phases. On-going exploration and development activities on the South Pipeline project by the Cortez Joint Venture has outlined a drill-indicated resource of 31 4 million tons averaging 0.106 oz Au/ton. As well, gold mineralization has been encountered approximately 1,000 feet west of the South Pipeline deposit. Work is continuing testing near-surface and deep mineralized zones. Overburden removal and plant construction are scheduled for 1994 (Bonham and others, 1993). According to the Nevada Miner dated January 1994 (vol.3, no. 1, pg. 4), the Pipeline gold deposit is estimated to contain approximately 4.2 million oz of gold. This is about three times the production at the Cortez Mine for the years 1969-1993. With the combination of the two Pipeline deposits, milling activity at Cortez will extend well into the next century in this area of Lander County.

The Robertson project has a geologic resource of 20 million tons averaging 0.036 oz Au/ton (Appendix B), and being explored and developed through a joint venture between Amax Gold Exploration and Coral Gold Corporation. According to Bonham and others (1993), Amax intended to continue exploring on the project through a Phase 3 program. According to The Mining Record (March 2, 1994, vol. 105, no. 9, pg. 7) Amax was beginning a 140-hole drilling program to further test mineralization style(s) and extent on the Robertson project. This project is located on the Battle Mountain gold trend, immediately north of Placer Dome's Pipeline gold deposit, and Carter/Gold Acres mine on the Eureka/Lander county border.

Cathedral Gold Corp. initiated deep drilling on their Trendline property in 1993, without success. Difficult drilling stopped completion of the first hole at 1,200 feet of a planned 1,500-foot hole. A second hole was completed to the targeted 1,800-foot depth. Thick zones of alteration were encountered, although no significant gold mineralization was intercepted. This project is not located in Figure 3.2 due to lack of data.

Cortez

The Horse Canyon Project is located east of the Cortez Gold Mine facility, approximately 2 miles east of Mount Tenabo in the Cortez Mountains of Eureka

County. Although this project is technically within Eureka County the ore is slated for shipment to the Cortez roaster facility for process. The close proximity of this project to Lander County warranted a brief discussion.

Hilltop

Alta Gold Co. has purchased Nerco Exploration Co.'s 50% interest in the Havington Peak Property in the Shoshone Range, 1 mile north of Placer Dome's Hilltop project. This purchase makes Alta the sole owner of the property.

Recent drilling (1993) on Equinox Resource's Slaven Canyon property has defined near-surface gold mineralization. Thirteen drill holes tested a series of strong gold geochemical anomalies, with eleven of the holes intersecting mineralization in excess of 0.01 oz Au/ton and ranging up to 25 feet of 0.047 oz Au/ton. A second phase of drilling is planned for early 1994 to test extent and style of mineralization. This project is being explored under a joint venture between Equinox and Uranerz USA Inc., who holds a right to earn 70% on Equinox's interest.

Kingston

Verdstone Gold Corp. has announced a minable, diluted, recoverable reserve has been calculated for the Victorine property at a 0.146 oz Au/ton cut-off grade. At an average mining width of 12 feet, reserve figures total 256,268 proven/probable tons grading 0.357 oz Au/ton, and 122,777 possible tons averaging 0.241 oz Au/ton.

In close proximity to the Victorine Mine is the Klondike Project (personal communication, Austin US Forest Service office). Precious Metals has the property and are conducting limited exploration.

McCoy

Echo Bay Mines set new production records in 1993 at their McCoy/Cove mine. Additional ore has been defined at the western margin of the original McCoy pit, which closed in 1991. Plans are to reopen this mine at some time in the future. Underground mining is slated for completion sometime in 1994. The McCoy/Cove mine is the largest silver-producing mine in the U.S., and one of the three largest in the world.

3.3 Geothermal Activity

Nevada is well endowed with both high- and low-temperature geothermal resources.

Over 40% of the state has a strong potential for the discovery of high-temperature (>200°F) geothermal resources, and another 50% has potential for low- to moderate-temperature resources (Bonham and others, 1993). Surface and subsurface indications of these resources are the more than 1,000 thermal springs and wells in the state.

In Lander County, there are several areas of geothermal activity. The Oxbow/Beowawe Geothermal Power Co. plant came on line in 1988, and is located in northeast Lander County, just across the Lander-Eureka county line. It is a 16-MW11, dual-flash plant, which uses geothermal fluids from three wells with a resource temperature of 430°F. The gross 1993 production (MW/h) was 136,612 (Bonham and others, 1993). Spencer Hot Springs, in the northern portion of Big Smoky Valley, is another well-known hot spot. The geothermal resource at this area has not been developed, although it has been used for years as a hot bath-recreation area.

Other areas of thermal activity in Lander County include hot springs in Grass Valley south of Cortez (in Lander County, as well as just over the county line in Eureka County), thermal springs on the west side of Smith Creek Valley, hot springs drilled by Amax just over the county line in Churchill County on the west side of the New Pass Range, hot springs in the Warm Springs mining district, and hot springs in Buffalo Valley. This data was summarized from the Geothermal Resources of Nevada, 1983 map. Figure 3.2 illustrates the location of these thermal areas.

4.0 PRODUCTION

4.1 Production - General

According to Bonham et al (1993), the minerals industry continued to make major contributions to the economy of both Nevada and the nation. In 1993, Nevada continued to lead the nation in the production of gold, silver, mercury, and barite; was second in diatomite and lithium; and was the only producer of mined magnesium (Bonham and others, 1993). Total nonfuel mineral production in Nevada in 1993 had an estimated value of \$2.8 billion, ranking Nevada second among the states in 1993 production value. Table 4.1 summarizes the production of gold, silver, copper, and barite for 1993 in Nevada.

Table 4.1 Production for Major Mines in Nevada for 1993

COMMODITY	PRODUCTION
Gold	6,700,000 ounces
Silver	23,200,000 ounces
Barite	340,000 tons shipped
Copper	10,000,000 pounds

METALS

Nevada mines produced record amounts of gold and silver in 1993, although no major new mines opened in the state during this particular year. Nevada maintained its rank as the leading state in the production of gold, silver, and mercury (Bonham and others, 1993). Gold production increased about 3% in 1993 over 1992, and 1993 silver production grew approximately 17% over 1992 production. Mercury production in Nevada occurs as a by-product of gold mining. The major gold producers in Nevada continue to be from mines located within the Carlin trend in Eureka County. One of the other large producers of gold is the McCoy-Cove Mine in Lander County, owned by Echo Bay Minerals Company. Other large gold producing mines in the state include: Santa Fe Pacific Gold's Twin Creeks mine (Humboldt County); Smoky Valley Common Operation's Round Mountain mine (Nye County); Independence Mining Co.'s Jerritt Canyon mine (Elko County); LAC Minerals Ltd.'s Bullfrog mine (Nye County); and FirstMiss Gold Inc.'s Getchell mine (Humboldt County).

Nevada also maintained its position as the nation's largest silver producer as a result of the production from two major silver mines along with significant by-product silver from the state's gold mines. In Lander County is located the largest silver-producing mine in North America, Echo Bay's McCoy/Cove mine. Coeur d'Alene Mines Corp.'s Rochester mine is the second largest silver-producer in Nevada (Bonham and others, 1993). The Candelaria mine, now owned by Kinross Gold Corp., resumed production in late 1993 and produced over 900,000 ounces by the end of the year. FMC Gold Co.'s Paradise Peak mine produced 795,000 ounces of silver, and closed operations when the reserves were exhausted late in the year.

In Nevada, the Yerington and Robinson districts are the two major copper-producing areas, in Lyon and White Pine counties, respectively. Heap leaching in 1993 produced 10,000,000 pounds of copper from the Yerington mine by Armetco International Inc., representing total copper production in the state. Studies within the Robinson district are currently underway by Magma Copper Co. with respect to completing feasibility studies targeting the start-up of mining and production activities within the district. This project is slated to produce approximately 125 million pounds of copper and 100,000 ounces of gold per year over a 16-year mine life (Bonham and others, 1993).

INDUSTRIAL MINERALS

Industrial minerals produced in Nevada in 1993 had an estimated value of about \$303 million, an increase of approximately 6% from 1992. Increases in production and dollar values of aggregate, barite, cement, gypsum, and salt in 1993 overshadowed decreases in clay, perlite, and silica. The following lists the industrial minerals produced in Nevada by importance in order of estimated dollar value: aggregate, diatomite, lime, barite, cement, gypsum, lithium carbonate, silica, clay, and magnesia (Bonham and others, 1993). As Nevada's population continues to increase, demand for industrial minerals, such as limestone, building stone, and sand and gravel, will also increase. As a result, the production of industrial minerals is expected to continue on a steady upward trend.

Nevada barite producers were a major factor in the increased value of industrial mineral production in 1993. M.I. Drilling Fluids Co. was the largest producer of barite in Nevada in 1993, shipping from three (3) operations in Lander County: processed barite from the Battle Mountain Grinding Plant; and crude barite from the Clipper and Greystone mines. Of Nevada's 540,000 tons of barite shipped in 1993, Lander County production contributed approximately 340,000 tons.

GEOHERMAL RESOURCES

Nevada's geothermal resources are also expected to increase in importance to the state's mineral economy. Geothermal electric power sales have risen from a zero

point in 1984 to an \$85 million industry in 1992. In 1993, Nevada was expected to exceed 200 megawatts of geothermal power production capacity (Tingley et al, 1993).

4.2 Production - Lander County

Most of the value in the produced ore from the mid-1860's up through 1969 in Lander County was in silver, gold and copper, with additional production in barite and turquoise and small quantities of antimony, arsenic, fluorspar, lead, manganese, mercury, tungsten, uranium, and zinc (Stager, 1977). More recently, Lander County production has dominantly been in gold, silver, and barite. The Battle Mountain district, originally in Humboldt County, was organized in 1867 and ceded to Lander County in 1873. This has historically been a very rich district, with mining related activity relatively steady from the time of discovery through to the present. In addition to the Battle Mountain district, other districts active today with significant mining and exploration ventures include: Argenta (barite); Buffalo Valley (Au); Bullion (Au, Ag); Cortez (Au, Ag); Hilltop (Au, Ag); Kingston (Au, Ag); and McCoy (Au, Ag, Cu). Section 3.2 summarizes the recent activities in each of these districts.

Appendix C summarizes the major precious metal deposits in Lander County, as referenced in Bonham and others (1993), with associated resources and reserves summarized.

In Lander County, recent major producing metal and barite mines were summarized and illustrated in Figure 3.2. In 1993, M.I. Drilling Fluids Co. was the largest producer of barite in the state, shipping from three operations in Lander County: processed barite from the Battle Mountain grinding plant and crude barite from the Greystone and Clipper mines. Major barite production came from the Argenta Mine and Mill, with 59,327 tons shipped in 1993; and the Battle Mountain Grinding Plant (Clipper and Greystone mines), with 85,000 tons shipped. Major metal mines in Lander County include the Cortez Gold Mine with production totaling 66,850 oz Au; the Fortitude Complex with gold production totaling 57,630 oz and silver totaling 109,650 oz; and the McCoy/Cove Mine with production totaling 395,610 oz Au and 12,454,340 oz Ag. As mentioned previously, the McCoy/Cove mine is the largest silver-producer in the North America and the third largest in the world. Totals from these mines are summarized in Table 4.2 summarizes production of gold, silver, and barite relative to the major mines for the years 1991 through 1993. The figures used in this summary are from the Major Mines of Nevada, Nevada Bureau of Mines and Geology Special Publication P-5, for the years 1991-1993.

Table 4.1 Production figures for the Major Mines in Lander County, 1993-1992-1991

	PRODUCTION		
YEAR	GOLD (oz)	SILVER (oz)	BARITE (tons)
1993	520,100	12,600,000	144,300
1992	555,081	8,343,230	252.000
1991	529,331	6,042,225	389,677

In 1993, a total of 27 operations were active in Lander County, and employment related to these major and minor operations totaled approximately 1,135 people (Mine Safety and Training, 1994).

The Cortez Joint Venture partners hope to produce 3.7 million ounces of gold from the Pipeline deposit (exclusive of South Pipeline) over a 12-year mine life, and plans to increase the current work force from 195 to 275 employees (Nevada Miner, January 1994, vol. 3 no. 1). A feasibility study is underway for the South Pipeline resource in connection with an Environmental Impact Statement relative to proposed mining activities. Combining the two Pipeline deposits, mining at the Cortez will extend well into the next century. The overall gold resource for the two deposits totals more than 7.4 million ounces (Nevada Miner, January 1994, vol. 3, no. 1).

Battle Mountain Gold Co. stated in their 2nd quarter report that an approximate 25 percent increase in gold production in 1994 relative to 1993 is expected to be achieved. Placer Dome has also indicated that an increase in gold production is outlined for 1994.

5.0 CONCLUSIONS

5.1 Conclusions

Lander County is one of the more active counties in Nevada, witness to a surge in exploration and development activities. The major mines in the county contribute significantly to the county's, and the state's, economy. These projects include the McCoy/Cove mine and the Cortez gold mine, as well as some very viable exploration and development projects, such as the Pipeline deposit(s), the Reona and Phoenix projects, the Mule Canyon project, and the Buffalo Valley Mine project, to mention only a few. Lander County has been the site of various exploration and mining activities since the 1860's. The Battle Mountain complex area has been actively mined since the 1870's (BMG Annual Report, 1993), relatively uninterrupted through to the present. In addition, the Cortez district is the site of expanding and evolving exploration development activities with the development of the Pipeline deposits. Exploration and mining related work is expected to continue well into the next century with the expanded reserves at the Battle Mountain complex and at Pipeline.

Because mining and exploration related technologies are constantly changing in response to technology advancements, search for and development of mineral resources is a continually evolving process. Technological breakthroughs contribute to resurgences of exploration and mining activities in previously explored districts, as well as in virgin territory.

The Cortez district is an example of the effects of technology advances. Mining related activity in the Cortez district started in 1862 with the discovery of rich silver ore at the Garrison mine at the Artie tunnel. These mines were operated with various levels of success over the years. In 1968, the Cortez Joint Venture was formed with Placer Dome U.S. as the managing partner. Gold reserves were outlined and a seven-year mine life was estimated. A heap leach gold recovery mill was operated from 1969 to 1976. In the late 1970's, due to lack of mill grade ore, the mining equipment was sold and the mill was shut down for four years as heap leach operations continued. Mill conversions and leach process changes marked the period in the late 70's and into 1987. New advances in process technologies contributed to continued interest in the area. A circulating fluid-bed roaster has been utilized most recently in response to technology advances, treating 'refractory' ore. This process has been refined over the years, and as a result the facility provides acceptable gold recoveries from previously defined 'untreatable' ore. Consequently, the life of the mine is extended as a result of technology advancement.

From the time of discovery through to the present, mining districts have been witness to resurgences in mining and exploration activities as technologies and economic viabilities change. In response to this, Nevada has become the key producer of gold

and silver in the United States, as well as a vital contributor to the overall world production of these two commodities. Changes result in reactivated interest in established mining districts, creating a very dynamic, evolving industry. This dynamic nature makes it difficult to quantify and summarize mineral resources. As a result, this study does not represent a final, conclusive summary. Instead, the information in this report should be used as a guide to expanding the understanding of mineral occurrences in Lander County.

5.2 Mining Law Reform

The future of the 1872 Mining Law is still uncertain due to proposed mining law reform, although Congress has decided not to tackle the issue this year. Separate measures related to the reform debate were passed earlier in each house of Congress (S.775 and H.R.322), and mining law reform discussions are sure to resume next year when Congress meets again. It is expected any new legislation will impose higher costs for all mining companies exploring for and/or operating mines in the U.S. While the extent to which the existing law might change is not yet known, it is expected to be unfavorable in most respects, ultimately causing companies in the U.S. to be cautious when designing exploration, development, and mining programs. In general, U.S. companies are funneling more and more of their exploration dollars off-shore into other projects in the international arena. Certainly, in Lander County, mining and advanced-stage exploration ventures appear to be remaining steady, although if radical mining law reform is passed these activities will surely diminish.

New claim holding fees for all mining claims on public lands came due at the end of the 1993 assessment year (Public Law 102-381). In response to the new fees, an approximate 69% decrease in active claims in Nevada resulted between September 30, 1992 and September 1, 1993.

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Country-specific estimates were developed for the fraction of N loss from volatilization (Fracgas) and runoff and leaching (Fracrunoff/leach). Fracgas values were based on. Uncertainty is estimated using an IPCC-recommended Tier 2 method developed by EPA (2003) based on the Monte Carlo Stochastic Simulation technique.Â Grazed lands can be either a source or a sink of CO₂, depending on the level of soil disturbance, soil type, previous land use, and grazing intensity. In general, grazed mineral soils that were previously cropped with annuals and then tilled sequester C upon conversion to perennial vegetation cover. However, drained organic soils (histosols) used for grazing are typically a CO₂ source because draining enhances decomposition of soil organic matter.