Historic Properties Treatment Plan for Mitigation of Historic Sites within the Comstock Mining, LLC Right-of-Way Permit, Storey County, Nevada

Prepared by Jason Spidell, B.A. and Robert R. Kautz, Ph.D.

BLM Report No. CRR3-2643.3

Submitted to:
U.S. Bureau of Land Management
Sierra Front Office

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Cover photo:The Justice Hoisting Works (1871-1876). Hearst Collection of Mining Views by Carleton E. Watkins.

Frontpiece illustration, in lower right corner, is of a pecked and grooved saurian effigy head discovered in an Archaic site in the South Truckee Meadows, Nevada. Illustration by J.W. Oothoudt

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KEC Project 875

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1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

In April 2015, Ms. Rachel Yeldermam, Environmental Affairs Director at Comstock Mining LLC (CM) contacted Dr. Robert R. Kautz of Kautz Environmental Consultants, Inc. of Reno, Nevada (KEC), to request the preparation of a treatment plan for four historic resources located within the direct affects Area of Potential Effect (APE) for The American Flat and Lucerne Haul Road Right-of-Way (Undertaking). The Undertaking is located south of Gold Hill, Nevada, and is within the Virginia City Historic District, also a National Historic Landmark (Figure 1.1). The Undertaking consists of an exclusive use haul road to be segregated from the American Flat Road, to haul ore from CM's mining operations in Gold Canyon to their processing facility located in American Flat. The Sierra Front Field Office of the Carson City District of the Bureau of Land Management (BLM) plans to issue a Right-of-Way for the project pursuant to the Federal Land Policy and Management Act of 1976, as amended (43 USC § 1761).

1.2 PROJECT EFFECT

The Undertaking will adversely affect four historic-aged resources that have been determined eligible for listing in the National Register of Historic Places (NRHP). In addition, these resources have been determined contributing elements of the Virginia City Historic District, also a National Historic Landmark. These resources constitute "historic properties" as defined in Section 106 of the National Historic Preservation Act, and its implementing regulations codified in 36 CFR § 800. The mitigation measures presented herein have been developed to resolve the determination of adverse effects to historic-aged historic properties within the undertaking's APE, and to fulfill the CM's obligations outlined in the *Memorandum of Agreement for the American Flat and Lucerne Haul Road Right-of-Way*.

The four Historic Properties that will be adversely affected by the Undertaking include CrNV-03-1489/4371 (26St602); CrNV-03-4378 (26St609); CrNV-03-4408 (26St611); and CrNV-03-8915 (26St628) (Appendix A: Figure 1.2). The Undertaking has the potential to physically adversely affect those aspects of integrity that contribute to the eligibility of the historic properties. These potential effects include impacts to each historic properties' integrity of location, design, workmanship, or materials, by means of physical impacts including complete or partial destruction, as well as effects to the historic properties' integrity of feeling, setting, and association through changes to the visual or audio setting. Impacts to all seven aspects of integrity (location, design, materials, workmanship, setting, feeling, and association) can be expected to those historic properties situated within the ROW's proposed footprint of disturbance.

1.3 REPORT OUTLINE

Section 1.0 of this report provides a summary of major project details including the project history and location, a definition of proposed impacts, and a brief description of the historic properties that may be adversely affected. Section 2.0 outlines the natural setting for the project. The historic overview can be found in Section 3.0. Research domains deemed relevant and their appropriate research questions, is presented in Section 4.0. Section 5.0 presents the general treatment proposed for historic sites in the project area. Section 6.0 defines specific individual site treatment protocols for resources that are eligible for the National Register, or that remain unevaluated. Section 7.0 outlines curation requirements and project deliverables. Finally, Section 8.0 contains the bibliographic references cited in the document.

Appendix A contains the Project Maps, Appendix B contains the Site Forms, Appendix C contains KEC's Curation Agreement with the Nevada State Museum.

2.0 NATURAL SETTING

2.1 GEOLOGY

The geology of the project area is contained within the Comstock Lode Mining District. This area has been extensively researched by geologists and miners alike. The information presented below is a general synopsis derived from Bonham (1969). For further information on the geological classifications of this area see Becker (1882a, 1882b), Gianella (1936), Hague and Iddings (1885), King (1870), Moore (1969), Richtofen (1865), Smith (1943), Stewart (1999), Stoddard and Carpenter (1950), and Thompson and White (1964). The district extends from Silver City on the southern end to near Orleans Hills to the north and from Mount Davidson on the west to Six Mile Canyon on the east (Bonham 1969:102). The oldest exposed rock within the Comstock District is likely Triassic metavolcanic and metasedimentary rocks (Bonham 1969:104). Outcrops occur around American Flat and Silver City. These metamorphic rocks were metamorphised, folded, and intruded by Cretaceous-aged granodiorite and prophyritic quartz monozonite (Bonham 1969:104). Small areas are exposed in American Ravine and on the southern exposures of Basalt Hill.

The Hartford Hill Rhyolite formation is the oldest Tertiary formation (Bonham 1969:104). It is approximately 1,000 ft. thick and is made of conglomerate with welded ash-flow tuffs. Potassium-Argon (K-Ar) dates of this formation indicate an age of 23 million years during the lower Miocene. The Alta Formation lies on top of the Hartford Hill Rhyolite formation. The Alta Formation includes pyroxene and hornblende andesite flows and breccias. It also includes the Sutro Tuff, which is a sedimentary unit of waterlain tuff, shale, sandstone, and conglomerate (Bonham 1969:104). The Alta Formation constitutes about half of the Comstock Lode district and is the host rock of gold and silver deposits within the district.

The American Ravine Andesite Porphyry is the next youngest unit (Bonham 1969:105). This unit is exposed in Gold Canyon and American Ravine. The next youngest unit is the Davidson Granodiorite and it forms the summit of Mount Davidson. The Davidson Granodiorite unit invades the Alta Formation. The Alta Formation within the Comstock District is overlain by the Kate Peak Formation that is Mio-Pleocene in age (Bonham 1969:105). The Kate Peak Formation includes at least 2,000 ft. of breccia, tuff breccias, waterlain tuffs, and tuffaceous sediments and flows.

The Knickerbocker Andesite is the next youngest unit and is Cenozoic in age (Bonham 1969:105). This unit is exposed at the southern end of the district and appears as intrusive masses, flows, and dikes within the Kate Peak Formation. The youngest unit is a Pleistocene age, remnant flow of McClellan Peak Olivine Basalt, that is present in the American Flat area.

Three major faults occur in the district, these include the Comstock, Silver City, and Occidental faults (Bonham 1969:105). The greatest majority of revenue within the district has been gleaned from the veins within the Comstock (the famed Comstock Lode) and Silver City faults. The Comstock fault is a large body of brecciated vein quartz and highly altered andesite. The famed Bonanza ore bodies of gold and silver occur at irregular intervals along the Comstock fault and within the hanging wall fractures (Bonham 1969:105). These bonanza ores include quartz, with sparse to abundant calcite containing abundant sphalerite, galena, chalcopyrite, and pyrite. The veins of the Silver City fault include quartz and/or calcite that contains pyrite, gold, silver, electrum, occasionally argentite, and rarely chalcopyrite (Bonham 1969:106). The Occidental Lode includes quartz, calcite, and adularia, which constitutes 15 percent of the vein materials.

2.2 SOILS

There are five distinct soil classes within the project area as defined in NRCS (n.d.). These soil types include the Pits-Dumps complex, the Devada-Rock outcrop complex, 15 to 50 percent slopes, the Bambadil-Indiano association, the Springmeyer-Reno association, and the Devada-Rock outcrop association. The Pits-Dumps complex consists of 55% pits and 45% dumps, which is a common soil type association and characteristic of a mining landscape. This soil type is typically located on hills.

The Devada-Rock outcrop complex, on 15 to 50% slopes occurs between 4,500 and 5,000 ft. in elevation on hills where residuum is derived from volcanic rocks. This is a well drained soil with a profile that ranges from very cobbly loam at the surface to gravelly clay between five and 18 inches below the surface, to unweathered bedrock.

The Bombadil-Indinao association occurs between 5,600 and 6,300 ft. in elevation. This soil type occurs on hills where residuum and colluvium is derived from volcanic rock. The general profile of this soil type ranges from stony to gravelly loam at the surface, to gravelly sandy clay loam from 13 to 33 inches below the surface to unweathered bedrock.

The Springmeyer-Reno association occurs between 6,000 and 6,500 ft. in elevation on alluvial fans and fan remnants from mixed alluvium. This is a well drained soil with a profile that ranges from gravelly and cobbly fine sandy loam at the surface to stratified loamy sand to very gravelly sandy clay loam, clay, and indurated, to very gravelly loam sand at 60 inches below the surface.

The Devada-Rock outcrop association occurs between 650 and 6,000 ft. in elevation on hills with residuum derived from volcanic rocks. It is a well drained soil with a general profile of very cobbly loam at the surface to gravelly clay at 18 inches below the surface to bedrock.

2.3 FLORA

Archer (1990) lists dominant plant taxa associated with various soil types occurring in the project area. General accounts of plant associations present in the Virginia Range and environs are found in Cronquist et al. (1972); Shantz 1925; Trimble (1989); West (1988); and Young et al. (1988). The primary plant community present in the project area is big sagebrush steppe. Dominant shrubs include big sagebrush (*Artemisia tridentata*), and bitterbrush (*Purshia tridentata*). A low cover of understory grasses, herbaceous perennials and annuals also is present. Grasses include invasive cheatgrass (*Bromus tectorum*), Thurber and desert needlegrass (*Achnatherium thurberianum* and *A. speciosum*), and squirreltail (*Sitanion hystrix*).

2.4 FAUNA

With respect to the terrestrial fauna, reptiles of note include Western rattlesnakes (*Crotalus viridis*), garter snakes (*Thamnophis* sp.), gopher snakes (*Pituophis melanoleucus*), and lizards (such as, *Sceloporus graciosus; Cnemidophorus tigris*). Among the birds (Alcorn 1988; Ryser 1985) are upland game birds, such as sage grouse (*Centrocerus urophasianus*) and mourning doves (*Zenaida macroura*). Common birds of prey include turkey vultures, eagles, and various hawks, falcons, and owls. A host of songbirds also is present

Upland game mammals include the ubiquitous jack rabbit (*Lepus californicus*), cottontail rabbits (*Sylvilagus nuttallii*), yellow-bellied marmots (*Marmota flaviventris*), Townsend ground squirrels (*Spermophilus townsendii*), California ground squirrels (*Spermophilus beecheyi*), white-tailed antelope squirrels (*Ammospermophilus leucurus*), , pocket mice (*Perognathus* sp.), kangaroo mice (*Microdipodops* sp.), kangaroo rats (*Dipodomys* sp.), pocket gophers (*Thomomys* sp.), grasshopper mice (*Onychomys* sp.), harvest mice (*Reithrodontomys* sp.), deer mice (*Peromyscus* sp.), wood rats (*Neotoma* sp.), meadow mice (*Microtus* sp.), sagebrush voles (*Lagurus curtatus*), muskrats (*Ondatra zibethica*), and porcupines (*Erethizon dorsatum*) (Hall 1946; Zeveloff 1988). Among the significant carnivores are coyotes (*Canis latrans*), striped skunks (*Mephitis mephitis*), badgers (*Taxidea taxus*), and bobcats (*Lynx rufus*). Deer (*Odocoileus hemionus*) (Hall 1946:621-628, Fig. 463), and, in the past, bighorn sheep (*Ovis canadensis*) (Buechner 1960:14-15, Figure 1, 66-67; Hall 1946:634-642, Fig. 473; McQuivey 1978:12-13, Figure 3; Pippin 1979:339, Figure 1), were/are the primary large herbivorous mammals.

3.0 HISTORICAL OVERVIEW

The mineral resources of the Comstock represent one of the largest precious metal deposits developed in the world. Development of the mineral resources on the Comstock resulted in the implementation of innovative mining and milling techniques on an industrial scale. The mining industry pioneered on the Comstock served as a model that would be recreated throughout the western United States, influencing the region's development as new mineral deposits were identified.

The history of the Comstock reviewed here is divided into five historical periods: Pre-Comstock Prospecting (1849-1858), the Comstock Bonanza (1859-1879), Depression and Decline (1880-1900), Post-Boom Renewal and Limitation Order L-208 (1901-1945), and Tourism and Modern Mining (1946-present).

3.1 PRE-COMSTOCK PROSPECTING (1849-1858)

The mountain man and explorer Joseph Walker became the first non-native person to cross the Great Basin in 1833. Others followed in the 1840s, including emigrant parties heading to California and Oregon, the notorious Donner Party among them, and the expeditions of the Corps of Topographic Engineers, led by John Charles Frémont, which produced maps of the area. Between 1846 and 1847, members of the Church of the Latter Saints (Mormons) left Illinois and forged a wagon road to San Diego. In 1847, another Mormon group, on hearing reports of Fremont's party, entered Salt Lake Valley where they settled (Rood and Thatcher n.d.).

With the discovery of gold in California, scores crossed the Great Basin on their way to the goldfields. One such person was Abner Blackburn, who had been among the Mormon group that had settled in Salt Lake two years previous. On his way to California, his party camped along the Carson River in Gold Canyon, and Blackburn wondered if the east side of the Sierra Nevada might also have gold. He and his companions did some gold panning, and in a few hours they had collected about ten dollars' worth of gold. California was their target, however, and Blackburn noted in his diary that he might someday return. Though Blackburn is not widely credited with being the first to discover gold in Nevada, the historian Sally Zanjani suggests that he was (Zanjani 2006:8).

Blackburn and Hampton Beatie established the trading post of Mormon Station at present-day Genoa in 1850, but they soon abandoned it. In 1851, Mormon John Reese claimed Mormon Station, which led to a permanent settlement and ultimately to Mormon control of the western portion of the then-named Utah Territory. Meanwhile, a trading post had been established by Nathaniel Haskill and Washington Loomis in Gold Canyon near where Blackburn and his fellow travelers had camped a year earlier. The only person occupying the site in 1850 was James Finney, known as "Old Virginny," after whom Virginia City would come to be named.

By 1851, more than 200 miners had joined Finney in Gold Canyon. Notable among these early residents were Andrew Hall, who purchased the trading post from Haskill and Loomis, and Hosea and Ethan Allen Grosh, who in 1853 discovered silver in the area. By 1858, the area was called Chinatown because of the number of Chinese miners working the placer deposits in the canyon. But in 1861 the town was renamed Dayton after the surveyor John Day (Rocha 1997).

When the U. S. government established Utah Territory out of the northern half of the Mormon state of Deseret in 1850, the boundary extended to the crest of the Sierra Nevada range. West of that line was California, where emigrants were bound for agricultural and mining pursuits. Prospecting, a largely opportunistic and mobile occupation, continued along the way. None of the early prospectors or traders thought of settling for any length of time, nor were they interested in anything but gold—despite various members of Mexican pack companies who recognized "mucho plata" in the Gold Canyon area.

"Old Frank" Antonio, who might have been Brazilian, confirmed the presence of silver in 1852, as did Count Leonetto Cipriani, a member of an aristocratic Italian family, the following year. In 1853, Cipriani was driving a large herd of cattle and oxen overland to California. While resting his mules by the Carson River, he collected a sample from a vein that appeared to be silver. He took his specimen to San Francisco for assaying, returning a value of $20,000 of silver per ton. But no one cared about Old Frank's or Cipriani's silver finds; the only stars in the eyes of miners were made of gold (Zanjani 2006:36-46).

In Gold Canyon in 1853, the 100 or so miners were living in brush shelters and tents in the summer and in stone huts in the winter, and they were practicing primitive mining techniques—at least as compared to those in California. Although prospecting was relatively profitable in Gold Canyon, a bothersome black material was complicating the miners' efforts. Two brothers, Ethan Allen and Hosea Grosh, had encountered Old Frank while prospecting in California, and slowly made their way to Gold Canyon, arriving there in mid-October 1853. They searched for the presumed silver, finding what they believed was the black silver ore, but they were too cash-strapped to have the ore tested. Following their untimely and tragic deaths in 1857, it would be argued that the Grosh Brothers had been the first to find the Silver City branch of the Comstock Lode. After the death of the brothers, James Finney stepped in and claimed the ore in 1858. However, the lode and its remarkable potential would not be recognized for another two years, and so others were credited with the discovery. The Groshes were later acknowledged as the first to purposefully and intelligently mine for silver in the area (Smith 1998:4; Zanjani 2006:46-48, 91).

To the gold prospectors in 1857, Gold Canyon appeared to be a failure, largely because of a lack of water. A mere 25 miners remained that year, after a peak of nearly 200 in 1855. In early 1859, four prospectors, including Old Virginny, moved upslope on Sun Mountain (later renamed Mount Davidson) and found promising material in a decomposing outcrop at the head of Gold Canyon. The men set up camp, calling the place Gold Hill. As word of the ledge spread, others posted their claims in the area. To test the potential of the area, the men began open-pit mining, a logical extension of placer mining, which revealed eight feet of consistent yield that would soon be identified as the Comstock Lode. This was enough to justify an investment of labor to build a flume from a stream on the other side of Sun Mountain. As the value of the returns grew to unprecedented heights over the spring, more water sources were developed, and by April 1859, gold fever had set in (James 1998a:7).

Patrick McLaughlin and Peter O'Riley, who had been working in Six-Mile Canyon, moved to a higher site and in June 1859 found an unusual crumbly black rock. Henry T. "Pancake" Comstock, a Gold Hill miner, happened on McLaughlin and O'Riley's workings and immediately recognized the significance of the discovery and the potential for it to be linked with the Gold Hill ledge. Comstock forced himself and his friend Manny Penrod in on the deal, and ultimately what turned out to be a huge ore body was given the name the Comstock Lode. As more miners arrived, the small community that developed was called Mt. Pleasant (James 1998a:9-10).

As it turned out, gold was not the only fever-producing mineral in the area. Confirming the observations of Old Frank, Cipriani, and the Grosh Brothers a few years earlier in Gold Hill, an assay of a sample of Mt. Pleasant ore returned a value of $876 per ton in gold and $3,000 per ton in silver in June 1959. Though the claim owners sought to keep the news secret, it spread like wildfire with the result of a rush from the California goldfields to Washoe silver. The original strike was called the Ophir Mine, and Mt. Pleasant became the town of Ophir (James 1998a:10-11).

Experienced quartz miners from Grass Valley and Nevada City in the California Mother Lode were among the first to make claims on the Comstock Lode both north and south of the Ophir and bought up the small claims in Gold Hill. George Hearst took an option on McLaughlin's one-sixth for $3,000. This small investment was the beginning of the Hearst fortune. In addition to the Californian and Mexican miners using ancient methods, an early wave of San Francisco capitalists were replacing the initial cadre of entrepreneurial placer miners who had so assiduously worked the surface deposits in Six-Mile and Gold canyons. As the nature and extent of the lode was becoming obvious, the mining of its gold and silver would shift away from individual prospectors and focus on underground hard rock mining performed by miners working for large mining companies (Smith 1998:8-18).

3.2 COMSTOCK BONANZA (1859-1879)

By late 1859, there were rudimentary settlements at Virginia City, Gold Hill, and Silver City, which ultimately came to represent the three major zones (North End, Middle, and South End) of the Comstock Lode identified by Jay A. Carpenter, the director of the Nevada Bureau of Mines between 1939 and 1951. The first Comstock discovery in 1859, which set in motion the cycle of bonanza and borrasca that would come to characterize Nevada's mining history, was made on a group of narrow claims in Gold Hill. Among them were the Bacon, Empire North, Eclipse, Trench, Empire South, Bacon, Bowers, and the Sharon, that became known as the Little Gold Hill Mines and were later combined as the Imperial Consolidated. The ore on these claims was free-milling gold ore in contrast to the refractory ore of the second Comstock discovery on the Ophir claim.

Initially these claims were worked for placer deposits; but as the unweathered lode deposit was encountered, Finney, Comstock, and the other original locators of the Comstock Lode realized their knowledge of lode mining was lacking, as was their access to the large sums of money that lode mining required. Except for a few of the holders of the Gold Hill and the Ophir claims, the first locators were eager to sell to the Californians who had come in response to the Rush to Washoe. Peter O'Riley got the highest price, $40,000, for his share of the Ophir. As promising as the initial discovery was, most of the fair-weather miners left the area before the winter of 1859 set in (De Quille 1985 [1876]:7-8).

As soon as the wagon roads became passable in the spring of 1860, the rush to the Comstock began in earnest. The route followed the emigrant trail along the Carson River to Chinatown, the oldest mining camp in the area, soon to be renamed Dayton, where the trail north diverged heading through Johntown to Silver City. Silver City had been founded a few months before at the mouth of a pass called Devil's Gate on the present-day Lyon-Storey County line. Beyond Silver City, the travelers advanced to Gold Hill and passed through the Divide to Virginia City, nearly a mile high at the base of Mt. Davidson (Sun Mountain). The trip from the valley to Virginia City was more than 12 miles in length, rising 2,500 feet in elevation (James 1998a: 21-23). Among the throng was J. Ross Browne who described the scene:

> Every foot of the canyon was claimed, and hangs of miners were at work all along the road, digging, and delving into the earth like so many . . . gophers. Many of the unfortunate creatures lived in holes dug into the side of the hill, and here and there a blanket thrown over a few stakes served as domicile to shield them from the weather. (qtd. in De Quille 1985 [1876]:9)

The birth of the Comstock Lode was fortuitously captured by the 1860 U. S. census. At the time of the enumeration, the area was in Carson County in the far western section of Utah Territory and constituted several enumeration districts generally comprising Virginia City, Gold Hill, and Silver City. Within a few months, the population on the Comstock had grown to more than 3,000 people, the majority of whom were single male miners. Others serving the mines and miners were speculators, assayers, mill operators, and engineers. Carpenters, masons, millwrights, stonecutters, tinsmiths, laborers, cabinetmakers, painters, and paperhangers built mine infrastructure and commercial and residential buildings. The road that linked the three communities became an extended commercial zone with merchants and clerks, shoemakers, blacksmiths, butchers, bakers, wheelwrights, laundrymen and -women, doctors, lawyers, and saloonkeepers. Other tradespeople included jewelers, gardeners, farmers, cigar makers, confectioners, and boardinghouse keepers (James 1998a:25). The Comstock was off to a good start, presaging the international acclaim it would soon achieve.

Among the early populations migrating to the region were experienced miners from around the world. While these miners possessed the knowledge to locate and extract ore, they generally lacked the funds or experience necessary to construct and operate industrial-scale mills. As a result, custom mills constructed for processing ore from multiple mining operations were operated by people with the skill and knowledge to process the complex refractory ore. The first industrial scale mill on the Comstock, the Washoe Gold and Silver Mining Company No. 1, was constructed in August of 1860 only after contracts were secured from multiple claim owners in the region to process 9,000 tons of ore at a cost 25 to 30 dollars a ton (Carpenter 1941).

A violent conflict between settlers and Paiute Indians in May caused somewhat of an exodus from the region, and over the summer of 1860, the only work on the Comstock was being done at the Ophir and the little Gold Hill mines. When miners reached the 160-foot level of the Ophir later in the year, they made a discovery that has been characterized as a bonanza—perhaps the first of the Comstock bonanzas. Nearby, the miners of the Gould & Curry found a small surface vein that would later prove to be the top of a large bonanza. Meanwhile, the little Gold Hill mines were producing rich ore from a 10-to-12-foot-wide vein running along the top of a small hill (Smith 1998:21-23; 42).

The year 1861 was one of mixed fortunes on the Comstock. Politically, the area was somewhat stabilized by the acceptance of Nevada as an independent territory. The mining camp in Aurora, in Esmeralda County, was offering competition, while the regional mines continued to produce to the extent that a craze for mill-building developed. The mills were widely distributed from Six Mile Canyon, through Gold Canyon, to Dayton and the Carson River, and seven more in Washoe Valley. By year's end of 1861, over 76 mills had been constructed in the region with the collective capability of processing 1,200 tons daily, far exceeding the production of regional mines (James 1998a). The year ended on a bad note, however, with heavy snow fall followed by rains that washed away buildings of all types and flooded the mines. By the spring of 1862, confidence returned, and hope and enthusiasm carried the Comstock to even greater heights in 1863 (Smith 1998:25-27). The production of regional mines has increased from $257,000 in 1859 to $6 million in 1862 (Smith 1998). The wealth of the Comstock had achieved international acclaim and created a rush in 1863. The population of the region peaked to 15,000, and the mines and towns of the region became formalized.

By 1863, as the surface bonanzas were tracked to ever deeper levels, individual claim owners found it impossible to support the operating costs and sold out to mining companies, who financed their operations through the sale of stock in the San Francisco market, and whose shares were based on the number of linear feet a mine owned. In 1863 the total stock value of Comstock mines exceeded $40 million, driven by speculation. The surface and near-surface bonanzas encountered across the Comstock were being mined at a rapid pace with revenue reaching $16 million in 1864. By 1865, a panic set over the region as the surface and near- surface bonanza ores played out across regional mines at a depth of 500 feet and the new ores encountered were of a comparatively low grade. This panic, although not evident in regional production numbers, is, however, evident in the value of regional stocks. In 1863 the total stock value of regional mines was around $40 million; this number dropped to $4 million in late 1865 (McDonald 1982). However, regional production numbers for 1865 remained at $16 million.

The stock market panic of 1865 changed the future of the Comstock. As a result of the perception that mining on the Comstock had come to its natural end as the bonanza ores played out, regional mining and milling operations lost investor support, forcing mines to rely on the banking system to finance their operations. As the grade of ore from mines declined in 1865, mines revenues dropped. The milling industry that had been over-developed since 1862, as a result of harsh competition and lowering ore grades, experienced a crash in the price that mines were willing to pay for processing ore. When mines and mills were unable to turn a profit and defaulted on their loans, the banks holding the loans assumed ownership. The Bank of California, through their Virginia City branch managed by William Sharron, reaped the benefits from the panic of 1865.

By 1867, the Bank of California, whose owners were known as the "Bank Crowd," owned seven mills and controlled two of the most profitable mines on the Comstock, the Yellow Jacket, and the Chollar-Potosi. The holdings of the Bank Crowd were organized under the Union Mill and Mining Company. By 1869, the company had seventeen mills, and it continued to take over struggling competitors.

To lower the costs of operations, the Bank Crowd built the Virginia & Truckee Railroad and acquired 50,000 acres of timber in the Tahoe Basin, which they cut and processed through their enterprise, the Carson and Tahoe Lumber and Fluming Company. They also established the Virginia and Gold Hill Water Company (Edwards 2010). By the late 1860's the Bank of California had secured a monopoly over both mining and milling operations on the Comstock.

The monopoly exercised by the Bank Crowd started to erode in spring of 1869, with the Crown Point/Yellow Jacket Mine disaster. The first open challenge to the monopoly of the Bank Crowd came from John P. Jones and Alvinza Hayward, who wrested control of the Crown Point Mine from the Bank Crowd through stock manipulation. Jones and Hayward's interest in the Crown Point mine sourced from the discovery in 1870 of a deep bonanza in the Crown Point Mine. This discovery marked a renewed interest in mining on the Comstock.

Despite the aggressiveness of the Bank Crowd to sustain a monopoly over mining and milling on the Comstock, by the early 1870s, the Bank of California was severely over-extended. The bank closed on August 26, 1875; and the following day, founder William Ralston died of apparent suicide. William Sharon re-opened the Bank of California in October, but he was not able to recover his dominance of the Comstock (Edwards 2010).

During the late 1860s, a group of four men, known as either the Big Four or the Irish Four, was challenging the Bank Crowd. Two men, John Mackay and James Fair, with the financial backing of James Flood and William O'Brien, seized control of the Hale and Norcross Mine in Virginia City in 1869. They continued to acquire other claims; and in 1873, as they were exploring the Consolidated Virginia and California Mine, Mackay and Fair discovered a remarkably rich ore body that became known as the Big Bonanza. Mackay, who owned two-fifths of the company, quickly became one of the richest men in the world. He and his partners established the Bank of Nevada in competition with the Bank of California, and the Bonanza Group controlled the Comstock Lode throughout the remainder of the nineteenth century (James 1998a). From 1870 to 1880, the peak years of the "Big Bonanza," $212 million dollars' worth of gold and silver were produced from Comstock mines during a period when gold was valued at $20.67 ounce, while silver averaged $1.23 an ounce.

3.2.1 Townsite Development

Several small communities, more camps than towns, existed prior to the discovery of the Comstock Lode. These early settlements included Johntown, Chinatown, Mt. Pleasant, and Ophir. The first of the Comstock discoveries, made at the south end of the lode, prompted the establishment of the town of Gold Hill. Virginia City followed with the expansion of the mines at the north end of the lode. Silver City grew up along a southern branch of the lode, and beyond that to the south, Chinatown was subsumed under the name Dayton. In American Flat, the well-capitalized American Flat Development Company laid out the town of American City with high expectations.

Accompanying the advent of a new mining industry on the Comstock Lode was a new pattern of townsite development. In contrast to the historic pattern for the development of most regional centers near the resources available to sustain a large population, mining towns across the Comstock were developed at the locations of the ore deposits, in places not ideally suited to sustain large populations.

Three federal land acts and the General Mining Law of 1872 are relevant to the history of regional townsite development as they served as the primary means of conveying public lands to private ownership. The acts relevant to the development of the region are the Townsite Pre-emption Acts of 1844 and 1867, the Homestead Act of 1862, and the Small Tracts Act of 1938.

The Townsite Pre-emption Act of 1844 permitted the development of up to 320-acre townsites prior to obtaining the land from the federal government. The townsites and individual lots could later be patented for a nominal fee once certain improvements to the property were made. The Act was originally intended to accommodate the development of agricultural land, but because of the mining booms in the West, the Act was revised in 1867 to exclude the ownership of mineral rights (Rowley n.d). By the 1860s, plat maps had been drawn for Virginia City and Gold Hill, American City and Silver City, subdividing the area into lots and blocks. As the lots were developed, the responsibility for acquiring a patent to the property fell to the occupant. In most cases, this was never done, resulting in a patchwork of patented and un-patented town lots, many of which are still occupied by residences. This pattern of development is not seen in Silver City since by 1873 the entire 332-acre townsite was patented.

The Homestead Act of 1862 was passed to promote development in the western United States. The act allowed for a claim to be established for up to 160 acres of public lands for residential or agricultural purposes. The act required the claimant to reside at the property for five years before it could be could be patented for nominal fee. The Homestead Act resulted in the development of approximately 10 percent of all lands in the continental United States.

The General Mining Law of 1872 allowed for the federal government to pass ownership of mineral claims to individual claimants through the mechanism of a patent. In order to obtain a patent, claimants were required to meet certain conditions, including the possession of a clear title to a mining claim and the demonstration $500 worth of improvements to the property. Generally, the issuance of a mineral patent included ownership of the surface rights as well as the underground mineral rights. In the cases of the platted townsites of Virginia City and Gold Hill, claimants of mineral patents gained the mineral rights, but not the surface rights, which were tied to the townsite lots. In some instances, a separate patent for surface rights over a patented mineral claim was issued under the Townsite Pre-emption Act of 1844.

The Small Tracts Act of 1938 allowed for the lease, lease/purchase, or purchase of up to five acres of vacant public land. The Act was not intended to encourage any particular activity such as agriculture, nor did it require the construction of improvements on the land in order to receive a patent. The goal of the Act was to sell public land that was generally suitable for the uses identified in the Act, which essentially meant lands open as small tracts were not good for much else. Allowable uses of Small Tracts included seasonal or year-round residences, recreation sites (e.g., a cabin), business sites (e.g., store, service station, warehouse, industry), and community sites that included a park or school or a non-profit facility (U. S. Department of the Interior 1958). Within the region, much of the town of Mound House was built on lands removed from the public domain by the Small Tract Act of 1938.

3.2.2 Virginia City

The town of Virginia City lies in Storey County, Nevada, about 1,500 ft. below the summit of Mount Davidson. Before the creation of the town, since 1850, miners had been prospecting below Mount Davidson for placer deposits. Finally, in 1859, Peter O'Riley and Patrick McLaughlin discovered a rich ore body on the eastern slopes of Mount Davidson. The area of the discovery was purportedly located on an area claimed by Henry T.P. Comstock, who cut himself in on the deal. The small mining camp that followed area was first called Mount Pleasant, then the Town of Ophir and finally renamed in September of 1859 to Virginia, paying tribute to James "Old Virginny" Finney one of the early miners of the area (James 1998a: 9-11). In addition to gold in it also soon was discovered that a quartz vein in the Ophir Mine was 75 percent silver. By April 1860, 10,000 speculative miners, wishing to make their fortunes poured into the region. Virginia City began as a tent-and-dugout town, clinging to the slopes below Mount Davidson (James 1998a: 9-11).Unfortunately, the silver in the Comstock Lode was not nearly as easy to mine as the placer gold deposits that most of the miners had been mining in California. The Comstock silver occurred in quartz veins, and expensive machinery was required to extract it. By August 1860, many disappointed would-be miners had returned to California

In 1861, the Comstock Mines began yielding bullion in large quantities. Capital began pouring into Virginia City, and the town became an industrial suburb of San Francisco. The large amounts of wealth being extracted from regional mines supported the development of a cosmopolitan atmosphere in Virginia City, earning it the title "Queen of the Comstock." (Ansari 1986:24).

Virginia City became the prototype for large-scale, industrialized mining in the western United States. This began in 1864, when William C. Ralston, president and founder of the San Francisco Bank of California, along with D. O. Mills and William Sharon, collectively known as the "Bank Crowd", made large loans to the Comstock mines and mills. During the crash of 1865 as struggling mines and mills could not pay on their loans, the bank took possession of the operations. The Bank of California organized their newly acquired mining properties to create the Union Milling and Mining Company in 1867. In 1869, the "Bank Crowd" constructed the Virginia and Truckee Railroad to carry the ore from the mines to the mills. By 1872, they had extended the line to Reno, where it connected with the Central Pacific-Union Pacific Transcontinental Railroad (James 1998a).

The single greatest bonanza in mining history occurred in Virginia City from 1872-1880, in which James Fair, James Flood, John Mackay, and William O'Brien struck a lode of silver and gold 54 feet wide, ultimately yielding them a total of $105,168,859. The great fire of October 26, 1875 destroyed most of Virginia City, but the community was quickly rebuilt. By 1876, production reached an annual high of $38,000,000 in 1876. Sutro completed his tunnel in 1878, the year in which the decline of the Comstock Boom began. By 1881, production had dropped dramatically to $1,400,000 (Smith 1998). The population of Virginia City fell correspondingly, from 20,000 in 1875, to 9,000 in 1889. During the 1880s, the community dispersed as capital and miners went elsewhere (i.e., to eastern Nevada, Montana, Idaho, Colorado, and Arizona), taking elements of the Comstock mining model with them.

Many of the prominent figures during the early days at Virginia City became major figures in history and politics, both in Nevada, and the rest of the United States. George Hearst founded the famous *San Francisco Examiner*. Samuel Clemens, who came to the Comstock in 1862 to write for the newspaper the *Territorial Enterprise*, left 22 months later as Mark Twain. Four of the first five U.S. Senators from Nevada had their roots in Virginia City. Among these was William Stewart, who authored the Federal Mining Laws of 1866. James Mackay became one of the best-known figures in American mining, and helped found the Mackay School of Mines at the University of Nevada, Reno.

During the 1880s and early 1890s, Virginia City began a slow decline. During 1893, the *Territorial Enterprise* ceased publication. In 1897, The Saint Mary Louise Hospital of the Sisters of Charity closed its doors. The 1890s witnessed significant technological changes in mining, including the introduction of the cyanide process, and the use of electricity. By 1900, the Comstock Lode had entered into alternating periods of steady decline, and limited revival/success. December 1914 marked the loss of the International Hotel from fire. By 1933, the last Chinese resident of Virginia City died.

During the Depression of the 1930s, residents of Virginia City began cannibalizing abandoned buildings. In the mid-1930s, open-pit mining of low grade ores began and portions of town were destroyed by the Loring and Kendall pits (Stoddard and Carpenter 1950). The year 1938 marked the end of rail service to Virginia City by the Virginia and Truckee Railroad. By 1941, the portion of the railroad from Virginia City to Carson City had been dismantled (Kneiss 1938, 1941; Myrick 1962; Wurm and Demoro 1983). World War II brought a temporary end to gold and silver mining, and a fire which destroyed part of Virginia City.

Creation of the modern Virginia City "myth" began during the 1930s-1940s, when writers discovered the charms of the community. They included Duncan Emrich, Walter Van Tuilberg Clark, and Bernard De Voto, who settled in the community. Among the most significant of this group were Lucius Beebe and Charles Clegg, who revived the *Territorial Enterprise* in 1952, and championed railroads in general, and the Virginia and Truckee in particular (Beebe 1947; Beebe and Clegg 1949, 1957). These individuals helped craft the Virginia City "myth," which received further support from the highly popular *Bonanza* television series of 1959-1973. With creation of the Comstock Historic District in 1966, many elements of the "myth" became reified. Today, Virginia City is primarily supported by destination tourism, in part a product of its sometimes highly self-conscious "myth."

3.2.3 Gold Hill

The site of Gold Hill was first discovered in early 1859 by James Finney, Jack Yount, John Bishop, and Alec Anderson, when they investigated a small hill in Gold Canyon that Finney had noticed earlier while on a hunting trip. The spot ultimately proved to be the south end of the Comstock Lode. The name Gold Hill was first used in the *Territorial Enterprise* in May 1859, although the place was also called "Slippery Gulch." As word of the new diggings spread, occupants of Johntown moved up to Gold Hill. Dutch Nick Ambrosia is reported to have built the first structure in Gold Hill, a small frame saloon. Eilley Orrum Hunter Cowan, who would gain fame as the wife of Sandy Bowers, operated a log boarding house and restaurant in Gold Hill (Ansari 1986:24). These establishments existed among canvas tents and dwellings made of blankets, potato sacks, and old shirts. Empty whiskey barrels served as chimneys. Gold Hill quickly developed into an important mining and milling center, and for a few years in the early 1860s it rivaled Virginia City, its neighbor to the north, which ultimately gained the title "the Queen of the Comstock" (Ansari 1986:24; Kautz 1989:25-30).

It becomes clear that while Virginia City garnered the bulk of the population and a national reputation for its varied and colorful lifestyle, Gold Hill was the site of the major innovations the Comstock introduced. The author Dennis Drabelle (2009:xiii) noted that "the Comstock was a laboratory for much that is great (and much, too, that is problematic) about America." Virginia City got the glory, but the laboratory, it seems, was Gold Hill.

Gold Hill's growth slowed during the late 1860s, but experienced a revival with the completion of the Virginia and Truckee Railroad in 1869 and the 1871 bonanza that followed the discovery at the Crown Point-Belcher Mine. Gold Hill's population in 1877 stood at around 8,000 (by then, Virginia City's population had peaked at 25,000); and the town had public and private schools, a newspaper that carried on a running editorial battle with Virginia City's *Territorial Enterprise*, three fire companies, a town hall, banks, halls for social and fraternal organizations, a Miners Union hall, and several churches (Figure 3.1 and Figure 3.2). In addition, the town boasted street lamps, fire hydrants, and a water system (Paher 1971:30-31).

As the Comstock began to decline at the end of the decade, so did Gold Hill (Ansari 1986:24). The mining depression lasted through 1900, when new major gold discoveries in southern Nevada around Tonopah and Goldfield re-energized the industry. The Comstock never regained its earlier status, but in the 1930s and early 1940s, a new technology that allowed for the reclamation of mine tailings and processing of low grade ore spurred renewed mining activity in the area including Gold Hill, but the town saw little growth. President Franklin Roosevelt's 1942 Order L-208, which brought an end to gold mining during World War II, forced the closure of the Gold Hill post office in 1943 after 81 years of continuous service (Paher 1970:30-31).

The Gold Hill cemetery represents one of the earliest burial grounds on the Comstock. The first burial in the Gold Hill Cemetery was in 1859 (Ansari 1986:24). While some maps show the cemetery as the Masonic Cemetery, in fact there were sections for multiple groups including Catholics, the Masons, the Odd Fellows, and one representing the county. Nearby is the New Catholic Cemetery, although the necessity for this new cemetery is not clearly understood (Wheeler 2008:2).

3.2.4 The Divide

Between Gold Hill and Virginia City, at the site of a large bend in the road, is an area commonly referred to as The Divide. Initially, simply denoting its location between the two important mining towns, mining activity at The Divide increased during the 1870s. As a result, The Divide, also known as Middletown, became a populated suburb of both Virginia City and Gold Hill. At its peak, The Divide was home to more than 1,000 people living in houses densely scattered across the hillside (Paher 1970:29).

3.2.5 American Flat

American Flat is located south of Gold Hill and was opened up to gold and silver mining in 1859 with the discoveries of the Baltimore, Maryland, and American mines. The first community in American Flat was Johntown, formed by a group of Chinese who had been hired by the Mormons to dig irrigation ditches in the area, and later by William Sharon to build the Virginia & Truckee

Figure 3.1 Gold Hill, Nevada. View from The Reservoir (c. 1871-1876). *Hearst Collection of Mining Views by Carleton E. Watkins*. The Bancroft Library, University of California, Berkeley

Figure 3.2 Gold Hill, Nevada. View from The Reservoir 2012.

Railroad. Johntown was an important settlement during the placer-mining period, but with the discovery of the Comstock Lode, most of the occupants moved to Gold Hill. In January 1864, as the mines in the American Flat flourished, the American Flat Development Company laid out a town on the site of an existing community in the west of American Flat, and they appropriately named it American City. Almost immediately, the founders of American City made a play for the Territorial Capital by offering a donation of $50,000 if the territory would relocate the capital from Carson City. The residents of Carson City lodged a protest and the proposal was defeated (Gavazzi 1998:94; 97).

The Charlie Collins business directory of 1865-65 lists the following enterprises in American City: one brewery, four blacksmith and wagon makers, two brokers and mining secretaries, five carpenters, one civil engineer, three grocers, seven hotels, three lumber companies, one millwright, one notary public, one recorder, and five saloons. In addition, Reed and Wade's quartz mills and the Rigby Company quartz mill, which catered to the local mines, were located in American City. The main toll road that connected Virginia City and Carson City passed through town, as well. The stretch of road between American Flat and Half-Way House (in present-day Mound House) was built by Waters, Blanchet, and Carson in 1861. There were also residential buildings in the town, and a post office that operated between March 1866 and January 1868, after which time the town declined. Since it was viable during the intercensal period, American City was never a separate enumeration district for the U. S Census. Instead, the occupants were counted among the Gold Hill population (Carlson 1976:37; Gavazzi 1998:97-98).

The Comstock communities demanded vast supplies of agriculture products, including meat, vegetables, and dairy products. Most of the agricultural goods came from surrounding areas, such as Carson City, Washoe Valley, and the Truckee Meadows. But because of its relatively flat terrain and abundant water, several agricultural properties developed in American Flat, among them Roux's Ranch, Jones Ranch (a dairy farm), and Frenchman's Gardens (Gavazzi 1998:98). By the late 1860s, American Flat and American City were surpassed by Silver City, Gold Hill, and Virginia City. A short recovery came in 1897, with the expansion of the Sutro Tunnel, but not until 1919 did American Flat experience a revival (Gavazzi 1998:98-99; Kendall 1998:102).

In 1919, two well-known mining engineers, Alex Wise and Roy Hardy, with the backing of rancher Herbert Humphrey, began a program of testing the near-surface bonanza area at upper Gold Hill. Within a year, the men had acquired a number of leases. By the spring of 1920, the Metals Exploration Company, headed by Harry Payne Whitney of New York and Boston, acquired the Wise-Hardy leases and formed the United Comstock Mines Company. On June 20, 1920, the new company launched one of the most ambitious and costly ventures to recover minerals from low-grade ores using the Cyanide Process that had first been implemented in Nevada around the turn of the twentieth century (Kendall 1998:102-105).

The company built an extensive milling plant on the site known in the previous century as Frenchman's Gardens. The operation comprised eight buildings performing the necessary functions of the operation. A detailed recordation of the remains of the mill can be found in Zeier et al. (2009). Pertinent to the present discussion is the development of a small town, called Comstock City, built near the mill to house the employees. The community consisted of cottages, bunk houses, a boarding house, a school, a store, and an amusement hall (Kendall 1998:105). A post office operated between January 1923 and February 1927. The closure of the post office coincided with the closure of the mill in December 1926. All that remains at Comstock City are the concrete mill buildings, stripped of anything detachable and lavishly decorated with graffiti art (Kendall 1998:108; Zeier et al. 2009:28). Three of the cottages from the town were moved to Virginia City, while the rest were destroyed during the mining operations in the 1970s and 1980s.

3.2.6 Silver City

The famed Grosh Brothers, who were the first to recognize silver deposits c. 1857, were among the earliest settlers in what became Silver City. The primary camp during the Groshes's time was Johntown about a mile and a half below Silver City, which developed in late 1859. The name Silver City appeared on Henry

DeGroot's 1860 map of Washoe Mines, and the post office was established on May 10, 1860, when the area was part Utah Territory. Within the first year, Silver City boasted four hotels, ten general stores, two drugstores, two butcher shops, three blacksmith shops, and several residences. When Nevada Territory was created in November 1861, Silver City fell just south of the Lyon County line (Ansari 2001:77; Carlson 1974:216).

The Storey-Lyon county line is marked by a rock formation that constricts the road, creating the appearance of a gate. A small settlement named Devil's Gate, comprising a toll house, tunnels, mills, residences, saloons, and other business, developed at the spot in 1859. Believed to be a hangout for bandits, Devil's Gate was later subsumed into Silver City (Ansari 2001:26).

Located on a branch of the Comstock Lode, Silver City's mines failed to develop any bonanzas of its own; however, it was a principal spot on the main line of travel between the Comstock mines and the mills on the Carson River. Animals used to haul ore wagons to and from the Comstock were boarded there, and by 1861, the population of Silver City stood at about 1,200. Almarin B. Paul's Pioneer Mill, one of the first steam-powered quartz mills, was built in Silver City in 1860 (Ansari 2001:77).

When the V & T Railroad bypassed Silver City in 1869, Silver City lost its freighting business, but by the early 1870s, there were eight stamp mills in operation and the population had risen to 1,500. The summary of a single page from the 1870s census provides a glimpse at the nature of Silver City's population. Of the 40 people listed on page 18 of the Silver City Precinct enumeration, only two were born in the U.S. The balance hailed from Canada, Germany, England, Norway, Prussia, Switzerland, the Azores, Italy, France, Ireland, Scotland, Australia, and China. These people, who lived in 17 dwellings and all but seven of whom are male, held the following professions: laborers (12), mill machinist (1), teamsters (4), railroad fireman (1), carpenter (1), "keeping house" (1), gardeners (3), gamblers (2), quartz mill hands (3), amalgamator (1), bookkeeper (1), miners (2), chemist (1), and harlots (5)—and two young children. Of those described as "harlots," three were young Chinese women, while the other two were middle-aged Europeans (1 Irish, 1 Prussian). While a single page does not provide a complete picture of Silver City's population, it confirms the rich diversity described by the historian Ronald James and others (c.f., James 1998a; James and James 2009; Schinn 1910).

Like the rest of the Comstock, Silver City suffered from the depression that started in the early 1880s. The Great Depression of the 1930s brought a resurgence of demand on milling, and several of Silver City's surviving mill complexes date to that period (Ansari 2001:78).

3.2.7 Mines

The Comstock mines were identified by the length of a claim (or claims) on the vein. Three branches of the lode came to be recognized: the Virginia City (The North End Mines), The Divide and Gold Hill (The Middle Mines), and Silver City, also known as the Devil's Gate District (The South End Mines). Nearby to the east and southwest, other mines were located at the same time on the Brunswick Lode: Cedar Ravine and Cedar Hill, Seven-Mile Canyon, Flowery Mining District near Six-Mile Canyon, and the Silver Star District. However, the center of mining activity remained along the Comstock Lode. Ownership and operation of the mines fluctuated as original claims were bought and sold by various mining companies, and companies consolidated and reorganized to take advantage of new discoveries and to maximize their investments. Activities at any given Comstock mine were influenced by the nature and magnitude of the operation and outside influences, such as the dominance of the Bank Group over Comstock mining during the 1860s, as well as the resulting advancement in mining technology. The major mines of the early period are listed in Table 3.1.

Table 3.1 Mines of the Comstock

Name	Located	Location/Branch	Claims or portions of claims	Comments
Alpha	1859	Gold Hill		Alpha Company
Alta	1859	Silver City	Alta and Benton claims	Near Justice & New York
Andes	1859	Virginia City		
Baltimore	1859	American Flat	Baltimore, Maryland, American Flat claims	
Belcher	1859	Gold Hill		
Best & Belcher	1859	Virginia City		
Bullion	1859	The Divide		
Caledonia	1861	Gold Hill	Includes 7 claims	Caledonia Tunnel Company
California	1859	Virginia	Central #1, Central #2, Kinney claims	
Challenge-Confidence	1859	Gold Hill	Burke, Hamilton, Confidence, Challenge, Imperial South	Original GH claim??
Chollar-Potosi	1859	Virginia City		Santa Fe Company
Consolidated Virginia	1863	Virginia City	White and Murphy, Sides claims	
Crown Point	1859	Gold Hill		
Daney	1859	Silver City		South end of Silver City
Dayton	1859	Silver City		
Exchequer	1859	The Divide/Gold Hill		Minerva Mining Company
Globe	1859	American Flat	Rock Island claim	
Gold Hill Tunnel	1861	Gold Hill		Gold Hill Tunneling-Gold and Silver Company
Gould & Curry	1859	Virginia City		Gould and Curry Mining Company
Hale & Norcross	1859	Virginia City		Hale & Norcross Mining Company

Name	Located	Location/Branch	Claims or portions of claims	Comments
Imperial	1859	Gold Hill	Imperial North, Bacon, Empire North, Piute, Consolidated, Rice & Co., Empire South, Imperial South	Empire Mine and Milling Company
Julia	1860	Virginia City	Julia Lode, Julia Lateral Lode, Julia Sarah Ann	Julia Company
Justice	1859	Gold Hill/Silver City Branch		Justice Company
Kentuck	1859	Gold Hill		Kentuk Company
Knickerbocker	1859	Gold Hill		
Kossuth	1859	Silver City		
Mexican	1859	Virginia City	Consolidated with the Ohpir	
Mint	1864	Virginia City		
Ophir	1859	Virginia City	South Ophir, Mexican, North Ophir, Burning Moscow claims	Original VC discovery; Ophir Company
Overman	1859	Gold Hill		Overman Company
Potosi	1860	Virginia City		Potosi Company
Savage	1859	Virginia City		Savage Company
Scorpion	1859	Virginia City		Scorpion Company
Segregated Belcher	1859	Gold Hill		Segregated Belcher Company
Sierra Nevada	1859	Virginia City		
Silver Hill	1859	Gold Hill/Silver City Branch	Waller's, Defeat, Lucerne, St. Louis, Echo	Near Hartford and Justice
Succor	1859	Silver City		East of Justice Lode; Succor Company
Uncle Sam & Trojan	1859	??	Trojan was the consolidation of several claims	Baltic Company/Uncle Sam Company
Union	1859	Virginia City		
Utah	1859	Virginia City		

Name	Located	Location/Branch	Claims or portions of claims	Comments
Ward	1860	The Divide		Ward Company
West Belcher	1859	Gold Hill		Not worked until after 1875
West Consolidated Virginia	1859	Virginia City	Cole, Santa Rita claims	Worked in the 1870s
Yellow Jacket	1859	Gold Hill		Yellow Jacket Company

3.2.8 Technology

Because of the unique conditions, Comstock miners and mining engineers developed a number of innovative technologies to maximize the efficiency and profitability of the mines. Some improved safety in the mines while others enhanced the processing of ore.

One of the initial systems of ore processing on the Comstock was the arrastra, which ground up the ore on a circular bed of flat stones similar to the way stone-ground flour is made. The arrastra was operated by draft animals–typically mules, donkeys, and horses–which were attached to a central pivot. Water, salt, and copper sulfates heated by the sun turned the ground stone into a paste, and then the introduction of mercury combined with the silver and gold in an amalgam. Known as the "patio process," the system was first used in Mexico in 1540 (Figure 3.3).

The first documented use of the Mexican Patio Process on the Comstock was in 1858 by the Pioneer Quartz Company (Carpenter 1941). A small arrastra was constructed in a canyon east of Devils Gate to mill ore produced from a quartz ledge. After three weeks of work, approximately 1,000 pounds of ore were successfully milled. The crushed ore was processed into an amalgam that yielded three and one-half ounces of bullion. After realizing such low returns, the project was abandoned (James 1998a). These small-scale milling and processing ventures were short- lived, being replaced by stamp mills and the development of the Washoe Pan Process.

At more than 6,000 feet in elevation, the Comstock's winters were long and cold, and overall not enough heat was generated to make the patio process practicable. Almarin B. Paul, a mill owner from Nevada City, California, established the Washoe Gold and Silver Mining Company No. 1 mill in Gold Hill in March 1860, where he introduced to the Comstock the 24-stamp mill, developed in Cornwall by tin miners and used during the California Gold Rush. Paul's mill showed early success, working the predominantly gold ore from Gold Hill. Other stamp mills provided competition; and in 1861, Paul built an additional 60-stamp mill in Gold Hill (Figure 3.4).

The amalgamation process that accompanied the stamp milling proved ineffective on the silver ore coming out of the surrounding mines. The solution was the development of the Washoe Pan Process, which, among other techniques, used steam to heat the amalgam to the temperature necessary to extract the silver (Figure 3.5). The Washoe Pan Process could extract up to 75 percent of the precious metal content of ore (Smith 1998). Despite the innovation of the Washoe Pan Process, significant amounts of gold and silver were tossed out in the waste rock piles. Nevertheless, the number of mills processing Comstock ores increased, creating an environment full of clatter and steam (James 1998a:46; 2010).

As mining on the Comstock shifted from open-pit to deeper underground hard-rock mining, it became clear that traditional methods of supporting shafts were not effective within the decomposing quartz of the Comstock Lode. A method of preventing the resulting collapses and cave-ins was developed by German mining engineer Philipp Diedesheimer at the request of W. F. Babcock, a trustee of the Ophir Mine. By late 1860, Diedesheimer developed a modular square-set-timber approach. Modular cubes made of timbers, ranging from six to seven feet tall and four to six feet wide, could be assembled in the underground mine, allowing the miners to move easily and more safely (Figure 3.6). In addition, the system could be filled with waste rock, which added strength and saved the effort of hauling the debris to the surface (James 1998a).

Flooding was another significant problem that developed as the Comstock mines grew deeper. The Ophir Mine bought a 15-horsepower steam engine to pump water from its shaft in 1860. At the same time, the Ophir, the Mexican, the California, and the Central mines pooled their resources for the Union Tunnel, which was intended to drain all of their mines at the 200-foot level. However, the depth of the mines exceeded that level and flooding continued to be a problem for the miners and mine owners. Giant Cornish pumps, with their steam engines, counterweights and enormous flywheels, were installed (James 1998a:58).

While the pumps were steaming away, the entrepreneur Adolph Sutro proposed the ultimate drainage tunnel. Receiving a legislative charter in 1865, Sutro established

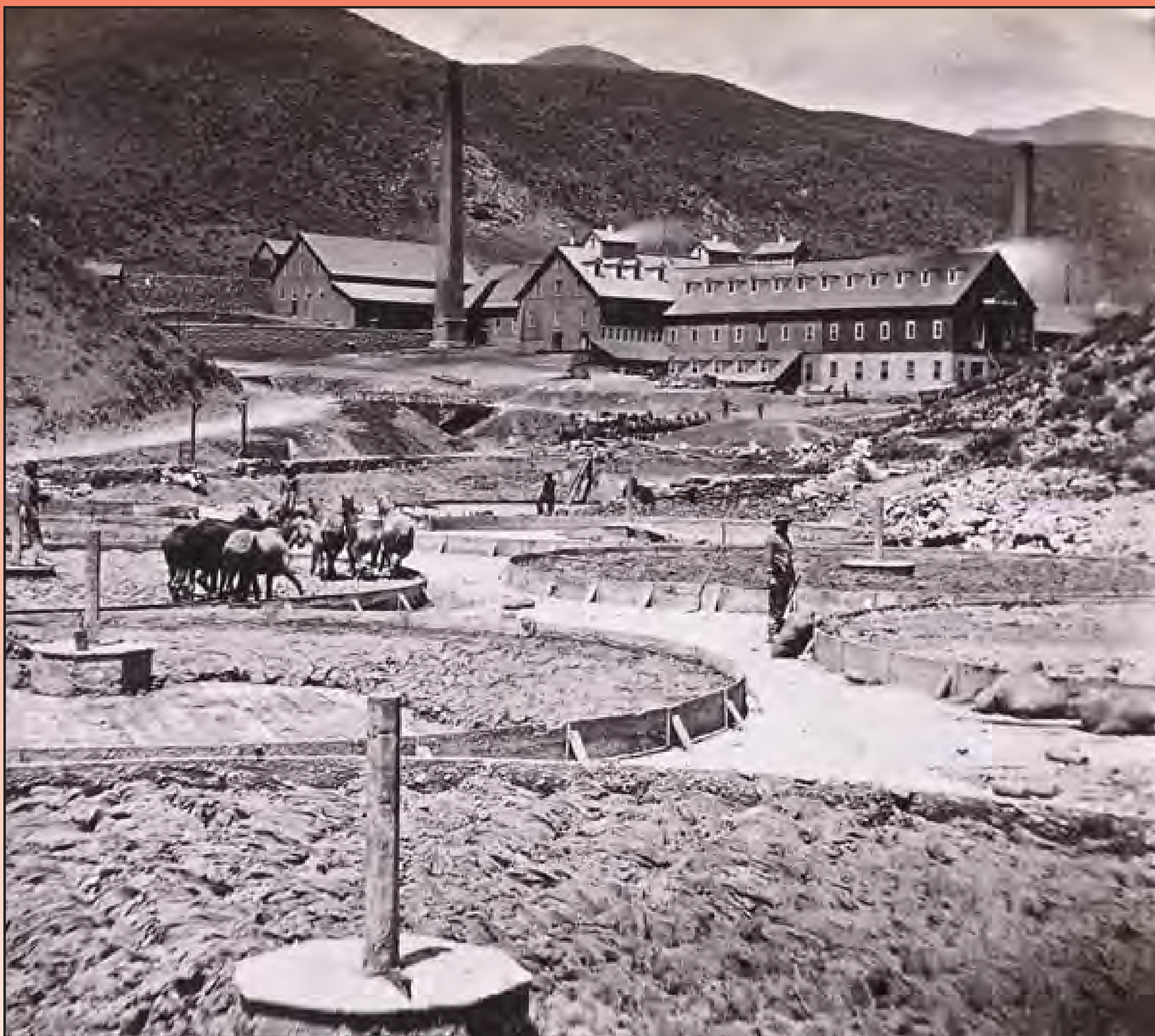

Figure 3.3 **The Patio Process, Gould & Curry Mill. Lawrence & Houseworth 1866, available from the Library of Congress Prints and Photographs Division.**

Figure 3.4 A Two Stamp Mill at the Arizona Comstock, Virginia City.

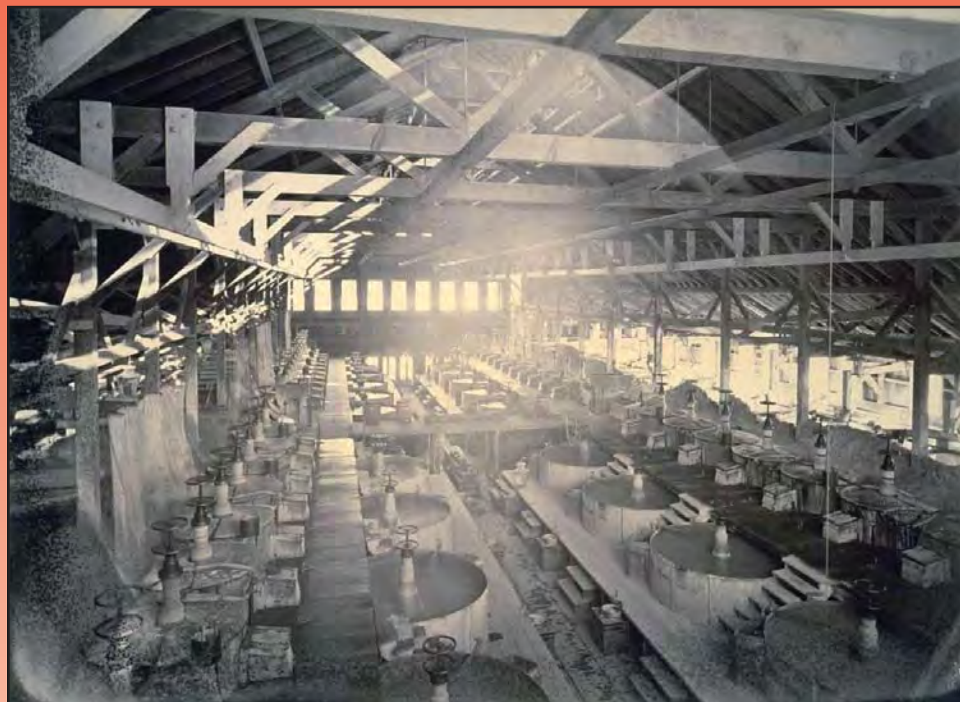

Figure 3.5 California Pan Mill (c. 1871-1876). ***Hearst Collection of Mining Views by Carleton E. Watkins.*** **The Bancroft Library, University of California, Berkeley.**

Figure 3.6 Square Set Timber in the Chollar Mine, Virginia City.

the Sutro Tunnel Company with plans for a 20,489-foot, three-mile long excavation from the Carson River Valley near Dayton, intersecting the Comstock mines at the 1,640-foot level, intended to provide drainage and ventilation. Completion of the tunnel was held up by opposition by some of the mine owners, so that when the tunnel was finished in 1878, the Comstock was entering a period of depression, and accordingly the tunnel failed to fulfill its mission (James 1998a:58).

While the mines provided plentiful water to the local water company, the water was not suitable for human use. In 1871, William Sharon, president of the Bank of California, which had held a monopoly of Comstock mines since 1864, sold the Virginia and Gold Hill Water Company to a group of investors that included John Mackay and James Fair. As discussed above, Mackay and Fair represented a group known as the Bonanza Crowd that ultimately broke the Bank of California's control of the Comstock. The closest source of good water was in the Sierra Nevada range more than 30 miles west of Virginia and Gold Hill. The elevations were daunting. In between the Sierra Nevada and the Virginia ranges was Washoe Valley, 1,200 to 1,500 feet below the Comstock and 2,000 feet below the water source. Mackay and Fair hired German engineer Herman Schussler, an expert in water systems, to design the ambitious project (James 1998a; Shamberger 1982).

The Marlette Lake Water System, as it was also known, was a remarkable series of diversion dams, wooden flumes, reservoirs, and a seven-mile-long iron pipe that crossed Washoe Valley and carried the water under the force of an inverted siphon to Five-Mile Reservoir, southwest of the Comstock. The English wrought-iron pipe, manufactured at the Risdon Iron Works in San Francisco, withstood the pressure of 1,850 feet of water. The lengths of pipe were connected with iron joints and caulked to reduce leakage. When water first poured through the line on June 11, 1873, Comstock residents celebrated with fireworks, bonfires, and the firing of the General Grant, the cannon at Fort Homestead in Gold Hill (James 1998a:110). A second inverted siphon was added in 1875; and in 1877, a tunnel was driven through the granite that separated the Hobart drainage from Marlette Lake, increasing the system's capacity (Shamberger 1972). Marlette Lake Water Supply was the first American water system designed to sustain the high pressures generated by the elevation changes in mountainous regions. Its initial inverted siphon was the largest in the world, and it withstood more than double the pressure of any contemporary pressure pipeline. The system, which still supplies water to Storey County, was designated a National Historic Civil Engineering Landmark by the American Society of Civil Engineers in 1975, and it was listed in the National Register of Historic Places in 1992 (Abbe 1992).

The deepening Comstock mines also tackled the problem of hoisting people and equipment in and out of the shafts and bringing up the ore. Early methods included hand-cranked windlasses and small steam engines to haul ore cars up a ramp. Headframes, especially the gallows type, were commonly used for this purpose. As the mines reached the 3,000-foot depth, more powerful hoisting engines were needed. High-speed iron cages hoisted with flat-braided cable proved to be an efficient solution to the problem, a solution provided by Andrew Smith Hallidie.

Andrew Smith Hallidie was an Englishman who had worked in the California placer mines and at blacksmithing. At the age of nineteen, he built a wire suspension bridge and flume over the American River; and in 1857, he started A. S. Hallidie and Company in San Francisco, which manufactured wire cable (Bailey 1996). Initially, the Comstock mines used hemp rope and round wire cable. As the mines got deeper, the hemp rope broke under its own weight, and round wire cable would kink and snap as it was rolled onto its spool. Hallidie solved the hoisting problem by developing a flat wire cable that would easily roll onto a spool. He launched his invention in a Gold Hill mine in 1864, and it quickly became the standard. Hallidie's invention was adapted for San Francisco's famous cable cars, which first ran in 1873 (James 1998a).

During its heyday, the Comstock was teeming with people of various kinds engaging in activities directly or indirectly related to mining. Despite the presence of women and children, the environment of the Comstock was overwhelmingly industrial, more like Pittsburgh than a remote Western mining town. The action from the mines and mills produced a twenty-four-hour racket from the technological innovations developed to solve the problems presented by some of the deepest and largest mines in the world (James 1998a:58).

3.2.9 Transportation

Roads

While a cross-country network of emigrant and mail and freight roads had been established early on, intra-regional travel was driven by the growth of the Comstock and the connection to mills that the mining companies constructed along the Carson River. The Ophir Grade, the earliest formal road grade in the region, was constructed in 1860 by the Ophir Company to connect the Ophir Mine to their milling operations in Washoe Valley, 12 miles to the west. The Ophir Grade was originally intended to be used for the company's proposed route of the Virginia City and Washoe Railroad; however, due to a number of factors–including poor mill returns and excessive freight costs for hauling ore 12 miles by wagon–the Ophir Mill closed in 1862 and the railroad was never built.

In 1861, the U. S. Congress authorized territorial status for Nevada. Under the territorial constitution, counties were given certain powers, one of which was the authority to award toll road franchises to entrepreneurs who undertook the development and improvement of roads. In 1861, the Ormsby County Commissioners issued a franchise to Mark McDonald and Michael Bedford for a toll road between Carson City and Halfway House. The stage station, called Halfway House, also known as Summit Station, had been established the year before by James Fair, and was thus named because it was located halfway between Carson City and Virginia City and sat on the Lyon-Ormsby County line (Drews 2009:16).

Beyond Halfway House, the road split into two routes. The American Flat Toll Road headed north along Basalt Flat and American Flat, then turned east to Gold Hill, and on to Virginia City. The Devil's Gate Toll Road followed more closely the emigrant trail until it headed northeast to Silver City, and from there on to Gold Hill and Virginia City. Modern State Route 341 (originally State Route 17) generally follows this same route (Ansari 2001:63; Fey 2008:139).

3.2.10 Railroads

The Virginia & Truckee Railroad (V&T) was an integral part of the development of the Comstock. For 80 years, the railroad ran supplies to the mines, brought passengers to and from the mines, and hauled ore from the mines to the mills on the Carson River. The railroad was expanded through Washoe Valley into Reno, connecting with the Transcontinental Central Pacific Line and allowing for greater transportation of goods to and from California (Ferrell 1999; James 1998a:80-84; Myrick 1962).

The Virginia & Truckee Railroad Company was formed in 1868 by the Bank Crowd. Construction began on the standard gauge rail line in February of 1869. The original track was 21 miles long, requiring six tunnels and multiple twists and turns, rising over 2,400 feet in elevation. In many areas of the route, heavy construction was needed to build the road bed. Working to build the V&T were approximately 1,600 mostly Chinese men, unwelcome among the mostly Euro-American miners. When they reached Gold Hill, the Chinese were forced to camp on American Flat. Following an uprising against them in September 1869, the Chinese workers were restricted to the area south of Gold Hill, and company director William Sharon agreed to hire unemployed miners to finish the route through Gold Hill to Virginia City (James 1998a).

Two months after the V&T rolled into Gold Hill, it was finally connected with Virginia City (Figure 3.7). It took another two years to connect with the transcontinental rail line in Reno. To serve the large mines, short spurs of the railroad were built in Virginia City and Gold Hill. After the railroad was built, about 100 full-time employees ran the day-to-day operations. Salaries ranged from $15 a month for the station cleaners to dividends of $1,000 a month for the investors (James 1998a:80-84).

Figure 3.7 The Virginia & Truckee Railroad in Gold Hill (reconstructed).

By 1880, the Comstock boom was coming to a close. The V&T railroad spur that led to Silver City was torn up and the materials re-used for the narrow gauge Carson and Colorado rail line. In 1900, the strapped V&T sold the Carson and Colorado to the Southern Pacific, which built a more direct route that left the V&T off the line. In 1906, the railroad connected to the newly created town of Minden to the south, focusing its service on agricultural products. The V&T was kept alive by the beneficence of the general manager, Odgen Livingston Mills. Mills died in 1937, and in 1938 the company filed for bankruptcy. The line between Carson City and Virginia City ended that year, but the interest of rail fans and the sale of rolling stock to Hollywood kept the railroad barely alive. The last run on the V&T was on May 31, 1950 (Edwards 2009).

3.2.11 People of the Comstock

The 1848 Treaty of Guadalupe Hidalgo that ended the U. S-Mexican War ultimately ceded to the U.S. more than 500,000 square miles of land previously held by Mexico. In 1850, President Millard Fillmore signed the proclamation establishing the Utah Territory out of a portion of the country's new holdings. The Utah Territory, which extended to the Sierra Nevada mountain range and included what would become Nevada, was essentially an enclave for members of the Church of Jesus Christ of Latter-Day Saints, also known as Mormons. With these origins, it is not surprising that among the first Euro-American settlers in Gold Canyon and the surrounding area during the pre-Comstock period were either Mormon or from Latin American countries.

The first discovery of gold in the region was reported to have been made by a Mormon party on their way to California in the early spring of 1850 (Lord 1980 [1883]). William Prouse and John Orr are credited with finding the first traces of gold dust in a small creek and after following the creek bed up the canyon they pried free the first quartz-encased gold nugget found in the deserts of the western Utah Territory. They named the area Gold Canyon and by the following year a mining camp had sprung up around the placer.

Although Mormons are credited with the initial discovery of gold at Gold Canyon they do not appear to have exploited it. James (1998a:1) states that the church discouraged its followers from mining. Instead the Mormons practiced an agriculture-based settlement pattern and were responsible for establishing the first such settlements along the eastern Sierra Front. The earliest of these, Genoa (first known as Mormon Station), was established in 1850. It served as a trading post during the California Gold Rush for emigrants on the California Trail to re-supply before embarking across the Sierras. Shortly after, agricultural settlements sprung up in Carson, Eagle, and Washoe Valleys. The Mormon pioneers who first settled these areas provided the infrastructure that eventually allowed the successful exploitation of the Comstock Lode. Without the resources of the fertile valleys and timber covered foothills of the Sierras, the fabulous mineral wealth of the Comstock would have remained hidden below the harsh and barren shadow of Mount Davidson.

Despite their initial contributions to the success of the Comstock, the majority of Mormons withdrew from the region in 1857. It was at this time that Brigham Young, feeling threatened by the US government, called his people to Salt Lake to defend the State of Deseret. Although the conflict which came to be known as the Utah War never resulted in actual aggression, it did cause a great Mormon exodus from Nevada, although a few notables such as Eiley Orrum Bowers stayed behind to become part of the Comstock saga.

When the "Rush to Washoe" began in 1859, it initially represented an eastward movement of miners and others who had been part of the California Gold Rush. This group was already quite diverse, as shown by the 1860 U. S. Census (enumerated in August shortly after the Rush began) (Table 3.2).

Table 3.2 Nativity of People Living on the Comstock in 1860 Including Virginia City and Gold Hill (James 1998a:35)

Nativity	Number	Percentage Female
USA*	1,949	5
Ireland	310	4
Germanies	230	4
Britain	165	6
Canada	118	3
Hispanic	99	17
Scandinavia	41	2
France	27	4
China	14	--
Switzerland	13	8
Italy	9	--
Russia	6	--
Other†	36	9
Total	3,017	5

* Includes 7 male African Americans

† Includes 19 groups

Although these numbers reflect a primarily male population they also include 111 women and more than 100 children (James and Fliess 1998:22). Native Northern Paiutes, surely present on the Comstock at this time, are not enumerated in the census (James and Fliess 1998:19).

Ten years later, the population of the Comstock had changed radically as the 1870 census shows (Table 3.3). The population had grown by more than 375 percent, and the number of women and children was twenty times more than that enumerated in 1860 (James 1998a:92). Other perceptible changes can be seen in the profile of ethnic groups. While the Hispanic population was nearly stagnant (growing by only 17 individuals in 10 years), the Irish population appears to explode with a nearly 700 percent growth rate, making the Irish one of the largest and most important ethnic groups on the Comstock. The African American population grew substantially from 1860 to 1870, but since it never reached more than 100 individuals, they remained a small minority of the population.

Table 3.3 Ethnicities on the Comstock, 1870 (from James 1998a:95)

Nativity	Number	Percentage Female
USA*	5,560	37.4
Ireland	2,160	34
Germanies	578	25.6
Britain	1,150	19.1
Canada	488	17.8
Hispanic	116	41.4
Scandinavia	82	9.8
France	111	26.1
China	744	13.7
Switzerland	82	15.9
Italy	53	15.1
Portugal	43	7
Other†	152	17.8
Total	11,319	31

* Includes 71 African Americans

† Includes 26 groups (11 non-African American blacks)

Other important trends can be seen on the Comstock between 1860 and 1870 in the number and the types of professions in which people were engaged (Table 3.4). In1860 more than two-thirds of the population was involved in mining while the remaining third either did not list a profession or participated in jobs typical of a small mining camp or boomtown (e.g., mercantiles, saloons, construction, etc.). By 1870 the Comstock was highly industrialized, and the proportion of miners had dropped to less than half of the overall population as compared to 71.4% in 1860. The workforce was also more diverse, reflecting a thriving cosmopolitan city. James (1998a:91-92) notes that the 1870 census included 22 bakers, 49 butchers, five confectioners, two oyster vendors, one coffee vendor, one peanut vendor, 19 people involved in the theater, 14 musicians, two gymnasts, as well as gardeners, librarians, photographers, milk dealers, tailors, stockbrokers, politicians, federal tax agents, doctors, and lawyers.

Table 3.4 Occupations for Comstock Men* , 1860 and 1870 (from James 1998a:92)

Occupation	Number in 1860	Number in 1870	Percentage of Workforce in 1860	Percentage of Workforce in 1870	Ratio of 1860 to 1870
Mining	1,984	2,808	71.4	42.6	1:1.4
Construction	221	325	8.0	4.9	1:1.5
Teamsters/ Packers	176	146	6.3	2.2	1:2.1
Service	125	499	4.5	7.6	1:4.0
Mercantile	124	766	4.5	11.6	1:6.2
Saloons	61	234	2.2	3.5	1:3.8
Manufacturing	24	623	0.9	9.4	1:26.0
Infrastructure	23	126	0.8	1.9	1:5.5
Mills	7	381	0.3	5.8	1:54.4
Railroad	—	44	—	0.7	—
Other	1	498	—	7.6	1:498
None	32	148	1.4	2.2	1:4.6
Total	2,778	6,598			1:2.4

* Men are defined as 15 years or older.

Women during the 1860s rarely declared a profession. James and Fliess (1998:22) note that of the 111 women enumerated during the 1860 census, 83 were living with their husbands. It is likely that most of these women would have seen themselves as keeping house. A few did declare professions outside of the home, including one school teacher, three seamstresses, one laundress, one milliner, two saloon keepers, and one actress. From this data it appears that few, if any women, were employed in prostitution which is in direct contrast to the popular image of a "Wild West Boomtown."

By 1870 the larger population of women on the Comstock allowed for a clearer picture of women's professions. Table 3.5 lists the numerous types of occupations women declared during the 1870 census. However, as several historians have noted (James 1998a, 1998b, 2012; James and Fliess 1998; Loverin and Nylen 1998; Nicoletta 1998) women were more likely than men to pursue multiple occupations but were required by the enumerator to list only one. Therefore, a woman who declared keeping house as her occupation may have also been earning wages as a seamstress or laundress, activities that could be done concurrently with the duties of taking care of her own household.

Table 3.5 Occupations for Comstock Women*, 1870 (James 1998a:94)

Occupation	Number	Percentage of Total
Keeping House	1,604	72.9
Prostitution	160	7.3
Seamstress	58	2.6
Servant	53	2.4
Lodging/Boarding	28	1.3
Laundry	14	0.6
Milliner	13	0.6
Daughter of Charity	8	0.4
Teacher	7	0.3
Restaurant Work	7	0.3
Health Care	2	0.1
Other	19	0.9
At School	29	1.3
None	199	9.0
Total	2,201	

* Women are defined as 15 years or older.

By 1880 the Comstock had begun its slow decline. From an estimated population peak of 20,000 to 25,000 in 1875 (James 1998a:109), the population dropped to fewer than 10,000 in 1890, and by 1900 the percentage of women on the Comstock had peaked at 47% of the total population (James 1998a:244). The era of a community dominated by mining and miners had come to an end.

3.2.12 Ethnicity

While the fame of the Comstock brought people from all over the world there are a handful of ethnic groups that should be mentioned as especially contributing to the diversity of the Comstock. These groups include Hispanics, Native Americans, African Americans, Chinese, Irish, and Cornish.

Spanish Speakers

The Spanish-speaking people were some of the first to arrive at the Comstock. While many were from Mexico, others had emigrated from South America, Spain, Panama, New Mexico, California, and Utah (James 1998a:35). As a group they comprised more than three percent of the population in 1860. Since the land that comprised the Comstock had belonged to Mexico little more than a decade previously, it is not surprising that Spanish speakers would represent a significant portion of the population. Another reason for the high number of Spanish speakers on the Comstock was the nature of the complex silver ores. The first prospectors on the Comstock were placer miners who had little knowledge of silver mining and even less of the hard-rock mining techniques required to extract it. Silver mining had been conducted profitably in Mexico since the sixteenth century, and consequently the knowledge and skills of the Mexicans were in high demand.

One of the early successful mines on the Comstock was the Mexican Mine. Owned by the Maldonado brothers and worked by mainly Spanish speakers, the Mexican Mine was one of the Comstock's best producers during the early 1860s (James 1998a). The brothers employed the traditional Spanish method of mining referred to as *el sistema del rato,* which translates to "the system of the moment" (James 1998a:36). This pragmatic method employed the most cost-efficient and simple means of exploiting the rich ores. As a result the mine tended to meander as they followed the twists and turns of the richest veins. This led to the often disparaging remarks of Mexican "rat hole mining" by the other large contemporary mines who employed the latest and most state-of-the-art technology when engineering their diggings (James 2012).

The Comstock's Spanish-speaking community followed a distinctively different trajectory than groups. Whereas the population of some groups increased dramatically from the 1860 to the 1870 census, the Spanish speaking population increased by only 17 individuals. Another notable trend is the diversity of professions held by Spanish speakers from 1860 to 1870. The 1860 census listed them as packers, but also among this group were three merchants, two saloonkeepers, one shoemaker, and one teamster (James 1998a:36). By the 1870 census, most Spanish-speaking males declared themselves miners, while most Spanish-speaking women were categorized as prostitutes (James 1998a:156). This was in direct contrast to the trend that showed a dramatic decrease in the number of miners from more than 70 percent in 1860 to slightly more than 40 percent in 1870. The trend in professional occupations appears to hold for Spanish speakers into the 1880 census (James 1998a).

In contrast to the broader demographics of the Comstock, the number of Spanish-speaking women increased between 1860 and 1870. This trend continues for children living on the Comstock. In 1860, children under the age of 16 represented less than four percent of the non-Spanish-speaking population compared to 12 percent of the Spanish speakers (James 1998a:36). The data suggest that Spanish speakers formed a large part of the earliest family life on the Comstock.

African Americans

Despite the fact that the African American population on the Comstock never exceeded 100 individuals, it deserves mention, especially when the larger political climate of the country during this period is taken into account. Nevada's motto "Battle Born" reflects the role the state played in the American Civil War. In addition to the wealth being generated on the Comstock, the liberal leanings and pro-Union feelings of the residents spurred President Lincoln to advocate Nevada's admittance as a state before it had reached the required minimum population (James 1998a:152). As a result, African Americans found a relatively tolerant community on the Comstock, although not one completely devoid of racism and bigotry.

With so few members, Blacks on the Comstock did not live in a separate neighborhood. The historian Ronald James (1998a) notes that both the census records from 1880 and an 1873 directory of the Comstock show African Americans living throughout the community, though usually within working-class neighborhoods. African Americans came together as a community at their churches. From 1863 to 1879, the Southern Baptist church and the African Methodist Episcopal church appear to have served as the core of the Black community.

In 1863, there were 35 African American men living and working on the Comstock (James 1998a:97). They were primarily barbers, cooks, barkeepers, and laborers, but a few were employed washing clothes, as carpenters, and as blacksmiths. One was listed as a miner. The 1870 census enumerated 82 African Americans, most of whom worked as laborers, servants, cooks, and barbers, but there was also one physician, a saloon owner, a tailor, and two milliners (James 1998a:98). African American prostitutes were also present, with four women claiming the profession in the 1870 census and three in the 1880 census (James and Fliess 1998). However, since there were so few African American women in the community (23 in 1870 and 26 in 1880, these data cannot be used to draw any meaningful conclusions about prostitution among this community.

Irish

Years of starvation from the Great Famine (1845-1852) as well as religious and political oppression resulted in hundreds of thousands of Irish leaving their homeland in the decades preceding the discovery of the Comstock Lode. Once they arrived on the East Coast of America, however, they encountered similar discrimination. The West provided, like it did for many other marginalized groups, a chance to be free from persecution and to become successful. The timing of Irish emigration and the opening up of the American West allowed the Irish to become the single largest ethnic group on the Comstock, which during the boom years made up nearly one-third of the population of Virginia City (James 1998a).

Unlike other ethnic groups living on the Comstock at this time, the Irish were one of the few groups to establish a permanent community there (James 1998b). Irish women made up nearly 34 percent of the Irish community in 1870, which was three percent higher than the percentage of all women living on the Comstock (James 1998a:95). Many of these women married Irish men and settled in Irish neighborhoods, providing a strong core and sense of ethnic identity for the community. James (1998a:144) also notes that more than other groups, the Irish stayed on when the Comstock depression began.

In terms of employment, Irish men followed the same pattern as the general population, with mining representing the majority early on and an increasing diversification over the subsequent decades. Irish women, on the other hand, exhibited a slightly different pattern from women of other ethnicities. While the majority of Irish women declared their occupations as "keeping house," they were more likely to be employed as house servants or laundresses than women of other ethnicities (see James 1998b for a discussion of Irish women on the Comstock).

Cornish

The Cornish, widely regarded in the Mining West as some of the best miners in the world, have a rich mining tradition in their homeland in Cornwall. For more than three thousand years they perfected techniques for extracting tin ores from the hills of southwest England, which was traded and alloyed with copper from the Mediterranean countries to produce bronze (Calhoon 1986:298). By 1860, however, the mines had become depleted and foreign ores were being produced more cheaply, forcing the English mines to close and leaving thousands of Cornish miners unemployed. Many sought employment in the booming mines of American West.

Although the Cornish miners were a main-stay of the mining west, they did not appear on the Comstock during the earliest years. The Cornish, knowledgeable as they were of the boom-and-bust cycles of mining, appear to have waited until the Comstock proved itself before taking the risk and expense of traveling to the burgeoning district (James 1998a:30-31). By 1870, however, the number of Cornish immigrants numbered in the hundreds and constituted one of the major ethnic groups on the Comstock.

As an ethnic group, the Cornish tended to be "clannish" and whenever possible they gave preference to their families or others of their ethnic background. It was said that whenever there was an opening in a mine's labor force, one of the Cornish miners would immediately appeal to the foreman for the employment of "me cousin Jack." As such, the men were commonly called Cousin Jacks and their women, Cousin Jinnies. Because of their reputation as miners the Cousin Jack usually won the job over every other applicant.

The preference given to miners of Cornish descent led to antagonism with other ethnic groups, the Irish in particular. Competition between the two groups appears to have been intense with occasional violence breaking out (see James 1998a:146-147). And while both Cornish and Irish miners were employed in virtually every mine on the Comstock, they formed distinctive neighborhoods with the Irish preferring Virginia City, where they made up nearly one-third of the population, and the Cornish living primarily in Gold Hill.

Even removed from their homeland, the Cornish retained many of their traditions and lifeways, providing a glimpse into the collective past of Cornwall. They were exceptionally fond of music and had a rich tradition of male singers, and the cornet band and songs were handed down through the generations as part of the oral history. The Cornish also retained their foodways. The pastie, a meat and vegetable pie, was a staple of the diet, both at home and in the mines. At the start of their shifts, Cornish miners would bring with them a canteen of tea and a pastie for lunch. A spare candle inserted under both at the beginning of the day would ensure a warm meal by lunch.

Chinese

Much has been written about the Chinese experience in America and the role of the Chinese in the settlement of the West (see: Cassel 2002; Chan 2006; Chang 2004;

Chung 2011; De León 2002; Dirlik and Yeung 2001; Ling 1998; McClain 1994; Tong 2000). While the story of the Chinese on the Comstock is similar to that of the Chinese across the country, there are distinct differences.

The first known Chinese people in northern Nevada were brought from California in 1856 to dig a water ditch up to Gold Canyon (De Quille 1985[1876]). Some of them prospected in the area and De Quille (1985[1876]:11) states that, "at one time not less than one hundred and eighty Mongolians were at work at the lower end of the canyon." The large concentration of Chinese men working and living at the mouth of Gold Canyon became known as Chinatown (present day Dayton). By 1859, however, the Chinese were no longer legally allowed to hold claims in the Gold Hill District (De Quille 1985 [1876]:40).

Anti-Chinese sentiment was intense on the Comstock, as it was on much of the American frontier. The Chinese were despised as the lowest level of society, even lower than African and Native Americans, and they lived in highly segregated communities (hence the ubiquitous Chinatown). Caucasian laborers, fearing competition from the cheaper and highly-efficient Chinese, kept them from many professions. On the Comstock, the Miner's Union prevented Chinese from working underground in the mines; and when the V&T Railroad was being constructed, only the Caucasian union workers were hired to blast tunnels (James 2012: 43). Despite the restrictions, the industrious Chinese worked as launderers, laborers, cooks, and prostitutes, as well as druggists, doctors, carpenters, professional gamblers, woodcutters, a cigar maker, and a jeweler (James 1998a: 96; 164).

The Chinese population on the Comstock was large, exceeding 1,300 in the 1870 census (James 1998a). Women, however, made up only 13.7 percent of the Chinese community, one of the smallest of all the ethnic groups (James 1998a:95). Both traditional cultural roles of men and women as well as anti-Chinese legislation in the United States led to this situation. Many Chinese immigrants were single or married men who came to make their fortune and then return home. Since the traditional role of the wife in Chinese culture was to take care of the elders, many wives stayed at home while their husbands went overseas. In 1875, the U.S. Congress passed the Page Law, which required Chinese women to prove they were not prostitutes before immigrating (Chung 1998). Many of the Chinese women who had emigrated were younger second wives or concubines, a concept not understood or accepted by Euro-Americans. As a result, these women were thought to be prostitutes despite the fact that they were associated with one man and did not solicit sexual services. The 1870 census of Storey County lists all but nine of the 103 Chinese women living on the Comstock as prostitutes (James 1998a:96).

While the Chinatown of Virginia City was large enough to support a branch of one of the Chinese Six Companies, the Yeong Wo Mercantile (see Axsom 2009), by 1880 the population had dropped to half of what it was in 1860 (James 2012). A large fire in Chinatown in 1875 destroyed several homes and businesses. Likely because of the growing anti-Chinese sentiment, the Chinese did not rebuild. By 1890, the population of Chinese had dropped to a third of that in 1880, and by 1910 there were only 44 Chinese living in Storey County (James 1998a:251).

Northern Paiute

The Virginia Hills were part of the traditional territory of the Northern Paiute, the Kiyuidökadö, or Cui-ui eaters (Stewart 1939, referenced by Hattori 1975:14). Information on the Paiute living on the Comstock prior to 1880 is limited. Census takers did little more than take a head count of Native people until the 1880 census, which was the first to identify individuals by name, gender, age, marital status, and household (camp). The 1880 census counted 127 individuals, for which 114 have the detailed information noted above. These data show a relatively stable community of Northern Paiutes living on the Comstock during this period.

With the massive influx of emigrants into the region and the ensuing mining, lumbering, ranching, and farming many of the Northern Paiutes's traditional food resources (e.g., pinyon) and their semi-nomadic hunter-gatherer lifestyle was disrupted. While some Northern Paiute became wage laborers, working on the farms and ranches, many more adapted their food-gathering activities to exploit new resources. Contemporary accounts (Matthews 1985 [1880]; Waldorf 1970) refer to the Northern Paiutes as scavengers, and both Hattori (1975, 1998) and James (1998a) state that the Northern Paiutes were successful in adapting their gathering-based economy to the relative wastefulness of the Euro-Americans. Wood (along with other commodities such as scrap metal, glass, and rags) was salvaged from the dumps and used in the camps as fuel, building material, and tools. Women scavenged day-old fruits, vegetables, and bread, while men participated in hunting and fishing, peddling their catches on the streets. Both men and women were able to practice their traditional pine-nut gathering, but instead of stock-piling the excess for the winter, they sold them.

The Northern Paiutes of the Comstock adopted some of the European ways but retained many of their own traditional practices. Until 1876, they continued to build their circular domed house structures of reeds and willows, but many created homes of the same form using metal frames covered with canvas or sheet metal. An article in the 21 October 1876 *Territorial Enterprise* is considered to be the first mention of Paiutes building wood-framed houses similar to those of the dominant Euro-American population (Hattori 1975:21). The Northern Paiute typically lived in segregated communities located outside of town at the base of waste rock piles from the mines. Hattori (1975:20) notes three such areas, two dating to the 1870s, and one from the turn of the twentieth century.

Other traditional Paiute practices included face painting and the adapted form of their hunting-and-gathering economy. They also gathered in small groups for gambling, using cards instead of the traditional painted bones and sticks, and larger "Fandangos," the traditional days of feasting and dancing. As time went on, the Northern Paiute on the Comstock adopted certain Western practices, such as clothing and the toys Paiute children played with. By the 1870s, there were even a small number of Northern Paiute children attending Storey County public schools (Hattori 1975:22-23).

3.2.13 Women and Children on the Comstock

The popular image of the Soiled Dove of the West was not the reality for most women who came to the Comstock and made it their home. Instead, from the first discovery of gold in Gold Canyon, the overwhelming majority of women who came to the Comstock came with their husbands and sometimes children as well. The stories of these women can be found in such wonderful resources as Mary McNair Mathews' (1985 [1880]) eye-witness account and the edited volume of essays by Ronald M. James and C. Elizabeth Raymond (1998). Unlike many other boomtowns, the Comstock had a permanence that encouraged the growth of a community, and the women who settled there played an integral role in the development of that community.

Perhaps the most integral role women played on the Comstock was their contribution to the stability of family life. In 1860 the census enumerated 111 women living on the Comstock, of which 83 were living with husbands and collectively caring for more than 100 children (James 1998a:31). By 1870 the number of women on the Comstock was 3,505, a growth rate of more than three thousand percent in a single decade. These women likewise were primarily caring for families. The fruit of their labors can be seen in the annual reports of the State Superintendent of Public Instruction which shows twelve public schools in Storey County by 1865, with an enrollment of nearly 900 children (James 1998a:195).

Women's contribution to the economy of the Comstock should not be overlooked. By 1870 the Comstock was a bustling urban metropolis, and women contributed tangibly to that image both as consumers and producers of goods and services. In the 1860 census women were categorized as pursuing one of ten occupations, and more than 80 percent declared no occupation (Table 3.6). By 1870 the census lists 54 occupations (Table 3.7), and by 1880 the census lists 122 different categories of women's occupations. In addition to the occupations declared in the census records, women likely participated in mining. Although most helped their husbands with small family claims, there is at least one instance of women owning and operating a small mine (James 1998a:131).

Table 3.6 Female Professions, Occupations, and Trades for Age Fifteen or Older, 1860 (James and Raymond 1998:Appendix III.1:318)

Profession	N	Profession	N
None listed	88	Saloon keeper	1
Bar keeper	1	School teacher	1
Boardinghouse	1	Sewing	1
Housekeeper	5	Theatrical	1
Machine Sewing	1	Washing	1
Milliner	2		

Table 3.7 Female Professions, Occupations, and Trades for Age Fifteen or Older, 1870 (from James and Raymond 1998:Appendix III.2:318)

Profession	N	Profession	N
None listed	156	Laundry	2
Actress	7	Laundrywoman	1
At home	22	Lodgers	1
Boarding	15	Lodging house	8
Boarding home	1	Melodeon keeper	1
Boarding house	7	Milliner	13
Boarding; Housekeeping	1	Millinery store	8
Chambermaid	2	Nurse	2
Circus performer	1	Prostitute	109
Cook	2	Restaurant	1
Dressmaker	39	Saloon keeper	3
Harlot	48	School	11
Hotel de refreshment	1	School marm	1
Hotel keeper	4	School teacher	6
House holder	1	Seamstress	17
Housekeeper	59	Servant	46
Housekeeping	122	Serving the public	3
House servant	1	Shop woman	1
Housemaid	1	Nun at St. Mary's School	8
Intelligence office	1	Student at St. Mary's School	9
Keeping hotel	1	Theatrical	2
Keeping house	766	Upholsterer	1
Keeps house	652	Waiter	4
Keeps boarders	3	Wash house	1
Keeps dairy	1	Wash woman	3
Keeps lodgers	4	Washerwoman	7
Keeps store	1	Wife	1
Laundress	1		

3.3 DEPRESSION AND DECLINE (1880-1900)

The Spanish word *borrasca* is used to denote a severe decline in mining (as in other aspects of life), serving as the opposite of *bonanza*. Between 1859 and 1879, Comstock productivity fluctuated wildly. Bonanzas were punctuated with declines, but by 1880 the latest decline would prove to be long-term. Though miners are ever hopeful, a number of factors played into the collapse, from on-going problems with water, the on-going political wrangling surrounding the U.S. Coinage Act of 1873, which de-monetized silver, to the playing out of the mines and the redirection of investors' interest, to competing mining booms in other states. Only the processing of low-grade ores returned modest profits through the 1880s. An early indicator of the gravity of the decline was the decision by the V&T to tear up the tracks to their Silver City spur in 1880. The U. S. Mint in Carson City, which had been built to process Comstock ore, issued its last coin in 1883. The same year, the *Territorial Enterprise*, the famous Virginia City newspaper that gave America Mark Twain, ceased publication. In 1887 the last Washoe Pan Process mill was constructed to reprocess tailing from earlier mills. Perhaps the most poignant note ending the era was the entry in the ledger book of the St. Mary Louise Hospital in Virginia City: "The Sisters of Charity left for good, Sep 7, 1897" (Smith 1998). Comstock production in 1898 reached only $205,000, millions less than during the boom period (James 1998a:233-241). While the boarded-up buildings spoke to the air of pessimism, new discoveries and technologies were lurking just over into the new century.

3.4 POST BOOM RENEWAL AND LIMITATION ORDER L-208 (1901-1945)

By the early 1880s, high grade ore in the Comstock mines had essentially played out. In attempts to identify new deposits of high grade ore, exploration shafts and incline adits were developed across the Comstock to depths over 3,000 feet. These deep mining efforts on the Comstock were to prove unsuccessful for four reasons (Smith 1998): a lack of new ore deposits, the high temperature and quantities of water associated with mining at such depths, increased costs associated with de-watering, and lack of investor enthusiasm. By 1886, the last Cornish Pumps on the Comstock in the Combination Shaft ceased de-watering, allowing the mines located below the Sutro Tunnel to flood.

Efforts to conduct deep mining were restarted in 1899, when the Comstock Pumping Association was formed by the North End Mines. Pumping was conducted by electrically driven centrifugal pumps at the C & C shaft. Over a period of 20 years these efforts met with success, locating small deposits of high grade ore. However, the profitability of these operations was hindered by the high costs of operating at such depth (Stoddard and Carpenter 1950).

The revival of deep mining seen by the North End and Middle Mines in Virginia City was not undertaken in The South End Mines around Gold Hill and Silver City. From 1899-1922, mining efforts in The South End Mines were restricted to surface and shallow underground workings above the 1600-foot level and the reprocessing of low grade stope fill and tailings. The most active mine in the south end group during this period was the Yellow Jacket. The mine produced large amounts of low grade ore from underground workings as deep as the 1,600-foot level. Production for the period 1903 to 1920 exceeded 270,000 tons with a value range of $1.28 to $10.74 per ton. Other active properties in The South End Mines included the Caledonia (601 tons), the Overman (exploration only), the Imperial (exploration only), and the Justice (23,000 tons). One small-scale mine operated by the Donovan family had begun to extract ore from an open pit known as the Lucerne Cut. From 1899 to 1906, 60,000 tons of ore had been produced (Stoddard and Carpenter 1950; W.P.A. 1941).

With the high cost and limited returns associated with deep mining, efforts across the Comstock shifted to exploration of mines above the Sutro Tunnel and the reprocessing of tailings. Throughout the region the possibility of economically mining low grade ore and re-processing waste rock was being reevaluated. With the introduction of cyanidation to the region, these previously neglected deposits became potentially large sources of revenue. Cyanide processing had one principal advantage over pan-amalgamation: increased recovery rates. It allowed for low-grade ores and the tailings of previously treated ores to be economically processed. Such an instance is described in the Sutro Tunnel Company's proposal to construct a cyanide mill at Crown Point:

At that time (1865-1885) ore of less than $30 per ton value could not be extracted at a profit, and in mining, much ore of lower grade was not removed from the stopes, but was used to back-fill mine workings. In other places, not so filled, the old timbers have collapsed and decayed, allowing the adjacent ground to fill up the old stopes with ore that had been left in place by the early day miners. This ore left behind formerly, had been adjacent to rich ore removed and has now become, because of reduced mining costs and improved milling methods, ore of commercial grade. (Smith 1934)

Alchemists since the 1700s had known about the use of cyanide as a means of dissolving gold from ore. However, the method was not used commercially until after a process was developed by John S. MacArthur, a metallurgical chemist, and Robert W. and William Forrest, both medical doctors. The process was patented in England in 1887 and improved upon the next year with the introduction of lime and zinc. They patented their process in the United States in 1889 (Hardesty 1988:51; Meyerriecks 2003:154).

Initial use of the cyanide process in Nevada was in 1896 by Robert Jackson, a professor at the Mackay School of Mines. He treated tailings from early Comstock-era mills located near Washoe Lake. In 1898 Jackson purchased a stamp located in Silver City with the intention to implement the MacArthur-Forrest cyanide process on pan-amalgamation tailings that had accumulated in Gold Canyon. The mill was operational by 1900, equipped with a functioning cyanide process capable of treating 25 tons of tailings a day. Jackson operated the mill from 1898 to 1903, achieving a total production of $32,663. The mill was sold in 1903, changing hands several times and operating on a small scale until the 1930s when it was refitted with equipment to process 100 tons per day (Herbst 1980).

Ore and tailings processed by cyanide leaching were first crushed into a fine powder. The cyanide process required finer milling of ore than did the Washoe Pan Process. Although stamp mills constructed to process ore for the Washoe Pan Process were used in some cases to mill ore for cyanide leaching, the preferred method was by ball mill. Ore processed by ball mill was ground into a 40 mesh or finer, and then separated into two classes based on size, sand, and slime. The sand and slime fractions were processed separately as each required differing procedures to extract the precious metals. In general, both fractions were subjected to a diluted solution of sodium cyanide. The sodium cyanide dissolved the precious metals, holding them in solution. Zinc powder, when added to the solution, adhered to the dissolved precious metals, allowing for the materials to be removed from the solution. The zinc powder, once charged with precious metals, was removed from solution by a filtering device. The charged zinc filter cake was separated from the filters, dried, and smelted into a semi-pure alloy of gold silver, referred to as doré bars (Hardesty 1988).

The first major use of the cyanide process on the Comstock was by Charles Butters, who constructed the Butters Mill in Six-Mile Canyon at the base of Sugar Loaf Peak in 1901-1902. At the time, Butters Mill was considered the largest cyanide mill operation in the United States, capable of processing 100 tons of pan amalgamation tailings and ore per day. In addition to the processing of mill tailings from Virginia City and local surface ores, Butters Mill was used by miners in Tonopah between 1902 and 1903 for processing their high-grade ore (Ansari 1989:27, 29; Elliott 1966:157; Hardesty 1988:51; 2010:84-87; Rice 1907:83).

In 1906, Charles Butters began constructing a 20-stamp mill for crushing ores to be processed in the cyanide mill (Rice 1907:83). The ores were to be transported to the stamp mill by aerial tramway from the Virginia & Truckee Railroad station in Virginia City. In 1907 two mills in Virginia City, the Kinkead and the Best & Belcher, were crushing ore for the Butters Mill. Operating until the late 1920s, the mill treated approximately 100 tons of ore per day. About 300 men were employed at the mill during its peak period of operation (Ansari 1989:29).

The concept of cyanide processing of old pan-amalgamation tailings and custom ores was initiated at the Jackson and Butters Mill. However, the economic feasibility of the process was demonstrated on low grade ore at the cyanide mill of the Comstock Leasing Company in Six-Mile Canyon. The Comstock Leasing Company acquired the rights of the Hale & Norcross and the Chollar-Potosi and systematically extracted ores from surface workings, old stope fills, and select deposits. The mill had a recovery rate of 93 percent of gold and 86 percent silver, with a processing cost of $3.57 per ton. Production numbers from 1916 to 1922 indicate that ore averaged $9 a ton, with a $941,000 yield from over 100,000 tons processed.

Following the success of the early cyanide mills of the region, the United Comstock Mines Company constructed a large cyanide plant capable of processing 2,500 tons per day in American Flat to process stope fill and low-grade ore. The United Comstock Mines Company was organized in 1920 and through a series of acquisitions controlled many of The South End Mines on the Comstock. By 1922 the company owned the mineral rights to over 10,000 feet along the Comstock Lode and had constructed the American Flat Mill. Produced from the ore bodies of the Overman and Imperial mines, ore was transported to American Flat by a 9,250-foot-long adit. Problems with the ore, both in extracting and milling, as well as a drop in the price of silver, resulted in closing the operation after only two years of production. Recorded production from the mill was $3,400,000 from around a million tons of ore, or an average value of $3.40 a ton (Stoddard and Carpenter 1950). Operating costs for the same period were noted to range from $3.35 to $3.60 a ton (Smith 1998).

Comstock Merger Mines, a large-scale operation that had been working the Middle Mines (in The Divide and Gold Hill), bought out the United Comstock Mines Company in 1924. Comstock Merger Mines operated the American Flat Mill, supplying the mill with low-grade ores from an open pit near the Imperial Mine. This operation continued for three years from 1924 to 1926 and produced around one million tons with an average ore value of $4 a ton (Stoddard and Carpenter 1950). In December of 1926 operations of the Comstock Merger Mines ceased as operating costs exceeded returns.

Mining in the north end of the Comstock was no more successful than in the other two areas. Consolidated Virginia and others operated on a small scale with low returns although all of the companies anticipated a large tonnage of low grade ore. Several factors were involved in the difficulty of mining during the 1920s, including both the drop in the price of silver from $1 an ounce in 1922 to $0.67 an ounce in 1926, and the costs associated with using old techniques to extract the large quantities of low grade ore to supply the mills (Smith 1998:291-295; Stoddard and Carpenter 1950).

Following a period of decline of mining on the Comstock between 1927 and 1932, in 1933 several large companies were formed acquiring claim groups and reviving the old workings. This revival occurred as a direct result of the Banking Relief Act of 1933 and the Gold Reserve Act of 1934. These acts prohibited public ownership of gold bullion and established a government purchasing policy for precious metals at the set price of $35 an ounce for gold and $0.64 an ounce for silver. This policy change effectively raised the value of Comstock ore over fifty percent when compared to the previous values of gold and silver (Stoddard and Carpenter 1950). Prior to these events, the United States had retained its gold standard as set in 1837, with the price of gold fixed at $20.67 an ounce. Silver, on the other hand, traded on the open market and had a variable price. That price reached a low of $0.28 per ounce in 1932.

Companies reopened old mines for the purpose of extracting ores previously determined to be "non-commercial." These ores had been made profitable by the high recovery rates of the cyanide process, new mining equipment, and the increase in the values of precious metals.

Although the use of cyanide was recognized quite early as the superior process to extract silver and gold from low-grade ore, the costs to construct and operate a cyanide plant were high. A more (superficially) cost-effective method of processing low grade was by means of flotation (Gardener and Carpenter 1935). The flotation process involves milling ore to a fine powder, 40 mesh or finer, typically by ball mill. The milled ore is then combined with water and chemical reagents to form a pulp. Air is blown through the pulp to form mineral-rich froth that rises to the surface. The froth is collected and dried, producing a mineral concentrate that is further refined at a smelting facility (Hardesty 1988).

A flotation mill could be constructed with a lower up-front capital expenditure than could a comparable cyanide mill. However, the flotation process had two negative factors: recovery rates and marketing costs. First, the average recovery rate for flotation was around 70 percent, even less than the traditional pan-amalgamation, which extracted up to 75 percent of the value of ore. Secondly, the process of flotation produced only concentrate. It did not allow for the production of ingots on site, as was the case with pan-amalgamation and cyanidation. Concentrate produced from the flotation mills was sold to a smelting facility, resulting in a marketing cost not associated with the other methods of processing where ingots could be produced on site (Gardener and Carpenter 1935).

Both the failure of the United Comstock Mines' cyanide mill in American Flat and the economic impacts of the Great Depression created a difficult environment in which to secure capital for mine development in the 1930s (Smith 1934). The poor economic environment had a direct effect on the Comstock as many mining companies initially constructed the cheaper flotation mills, in some cases adding the equipment onto existing amalgamation mills and later transitioning to cyanide. In 1935, 13 mills were operating on the Comstock; of these, four were flotation, three were cyanide, and six were older pan-amalgamation mills incorporating chemical flotation (Gardener and Carpenter 1935). By the 1940s many of the Comstock's mills had either incorporated or were strictly cyanide mills (Stoddard and Carpenter 1950).

Companies of note during this period include the Arizona Comstock Corporation, the Sutro Tunnel Coalition Incorporated, the Dayton Consolidated, the Consolidated Virginia Mining Company, the Consolidated Chollar Gould and Savage Mining Company and Silver Hill Mining Company. Collectively, these companies controlled much of the Comstock. The operations of the Dayton Consolidated, Silver Hill Mining Company, the Consolidated Chollar, and the Arizona Comstock Corporation are discussed below as they typify operations during this period.

3.4.1 The Dayton Consolidated

In September of 1933, the Dayton Consolidated Mines Company was formed, with work beginning in re-timbering the Dayton shaft and construction of a milling plant. The Dayton Consolidated constructed an all-cyanide mill from equipment procured from the Flowery Mill. From the start, the operation had a high recovery rate of 95 percent for gold and 75 percent for silver (Gardner and Carpenter 1935). Ore processing at the mill began in early 1934. In addition to ore from its workings, the mill also processed ore from other companies on the Comstock between 1937 and 1942, adding to the company's profitability. Beginning in 1935, the Dayton Consolidated Mines Company began leasing other properties. The first was the Woodville-Justice Group, located over a mile to the north of the Dayton shaft. Based on a visit to the mine and on accompanying material about its production history, C. G. Clifton, a consulting engineer, wrote of his findings to A. C. Jones regarding the property in a 1933 letter. Clifton indicated that though he had been unable to visit the mine, he recommended the Woodville-Justice Mine as an investment, suggesting the mine be worked through a staged development program. This mine group was later purchased, with the deed received in December of 1941 (S. K. Cunningham & Co. 1948).

A second group of claims was purchased in 1936 from the Comstock-Keystone Mining Company. The Keystone Group, located to the north of the Woodville-Justice Group, was acquired because the lode being worked continued in that direction. A second acquisition, also to the north, was the New York Property of the Consolidated Chollar, Gould and Savage Mining Company in 1940. After the re-conditioning of the shaft in the New York, it was soon connected below ground to the Keystone, resulting in profitable workings between the two shafts (S. K. Cunningham & Co. 1948).

By 1942, properties owned by the Dayton Consolidated had produced 446,312 tons of ore yielding $4,295,614, at an average value of $9.60 a ton. Ore was produced primarily by underground mining at the Dayton (185,428 tons), New York-Keystone (170,000 tons), and Woodville-Justice (60,000 tons) mines. The company also processed 85,818 tons of custom ore shipped to their mill by small operations in the region (Stoddard and Carpenter 1950). In 1942 the Dayton Consolidated began open pit operations on the Dayton mine; these operations were short-lived, closing the same year as a result of Limitation Order L-208 that limited mining due to the war (Nevex Gold Company 1986).

3.4.2 The Silver Hill Mining Company and the Hartford Mine

Situated between the large holdings of the Consolidated Chollar and the Dayton Consolidated were two small open pit mining operations of the Silver Hill Mining Company and the Hartford Mine.

The Silver Hill Mining Company was incorporated in 1872 and since 1899 mined the Lucerne cut located at the base of Hartford Hill. During the twentieth century the Silver Hill Mining Company was managed by members of the Donovan family, first by William Donovan Sr., and after 1922 by William Donovan Jr. From 1899 to 1906, the company operated in the Lucerne pit, producing 60,000 tons of ore from the open cut. In 1912 the Company acquired the Jackson Cyanide Mill in Silver City, which is presently known as the Donovan Mill. The Donovan Mill was operated by the company from 1912 to 1959, processing ore from holdings of the Silver Hill Mining Company as well as custom ores and tailings from small scale mines of the region (Herbst 1980). Production for the years 1922 to 1950 was noted to be $1,200,000 from 2,000,000 tons of ore and tailings (Stoddard and Carpenter 1950).

The Hartford Mine is situated in the Hartford Lode originally located in 1876. In 1933 George Drysdale acquired an option for the property and by 1934 found that there was enough ore from a vein in the Hartford mine, identified as an off-shoot from the Justice fissure, to profitably rework it. A cyanide mill, named for the mine, was constructed between May and August of 1934 with financial assistance from Edward Gunderson of San Francisco (*NMJ* 1934:63[90]5; 1934:63[274]6; *REG* 1934:58[120]6). The Hartford Mine operated between 1935 and 1940, with production of $400,000 from an estimated 72,000 tons of ore extracted from the Hartford Pit (Ansari 1989; Gardner and Carpenter 1935).

3.4.3 Consolidated Chollar Gould & Savage Mining Company

During the 1920s, a corporation named the Comstock Limited began operation as a high risk, high return investment opportunity with plans to re-open the Union Mine in Virginia City. The mining company, a California corporation based in San Francisco, raised capital through its initial public offering of stock. Buildings were constructed, the shaft and hoisting works were refurbished, and exploratory operations were begun as the shaft was stabilized (Comstock Limited, n.d).

Concurrently, the company began a joint venture with the Savage Gold & Silver Mining Company, the Chollar Gold & Silver Mining Company, and the Gould & Curry Mining Company at the Overman Mine in Gold Hill, on what is historically known as the Overman New Shaft (Lord 1980 [1883]). The basis for the venture lay in the idea that a large portion of the Comstock Ledge ran under American Flat, but could not be reached during the height of the Comstock District's boom years due to a very high water table (*SFC* 1929). From 1929 to 1932 many of the buildings necessary for the mine were constructed, including hoist houses for the main shaft and the No. 2 Shaft (which has not been located), an assay office, machine shop, blacksmith shop, office, and living quarters (Roberts 1938). Everything was in order to begin operations, except for the mill, which was constructed the next year by an outside contractor (Grotyohn 1932). In 1932, the company constructed a flotation mill initially rated for 50 tons a day. The company planned to extract and supply the mill with ore from the Overman Shaft. The Overman Shaft, once refurbished, was a three-compartment shaft, with a double-drum hoist and steel headframe (Roberts 1938), running to a depth of 1,100 feet (Grotyohn 1932).

In 1933, Henry L. Slosson, Jr., president of all four ventures, combined the operations to form the Consolidated Chollar Gould & Savage Mining Company. From 1933 to 1940, the company processed old pan-amalgamation tailings and extensively reworked the underground mines. During this period 100,000 tons were processed from underground, and 400,000 were produced from old mine tailings and dumps of the region (Stoddard and Carpenter 1950). Finding the original 50-ton-per-day mill insufficient for the ore deposits that had been located, the company installed a 400-ton-per-day cyanide mill by 1940.

In their annual report to their stockholders for 1939, Fish and Boekel (1940:1-2) discuss the transition of the Con Chollar Mill over the short history of the company. They note that during the years of operation, beginning in 1933, the mill had been enlarged four times, processing from 50 tons using flotation in 1932, to 300 tons using flotation and cyanide in 1938-1939, to 400 tons using complete cyanidation in 1939-1940. During the year 1939, the company completed the "installation of a new crushing unit and slime plant and concentrating tables," creating a "completely integrated cyanide unit rated at 400 tons capacity per day, currently handling a daily tonnage in excess of this figure" (Fish and Boekel 1940). The figures provided for a "Monthly Operating Schedule" production of 3,000 tons from the underground and 9,000 tons from the surface, for a total of 12,000 tons per month, with a 90-percent recovery (Fish and Boekel 1940).

In conjunction with the expansion and modernization of the Con Chollar Mill, the company ceased all underground mining and began operations at the Overman (Con Chollar) open pit. As detailed in the 1940 annual report to the shareholders of the Consolidated Chollar Gould & Savage Mining Company, underground work was suspended "as the ore developed could be subsequently mined by power shovel at an 80% reduced cost" (Fish 1941:1). The change in operations was based on knowledge gained through the underground mining, indicating that the presence of a large ore body 250 feet wide by an unknown length was located within 100 feet of the surface. This resulted in the development, in 1940, of a large-scale surface mining operation to expose the ore body.

Fish (1941:2-3) discusses the benefits of changing operating methods from underground to open pit mining, noting that continuing with underground methods of extraction on the ore body would have resulted in leaving substantial portions of the ore because it would have been considered "too low-grade to be of commercial value." Using the open pit mining method would recover all of the ore present and generate a "net operating profit in excess of $2.59 a ton" for this area alone. It was estimated that this portion of the Company's holdings would be operating for more than ten years. He further noted that the Company's engineering department was working toward determining how the power shovel could be effectively used, resulting in minimized taxes and maximized productivity.

Large-scale mining operations began at the site of the Overman (Con Chollar) Pit in 1940. The first phase of work to expose the ore body resulted in the removal of about 500,000 yards (805,000 tons) of overburden at a cost of $0.12 per yard. Ore and waste rock were extracted using a Northwest power shovel and transported to the mill by a fleet of 20-ton trucks, operated by the Nevada Rock and Sand Co., Inc. located in Reno (Figure 3.8; Russell 1941). The pit size at year's end in 1940 was 540 feet long by 250 feet wide, with a maximum depth of 125 feet, set at 90 degrees to the vein. By year's end, production of ore from the Overman (Con Chollar) Pit was noted to be 400 to 450 tons daily (Fish 1941; Russell 1941; Stoddard and Carpenter 1950).

In 1940, the Consolidated Chollar Gould & Savage Mining Company leased the Imperial Pit from the Sutro Tunnel Coalition, Inc., a subsidiary of the Comstock Tunnel & Drainage Company. The projected daily yield was estimated at 300 tons per day. The pit was located near the Company's Crown Point Mill (Fish and Boekel 1940:2-3). This project never came to fruition, as in 1942 the Sutro Tunnel Coalition Inc. began its own open pit operation at the site (Stoddard and Carpenter 1950).

Figure 3.8 Power Shovel and 20 Ton Truck operating in the Overman (Con Chollar) Pit 1941 (Russell 1941).

From 1869 to 1938, the Virginia & Truckee Railway (V&T) had hauled passengers, freight, and ore between Carson City and Virginia City (Ferrell 1999). In 1938, due to declining demand, service was suspended from Mound House to Virginia City, and several "final" excursion trains were run for railroad enthusiasts wishing to be a part of the last bonanza railroad (Ferrell 1999). The tracks were left in place after this run, but to all outward appearances the railroad had been abandoned (Barton 1939). Between the Overman (Con Chollar) Pit and the Consolidated Chollar mill, the V&T bisected the ore haulage road, creating a steep grade and sharp dip over the tracks, which was similar to the highway crossing near the Gold Hill depot (Barton 1939). In 1939, a contractor working as an ore hauler for the Consolidated Chollar in the Overman Pit took it upon himself to ease the transit of ore and covered the tracks with a very large fill (Barton 1939). This was quickly discovered by the V&T, who began a series of correspondences with the Consolidated Chollar Company to rectify the situation, culminating in the ultimate removal of the rail system (Ferrell 1999).

The Consolidated Chollar Company continued operations until World War II. Although the operation was exempted from the closures mandated under Limitation Order L-208, it was due to a scarcity of labor and materials that operations at the Consolidated Chollar mine ceased in 1944. In 1946 the mine restarted operations with production of 300 tons per day, and by 1948 had restored operations to 400 tons per day. In 1948 the open pit had a maximum dimension of 1,000 feet long by 800 feet wide, with a depth of 300 feet (Figure 3.9). Although archival documentation is sparse, the Overman (Con Chollar) Pit was operated by the company until at least 1949, and likely into the 1950s (Con Chollar 1949; Stoddard and Carpenter 1950).

Figure 3.9 The Con Chollar (Overman) Pit - USGS 1948 Air Photo: Flight Frame 1-120 GSHF.

3.4.4 The Arizona Comstock Corporation

The Arizona Comstock Corporation was formed in 1933, leasing the Chollar, Potosi, Savage, and Hale & Norcross from the Sutro Tunnel Coalition, Inc. In 1933 the company constructed a 110-ton-per-day flotation mill and supplied the mill with ore produced from the underground workings of the Hale & Norcross tunnel (Gardner and Carpenter 1935; Stoddard and Carpenter 1950). The first year's results showed a low tonnage yield of 13,539 at a value of $4.28 a ton. To lower the cost of production and to increase the flow of ore to the mill, the operation shifted from underground to surface (open pit) mining. Ore was extracted using a power shovel and transported to the mill on 10-ton trucks (Loring 1936).

The operation was successful in extracting and processing the low-grade ore at an overall low cost, but little profit was realized due to the antiquated mill technology. In a report of the Arizona Comstock Corporation's first two and three-quarters years of operation, Loring and McFarland (1937) discuss the problems encountered during the milling process. After providing figures of the tonnage milled and the cost of processing from 1935 to September of 1937, they attributed the low profits realized to several reasons. These included an obsolete crushing plant and the lack of funding available for the installation of a concentrate treatment plant for the production of bullion so that money was spent in drying the concentrate and shipping it to a smelter in California. Additionally, it was noted that not only was the plant obsolete, but it was also incomplete, and accordingly the cost to process each ton of ore was higher than it should have been.

It was requested that funding be provided for the construction of a modern crushing facility and cyanide plant (Loring and McFarland 1937). There would be an increase in cost per ton of ore with a new crushing plant and the treatment of tailings with cyanide. However, this method would result in more tonnage being processed with an increase in the recovery of the gold and silver ores. During the period of operation, 81.24 percent of gold and 56.56 percent of silver was recovered for a total recovery of 70.35 percent. According to lab results, a modernized cyanide mill would have raised the recovery 22 percent, recovering approximately 92 percent of the precious metals from the ore (Loring and McFarland 1937). Additionally, a modernized cyanide mill would have allowed the company to produce ingots on-site rather than outsource the ingot production from the concentrate produced by the flotation mill. Funding for the cyanide plant was never secured, and by 1938 the operations of the Arizona Comstock Corporation ceased (Stoddard and Carpenter 1950).

3.4.5 Limitation Order L-208 and World War II

During the period from 1933 to 1942 eight open pits had been developed. From south to north along the Comstock Lode, the pits included the Dayton, Donovan's (Lucerne Cut), the Hartford, Overman (Con Chollar), Imperial, Loring Cut, and Kendall (Stoddard and Carpenter 1950). Of these, the largest and most productive was the Con Chollar, with dimensions noted above.

Unfortunately for these and other precious metal mines in the United States, operations were soon identified as non-essential for national defense following the entry of the United States into World War II in December 1941. Early in 1942, it was known that nonferrous materials such as copper were in short supply, along with the materials and machinery needed for their production. Gold mining was eventually classified at the lowest priority rating for supplies and machinery by the Office of Production Management and its successor, the War Production Board (WPB). In addition to the materials and machinery, skilled labor was greatly reduced due to the military draft and opportunities with higher pay in other industries. It was thought that closing down the gold mines would result in the miners moving into positions in nonferrous mining. Therefore, on October 8, 1942, the WPB (War Production Board) issued Limitation Order L-208, which was addressed solely to gold mining. Those in charge were to begin procedures for closing down their respective mines' operations immediately, with a 60-day period for complete cessation of all gold mining operations. This period would allow for necessary activity for the maintenance of "buildings, machinery and equipment, and to keep the workings safe and accessible" (357 U.S.155, 158-160). Exceptions were allowed, including letting select mines continue operating.

On November 19, 1942, the order was amended with a proviso allowing the sale of machinery or supplies only with the permission of WPB officer. As part of this, mine superintendents/ managers were required to provide inventories of their equipment, noting those machines that could be rented or sold. This proviso was augmented by a second amendment on August 31, 1943 that permitted mining companies to dispose of equipment without WPB permission to individuals who had specific preference ratings. Order L-208 was in effect until its revocation on June 30, 1945 (357 U.S. 155, 161).

3.4.6 Post Limitation Order L-208

There is limited data available regarding work done after World War II by most of the mining companies noted above. The effects of L-208 and World War II were seen across the Comstock as only three mines appear to have resumed production. These included the Consolidated Chollar, the Donovan, and the Dayton Consolidated (Stoddard and Carpenter 1950). Although many of the mines of the region were generally considered economic failures, Stoddard and Carpenter (1950) indicate that in 1950 the operations at the Consolidated Chollar were a story of survival.

Since the start of operations in 1933 there has been milled a high total of over 1,400,000 tons for a recovery of $4,000,000. In spite of the war, that proved disastrous to so many precious metal operations, the company has levied no assessments, and while no dividends have been paid it has expanded from a 50 tons a day underground operation with a small flotation mill to a 400 tons a day open-cut mine with a large and efficiently operated cyanide plant. The conception and operation of such a project and overcoming unforeseen war obstacles reflects great credit upon Mr. T. V. Barton of the San Francisco office and Mr. F. V. Dempsey, the mine superintendent. (Stoddard and Carpenter 1950)

Production records for the region suggest that by 1952 mining on the Comstock was virtually non-existent with only 14 tons of recorded production for the entire region (Smith 1998). Production records for the region did not significantly increase until the 1980s as a result of the Houston Oil and Minerals' re-opening of the Imperial Pit in 1978 and United Mining Corp.'s operations at the New Savage Mine, an underground operation (Smith 1998).

3.5 TOURISM AND MODERN MINING (1946 TO DATE)

Reno's infamous migratory divorce trade, which lasted from 1900 to the late 1960s, supplied scores of captive tourists to the old mining camps at Virginia City and Gold Hill. These people were confined in Nevada during the residency period required by law in order to get a quick Nevada divorce. The residency periods changed over time, from six months until 1927, three months between 1927 and 1931, to six weeks from 1931 on (Harmon 2008).

The 1937 arrival of folklorist Duncan Emrich in 1937, followed by the opening of the 1940 film *Virginia City*, starring Errol Flynn, Randolph Scott, and Humphrey Bogart, attracted the attention of a certain class of people who found the Comstock to be a place where personal freedom was easily tolerated. Lucius Beebe and his lifelong companion Charles Clegg settled in Virginia City among an interesting mix of local characters, Eastern socialites, artists, and writers. Emrich began recording interviews with some of the old-timers, while Beebe and Clegg bought the rights to the *Territorial Enterprise* and resurrected the famous newspaper that had given America Mark Twain (James 1998a:260-261).

The event that secured the Comstock's role as a tourist destination was the television show *Bonanza*, which ran for 440 episodes beginning in 1959. The television show aired on the 100- year anniversary, commemorating the discovery of the Comstock Lode. Tourists arrived expecting to see the Cartwrights, and in response, property owners on C Street, Virginia City's main street, installed pecky-cedar storefronts to match the fictional Virginia City. While *Bonanza* reigned in American popular culture, the growing counterculture of the 1960s happened on the Comstock, finding the same sense of freedom discovered two decades earlier. The Red Dog Saloon in Virginia City became a popular hangout featuring the likes of Janis Joplin and Big Brother and the Holding Company, as well as the Charlatans (James 1998a:265-266).

In 1961, the National Park Service designated the Comstock as a National Historic Landmark, based on information collected by the Historic American Building Survey in the early 1940s. When *Bonanza* finally ended, tourism on the Comstock slowed, forcing residents and business owners to take stock of the remaining historic buildings, which they had come to see as vital to the tourism industry. From this recognition came the establishment of the Virginia City Historic District Commission in 1969 which today goes by the name of the Comstock Historic District Commission (James 1998a:268).

While tourism continued to draw visitors, the increasing price of gold since in the late 1970s forced a new look at the feasibility of mining within the region. In 1978 the Houston Oil and Minerals Company re-opened the Imperial Pit at the western edge of Gold Hill. Public opinion regarding the enterprise was mixed; and by 1982, operations ceased after much controversy (James 1998a:269). Since the 1970s several mining operations have proposed reviving mining on the Comstock. These operations, although consistent with the historic use of the region, have sparked the debate on how mining and tourism can co-exist.

3.6 SUMMARY

The history of the Comstock is defined by the bonanza and borrasca cycle typical of the mining industry. This cycle results from numerous factors that affect the profitability of mining as mining will occur only if precious metals can be extracted profitably. The factors influencing precious metal mining operations include the value of precious metals, the nature of the ore, the available technologies for mining and processing ore, and the cost of labor, materials and transportation. Over the long history the Comstock, these factors were always changing. The introduction of new technology or a spike in the value of precious metals could be expected to result in an increase in mine production for the region, and was commonly the case. One piece of information clearly illustrates the volatility of mining in the region: tons produced per year (Figure 3.10).

Data on the tons produced per year across the Comstock for the years 1859 to 1959 correlate well to the major periods of mining on the Comstock: The Bonanza and Post-boom Renewal of mining. Also indicated by the data are the substantial effects of the post-boom decline of mining of the borrasca on the Comstock from 1880 -1900, the Great Depression, and World War II.

As precious metal prices continue to stay at historically high values, so does the value of Comstock ore. Accordingly, these high precious metal values have renewed mining interests in the region.

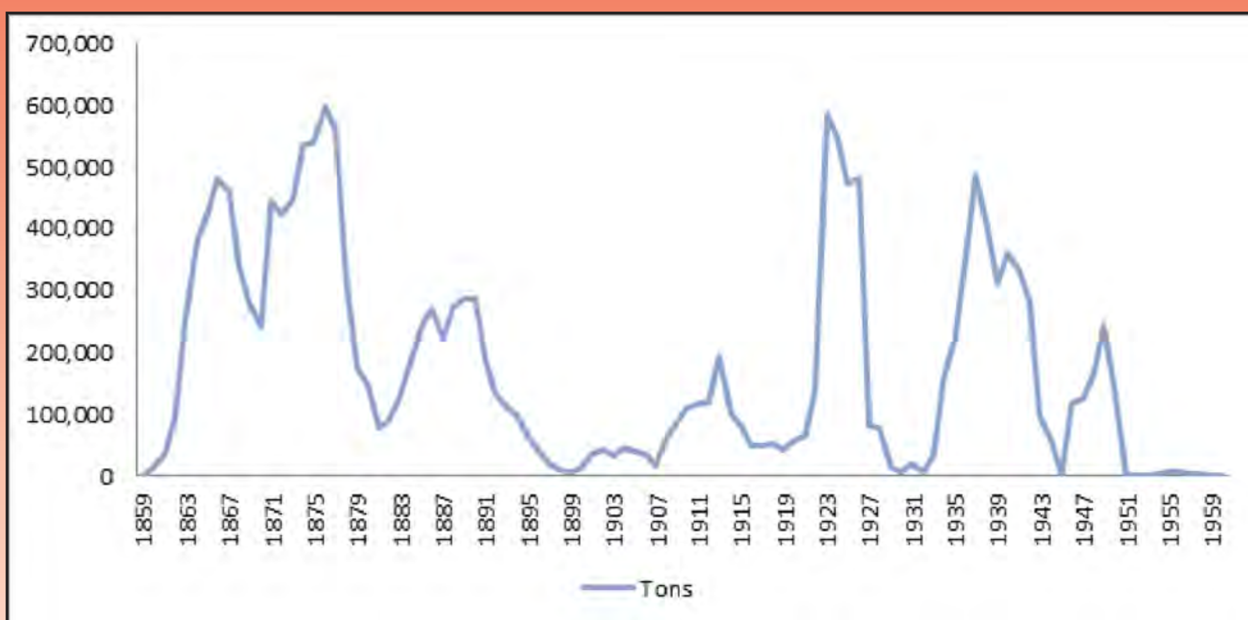

Figure 3.10 Tons Produced Per year 1859-1959, compiled from Smith 1998.

4.0 HISTORIC RESEARCH THEMES

General historic research themes, domains, questions, chronological periods, geographic areas, and property types applicable to the current project area are summarized and discussed by James (1998a, 2012), Smith (1998), and Hardesty (1988, 1998a, 2010), among others. The historic research themes particularly relevant to the sites within the region include *Mining Technology, Transportation and Communication, People, and Community Planning and Development* (Spidell et al. 2014).

4.1 MINING TECHNOLOGY

The current project area lies within the heart of the Comstock, a nationally significant mining district. The lode deposits of the Comstock were unlike the preceding placer deposits of the California Gold Rush, which could be mined on a small scale with few resources. The Comstock's ore, occurring as a lode deposit, required the development of extensive underground mines. Furthermore, the ore required protracted processing before bullion could be produced. The complex ore deposits of the Comstock resulted in the development of a large-scale industry to mine, process, and produce bullion. The mining technological system pioneered on the Comstock was subsequently recreated throughout the western United States as similar deposits of ore were located elsewhere.

Hardesty (2010) divides mining technology into two distinct categories, extraction and beneficiation. The technological system of extraction includes the means by which ore was prospected, mined, and transported to a processing facility where beneficiation would occur. Beneficiation involves the technologies used to separate, crush, concentrate, smelt, and/or chemically process the ore. The expression of mining technology is present in all aspects of the material record.

The mining technological systems employed on the Comstock were continually incorporating and adapting new technologies to increase the rate of ore extraction and improve the recovery of precious metals. These technological advancements were made necessary by one constant across the history of the Comstock Lode; the average grade of ore declined over time. Data on the major periods of mining (Smith 1998; 315-318) indicate that the average grade of ore extracted during the Comstock Bonanza (1859-1879) was valued at $59 a ton. By the post Boom Renewal and L-208 (1901-1945) period of mining the average grade of ore significantly decreased to an average of $8 a ton. Technological advancements in both extraction and beneficiation (Noble and Spude 1997:11) of ore mitigated the impact this decline in ore value had on the mining industry by lowering extraction costs and increasing mill returns thereby creating profit.

Each of the principal phases of mining on the Comstock is associated with specific technological systems of mining. During the earlier "Comstock Bonanza" phase of mining (1859-1879), extraction of ore was accomplished by underground mining and beneficiation of ore using the Washoe Pan, or less commonly the Freyberg Process. The Post-Boom Renewal and L208 phase of mining (1901-1945) is associated with the transition from underground mining to surface/open pit mining for ore extraction and the use of the chemical flotation and/or the cyanide process for the beneficiation of ore. The technological systems employed during various phases of mining had direct implications on the type of workforce employed, the structure of the community, and the development of infrastructural networks. It is through the study of mining technology that these aspects of historic mining settlements gain context.

The Comstock is a historic mining landscape that has been shaped and modified by mining-related activities, and is characterized by the presence industrial mining features, sites, structures and buildings (Noble and Spude 1997). Mining landscapes are complex resources, the result of sporadic boom and bust cycles of mining, shifts in extraction and beneficiation methods and further complicated by reclamation, reprocessing and reuse of preceding resources.

Francaviglia (2004) characterizes the typical phase of mining and their resulting effects to the mining landscape. The initial exploration phase is characterized by prospecting efforts scattered throughout a region. Mining-related features associated with this phase often are obliterated during the following initiation phase when mining operations greatly expand in scope and generally are directed towards production focused upon the most easily exploited mineral deposits. After about 10 or 15 years, this "bonanza" or boom period may be followed by a diversification phase. During this period, which can last up to 25 years or more, lower-grade ores usually are exploited, using more efficient processing, concentrating, and smelting techniques. Development of large, low-grade ore deposits characterizes the subsequent intensification phase. This generally takes the form of large-scale open pit mining, which usually produces major reworking of the mining landscape. This phase may last 40 to 50 years. Cessation is the phase marking the end of mining activities, followed by mining landscape alteration, resulting from natural processes such as erosion or from planned reclamation efforts.

The history of mining across the Comstock embodies the five phases of mining described by Francaviglia (2004). Locally, these phases are divided into Pre-Comstock prospecting (1849-1858), the Comstock Bonanza (1859-1879), Depression and Decline (1880-1900), post Boom Renewal and L-208 (1901-1945), and Tourism and Modern Mining (1946-date).

The architectural and archaeological mining resources of the Comstock are individual components within the historic mining landscape (Hardesty 2010; Noble and Spude1997). The problem presented to researchers studying historic mining landscapes and their individual components is that early phases of mining have commonly been altered by following periods, resulting in a landscape that is most representative of the last, most recent phase of mining activity (Francaviglia 2004:46-49). Preceding phases of mining can be difficult to readily identify without a proper understanding of context (Noble and Spude1997:3-5). Seriation of resources in such a landscape is possible through the identification of technological systems associated with features, sites, structures and buildings.

Hardesty (2010) suggests that research concerning historic mining is best approached by combining relevant data derived from the archaeological, architectural and documentary records. The archaeological resources associated with mining technology include simple prospecting locations, mining complexes exhibiting feature systems, and the remains of ore processing/beneficiation sites. In the case of the Comstock, many architectural resources remain well preserved. Those resources associated with mining technology include headframes, ore bins, mills and processing/beneficiation facilities. The architectural and archaeological resources of the Comstock are further complemented by an extensive documentary record. The documentary record includes information contained in plat maps, company records, diaries, professional and technical journals, government records, secondary accounts, newspaper accounts, and census records (Hardesty 2010:1-8).

Although much exists within the documentary record regarding the history of mining on the Comstock, because of the extensive dismantling of industrial buildings and equipment in addition to the re-working of the "Comstock Bonanza" period mines, few industrial components dating to the Bonanza period remain. Consequently, mining complexes and landscape features that retain integrity and date to the Bonanza period of mining are of particular importance to the region. Where these resources retain a high degree of integrity as a "feature system," they possess the ability to inform researchers about the technological system employed (Hardesty 2010).

<u>Research Questions</u>:

- What types of historic resources are present that directly or indirectly result from mining activities? Do these resources allow for a distinction to be made between Bonanza Era mining and later development and reworking activities so that the phase of mining technology can be deciphered?
- Are nationally important events, such as the Great Depression and World War II, expressed in the types of artifacts and features encountered or their sequence? If so, how did these events

affect the operations of mines and the lives of miners on the Comstock?

- Are mining-related resources linked to larger support systems such as transportation networks, infrastructure features, mills/smelters, businesses, or residences? If so, can these support systems be correlated with mining development occurring during particular periods so that information regarding the relationship between local industry and the world system over time may be better understood?
- What type(s) of mining exploration, extraction, and/or development took place (e.g., small-scale, large-scale, placer mining, lode mining, open pit mining, low tech, high tech, individual, corporate funded), and what implications might these have in regard to the technology, numbers of workers present, and the types of work conditions they might have experienced?
- Are features, sites, structures and buildings present from various periods of use that allow for an understanding of the development and evolution of the historic mining landscape? If so, what information can be derived from the evolution of the landscape in relation to the methods of extraction?
- What is the nature of refuse scatters associated with past mining? What type are they (e.g., household, industrial, commercial, mixed)? What are their basic attributes (e.g., size/amount of deposit, diversity/variability, surficial/buried, raw/burned [c.f. Majewski 2005; California Department of Transportation 2008:109-110])? Do refuse scatters exhibit patterning such as a random scatter vs. the presence of concentrations? What temporal parameters are represented? Do such scatters provide evidence regarding the lifeway of the miners and/or their families? Is the feature represented as sheet refuse or as a hollow-filled feature?
- What architectural styles are represented in the district or its immediate region? Can a specific vernacular architectural style be identified?

4.2 TRANSPORTATION AND COMMUNICATION

The Transportation and Communication theme is concerned with the various infrastructural networks such as transportation, communication and utility systems, that developed to serve the remote communities of the Comstock. This theme centers on the movement of information, materials, and people, and the development trajectories of networks that existed historically. The development of transportation and communication corridors was particularly important in the remote mining communities of the Comstock as these transportation corridors provided a connection to the larger world system (Hardesty 1988:1). Initially, Virginia City and Gold Hill were accessed by a network of emigrant mail and freight roads that had been established early on, and subsequently, intra-regional travel was driven by the growth of the Comstock and the connection to mills that the mining companies established along the Carson River and in Washoe Valley (Ratay 1973, 1984). As the needs of the region expanded, a large infrastructural system was developed, including numerous ancillary roads, utility lines, toll roads, the Virginia & Truckee Railroad, and the Marlette Water System. Infrastructural systems played in integral role in the success of the mining industry and the establishment the community.

The introduction of the Virginia & Truckee Railroad in 1869 illustrates the far-reaching effects that infrastructural developments can have. The Virginia & Truckee Railroad was ultimately completed during a period of declining ore grades. Prior to the construction of the railroad, ore was transported to mills along the Carson River and in Washoe City by wagon at a cost of $3.50 a ton. The railroad charged $2 a ton (a 43% savings) to transport ore, allowing lower grades of ore to be profitably mined, extending the life of many mines across the region (James 1998a:83). The railroad produced additional effects as a result of lower freight costs. Since the railroad did not serve Washoe City, the mills located there could not compete due to the costs to haul ore charged by teamsters and packers, forcing the mills to shut down. The teamsters and packers were unable to compete with the low haulage rates charged by the railroad leading to the end of a line of work that had been vital since the early days of the Comstock (James1998a: 84).

The data requirements of the research domain of transportation and communication are largely linked to objects and features (linear and otherwise) associated with the transportation and communication networks. Transportation and communication-related data are represented by the presence of wagon parts, road grades, railroad spikes, loading platforms, telegraph/ telephone poles and wire, and so forth. Integrity is a major concern. Telegraph wire and railroad rails, ties, and spikes, frequently were recycled or collected. Unpaved roads can be modified through subsequent human activity and natural forces such as impacts by dirt bikes, four-wheel-drive vehicles, or natural erosion. Without supportive data in the form of historic maps or clearly associated features such as peripheral trash scatters, the temporal affiliation of unpaved roads can be highly hypothetical. The importance of transportation and communication as a research domain requires that maximum information be extracted from often ephemeral data.

<u>Research Questions</u>

- What is the historic developmental trajectory of the transportation network? In particular, how did the trail, road, and railroad networks develop, in what order, and what are their archaeological and geographic parameters?
- What types of historic structures, feature systems, or features are associated with the transportation network?
- How did historic and modern land use influence the development of historic transportation corridors and infrastructural elements in the general vicinity of the project area?
- What is the historic development trajectory of communication and utility corridors? How did the introduction of telegraph/telephone and electricity affect the community and/or mining industry?
- Is it possible using information from Shamberger (1969) and elsewhere, as well as field data, to use modern GPS to reconstruct the location of various water supply systems (and road, rail, etc.) to illustrate the development of these systems throughout the Comstock?

4.3 PEOPLE

While much of the life on the Comstock has been chronicled by historians, and Virginia City has reached the mythical status of a Wild West town in the eyes of tourists, the lives of the miners and everyday support people of Gold Hill remain largely undocumented. Some historical works are factual and/or autobiographical in nature such as Lord (1959[1883]), De Quille (1985[1876]), and Mathews (1985[1880]), while others serve as the basis of myth that surrounds the early days of the Comstock. The fictional embellishments of the *Territorial Enterprise* helped in no small part to secure the mythical status of Virginia City and the Comstock in the public domain. Mark Twain admitted in 1868 that, "To find a petrified man, or to break a stranger's leg, or to cave an imaginary mine, or discover some dead Indians in a Gold Hill tunnel, or massacre a family at Dutch Nick's, were feats and calamities that we never hesitated about devising when the public needed matters of thrilling interest for breakfast. The seemingly tranquil *Enterprise* office was a ghastly factory of slaughter, mutilation and general destruction in those days" (*Virginia City Territorial Enterprise*, 7 March 1868, in Scharnhorst 2010). Given the abundant and sometimes misleading historical record available for the Comstock, the archaeological record stands as an invaluable source of objective information on the daily lives of people.

Over the past 20 years or so, historical archaeology has begun to dispel the myth of the Comstock. James (2012) presents a comprehensive summary of the progress made by numerous archaeologists in recent years. Under the direction of Don Hardesty, graduate students from the University of Nevada, Reno have conducted excavations at Piper's Opera House, four boomtown saloons, and a Chinese mercantile, the results of which reveal a picture of the Comstock not portrayed in regional histories (Axsom 2009; Dixon 2005; Memmott 2004). Hardesty, using the information garnered from research on Virginia City and the Comstock, among other mining districts, has advanced the theoretical basis of industrial archaeology specifically for mining in the American West (Hardesty 1988, 2010).

The theme of people encompasses many interrelated subjects including ecology, technology and the workplace, ethnicity and place of origin, class, and *laissez faire* individualism (Hardesty 2010:110). Mining communities inherently present a social variability and demographic structure not present in other types of communities (Hardesty 2010: 110). Consequently, the archaeology of mining households is a focal point in the study of historic people, as these features contain the physical remains of this unique aspect of mining communities (Kautz 1989; Hardesty 2010: 134).

The type of community that existed prior to and initially following the discovery of the Comstock Lode in 1859 was comprised primarily of single men who possessed a poor sense of community and were driven by *laissez-faire* individualism (Hardesty 2010). However, due to the success of mining, the Comstock Lode and the communities that developed changed in character. By 1860, the disorganized tent city that was the humble beginnings of Virginia City gave way to a proper city made of wood, stone, and brick houses. From 1860 to 1870, the composition of the population also radically changed, reflecting a diversification of the community and a greater connection to the world system, so that by the 1870s, due to industrialization, the proportion of miners had dropped to less than half of the overall population (James 1998a:91). The community that formed was clearly divided by class, ethnicity, and occupation, following a locally formulated hillside social stratification that correlated social status to geographic elevation.

Mining communities were subject to the boom and bust cycle of the mining industry and exhibited characteristic isolated "island" networks (Hardesty 1988:111). As a result of these factors, the populations of mining communities employed coping strategies that include opportunism and resiliency, forming the principal components of a "coevolutionary" model of adaptive change (Hardesty 2010:180-187).

Specifically important for understanding the people of the Comstock are artifacts and features that indicate gender, ethnicity, occupation, and class of historic-period people. The most important archaeological correlate with data potential for the understanding of historic people is residential or household features such as foundations, tent platforms, privies, and dugouts with their associated artifacts. Where these features exist with a high degree of integrity, there exists the potential for intact buried deposits. The archaeological record can be complemented by historical records, including census data, historic maps, and tax records, among others.

<u>Research Questions</u>

- Are there artifacts present that indicate gender, age, ethnicity or occupation? If so, can a relationship be established between person and place?
- Are there habitation features present? What forms are they expected to take, temporary or permanent; owned or leased; single or multiple occupation, etc.? What implication does this information have regarding the socioeconomic status of the inhabitants?
- What is the association between site features and artifacts? What does this relationship indicate regarding the function of the site?
- Are there exotic or prestige items that can be associated with a high monetary cost such as grave treatments, imported goods, and/or specialty foods? What do these artifacts or features indicate about the values historic peoples placed on them?

4.4 COMMUNITY PLANNING AND DEVELOPMENT

The formal development of communities within mining districts presents a unique opportunity for historic research. In contrast to the historic pattern of development for most regional centers near the resources available to sustain a large population, mining towns generally developed in remote regions, in many cases, places not ideally suited to sustain large populations. The type of communities that developed in these remote environments were composed of social and cultural groups unique to mining communities.

Within the region several towns developed in close proximity; however, each expressed different and unique characteristics. Virginia City and Gold Hill were the centers of underground mining and milling. Lacking its own local "bonanza," Silver City served as a residential and milling center while American Flat never fully developed into a lasting town site. Although only three of the four towns presently exist, all four find expression in the archaeological record.

As the theme of People focuses research at the household level, the theme of Community Planning and Development focuses research on the relations between social and cultural groups, their settlement patterns, and the implications these factors have on the abstract concept of "community." Though frequently treated as a simple "work camp" (California Department of Transportation 2008:106; Gillespie and Farrell 2002) in less complex contexts, the Comstock landscape presents a far more complicated system of integrated localities.

The settlement patterns of historic mining towns result from the abstract concept of "community" (Hardesty 1988:13). Hardesty (2010:109) suggests that social networks and cultural identity are the underlying factors that shape a "community" and ultimately influence the settlement patterns of mining towns. The archaeological remains of mining towns comprise the physical evidence of these settlement patterns, and the utility of studying settlement patterns lies in the potential to understand these factors of the "community."

The abstract concept of community influenced the settlement patterns of mining communities, and is historically documented in the devolvement of Virginia City. Laid out on a grid pattern on the eastern slopes of Mount Davidson, the settlement pattern of Virginia City often related physical elevation to class or economic standing (Kautz 1989). Wealthy residences occupied the upper limits of the city, followed in descending geographic and social order by the commercial and government district, the working class neighborhood, the red light district, and finally Chinatown (Hardesty 1988:13).

Among the types of historic sites associated with this theme are the archaeological remains of residential and commercial buildings, historic residences and businesses, water system features, and utility lines. Data categories include archival documents providing information concerning settlement activities (e.g., GLO records, property titles, assessment and tax records, and so forth), along with historic artifacts in clear association with habitation structures and features to establish date ranges for periods of use, numbers of people involved, and their lifeways. The primary value of such sites and features lies in their research potential to contribute information regarding the history of settlement patterns as they relate to demographics, social networks, and cultural identity. In some cases, extant structures and features also may embody distinctive characteristics of a type, period, or method of construction.

Research Questions

- What is the patterning of historic settlement in the project area with respect to social networks, and cultural identity?
- When did settlement take place, and what are the temporal parameters of its principal events/trends?
- What types of historic structures occur? What sorts of historic structural remains occur?
- How does community development correspond with the development/location of historic infrastructure and transportation/communication features?
- Are documentary and archaeological data available allowing delineation of economic and social relationships between the mining industries and various support services, especially those concerning mining-related communities, work camps, and the like?

As the Comstock was primarily an industrial landscape, what can be learned about the development of the community by the placement of residential and industrial structures?

5.0 RECOMMENDED TREATMENT PROTOCOLS

This section outlines the general treatment protocols deemed appropriate for National Register eligible sites within Virginia City Historic District (VCHD), and it provides field and laboratory methods for fulfilling treatment. Historic properties recommended eligible for the National Register of Historic Places within the VCHD have been recommended eligible under Criteria A, C, and/or D. Different treatment protocols are deemed appropriate for each of these criteria.

5.1 GENERAL PROPOSED TREATMENT PROTOCOLS

Those properties eligible under Criterion A are deemed significant for their association with events that made a significant contribution to the broad patterns of history. Treatment measures for those sites that relate to significant events are focused first upon defining and understanding the site's relationship to the event, and second to increasing public awareness by making such information available in a forum that is easily understood and relevant to contemporary persons. A significant aspect of this treatment is archival research. When integrity of feeling, setting, and association are deemed particularly important for resources eligible under Criterion A, an attempt is made to preserve some form of these aspects of integrity in order to provide current and future generations with a "sense" of the historic property as it was during its period of significance. Transmission of this information may be accomplished through written reports or pamphlets, public education, websites, interpretive signage, or even oral presentations.

Those properties eligible under Criterion C are deemed significant because they embody the distinctive characteristics of a type or method of construction, represent the work of a master, possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction. Preservation of materials and design methods is most appropriate here. However, in the event that preservation of the physical materials is not possible, then the most appropriate treatment measure is the documentation of the *knowledge* of the design. This documentation includes understanding the type, method, or style, and making that information available to the public. Documentation may be accomplished through data recovery, photographic documentation, detailed mapping, and public education. As with Criteria A, mitigation protocols may include public education, written reports and pamphlets, websites, interpretive signage, or oral presentations.

Those properties eligible under Criterion D are deemed significant because they have the potential to yield information important in history. Data recovery is regarded as the most important treatment measure for these sites. Data may be gathered through archival research or by investigations at the physical location of the site such as excavation. Association is considered most important here, either association between the site and the archival record, or association between individual artifacts or features within the site. For historic components eligible under Criterion D only, both archival research and on-site data recovery procedures are critical. On-site data recovery can be accomplished by detailed site mapping using sub-meter GPS location, detailed photography and sketches of extant features, detailed surface artifact recordation, and subsurface investigations where appropriate. Since the manufacture of many historic artifacts is standardized through technological innovation, the collection of all historic artifacts on a site is not deemed appropriate. Rather, the most effective means of data recovery from surface artifacts is considered to be the detailed on-site recordation of the artifacts and the collection only of those materials that are unusual, non-standard, or for which manufacture or function is unclear.

Subsurface investigations may be accomplished through the use of a metal detector to identify subsurface features and shovel scraping and hand-excavation. A metal detector will be employed only at those site locations where there is an expectation, based on the historic activities conducted there, for subsurface metal items or features to be present. Hand excavation units will be placed only in those site locations in which there is a possibility for the presence of *intact, stratified* subsurface materials.

5.2 CONTRIBUTING ELEMENTS TO THE VIRGINIA CITY NATIONAL REGISTER HISTORIC DISTRICT

Sites recommended as contributing elements of the Virginia City Historic are so recommended based on their association with mining developments on the Comstock Lode (James 1991). The Virginia City Historic District is listed in the NRHP as eligible under Criterion A and C. The proposed amendment to the VCHD presented in Spidell et al. (2014) recommends that the current NRHP listing be amended to include historic archaeological resources as an Area of Significance, and to expand the District's NRHP eligibility to include Criterion A, B, C, and D. As no elements of the District discussed as part of the Undertaking have been recommended as contributing elements under Criterion B, no mitigation measurers are presented herein for Criterion B.

Those elements that contribute under Criterion A are related to mining and other pursuits for which the Comstock Lode was nationally recognized. These resources must retain sufficient integrity to convey their association, and date to the period of significance, 1859 to 1942. Elements that are considered to contribute under Criterion C are those elements that are either stylistically unique, or exemplary of architectural or industrial/technological methods of construction, or those elements that comprise the *rural historic landscape* but which may lack individual distinction (McClelland et al. 1999:15). Those elements that contribute to the District under Criterion D, posses data potential to address research questions developed for the District.

The mitigation of effects under Criterion A may include the following activities which, in combination, can then be used to educate the public regarding the history of mining and those activities conducted in support of the mining district. Mitigation of effect under Criterion A may include:

1) detailed site/feature mapping

2) hand sketches and color digital and black/white photography

3) archival research

4) inclusion of this data in the technical report available to the public

5) development of a public display or interpretive marker

6) development of an educational unit or lesson plan

The mitigation of effects under Criterion C may include the following activities:

1) archival photo documentation

2) architectural, engineering, land surveyor level documentation

3) archival research

4) incorporation of historic landscape reconstruction into CM's reclamation plan

Mitigation of effects under Criterion D may include the following activities:

1) archaeological and/or archival data recovery

2) public/museum displays at approved repositories

Public out-reach projects, which can draw on information derived from a combination of the above activities, will also be conducted under the theme of "multiple-use." As the Virginia City Historic District attracts numerous tourists, public outreach that is completed in an accessible and successful manner can be a powerful mitigation tool. On the Comstock there are several modern examples of successful mitigation efforts for cultural resources. These include the relocation of the Keystone Headframe, the installation of several interpretive markers at the north end of Virginia City, and the installation of six interpretive markers at the Cabin in the Sky.

5.2.1 Visual Effects: Rural Historic Landscape Treatment

Project related disturbances resulting from non-compatible land use practices (McClelland et al. 1999: 22) or resulting in the physical removal of contributing elements of the *Rural Historic Landscape* may affect the aspects of integrity of setting, feeling, and association for historic properties that contribute to the Virginia City Historic District.

Therefore, sites within the area of indirect effects that are eligible under Criteria A, B, or C may also require treatment addressing those aspects, even if the sites will not be directly (physically) impacted. In some cases, the appearance of the landscape from these sites may be altered significantly. Visual impacts may occur to Historic Properties outside of the area of direct affects. Accordingly, these Historic Properties may also require treatment.

The preferred method of treatment of visual effects is to minimize the visual impacts to affected sites and their settings. These treatment measures may involve the reconfiguring of proposed development projects, the incorporation of historic design standards established by the Comstock Historic District Commission (CHDC) into project related engineered features, reclamation efforts such as reconstructing the overall landscape contour, and/or reconstruction of historic landscape features to match the historic setting (Birnbaum 1994). If visual impacts cannot be minimized in these ways, alternative mitigation measures need to be taken. These alternate treatments do not eliminate the adverse effects, but are considered sufficient to compensate for heritage aspects lost to development and may include any combination of the following: offsite mitigation involving physical rehabilitation or restoration of contributing elements of the VCHD, archival research, detailed documentation, public outreach and interpretation such as signage or website documentation.

5.3 FIELD METHODS

5.3.1 Surface Investigations

Archaeological investigations at each site will begin with a surface inventory to verify the site's horizontal distribution and to locate or relocate surface artifacts and features. Each site will be subjected to a close-interval pedestrian survey of 3 to 5 meters in order to ensure that all historic temporally or behaviorally diagnostic artifacts are identified with pin flags. Following the identification of these materials, all will be recorded. For artifacts, provenience information will be gathered using a GPS unit with sub-meter accuracy and artifacts will be collected or simply recorded depending on the procedures outlined in the individual treatment measures proposed for each site. Features will also be GPS-located, and detailed sketches and photographs will be obtained.

Historic artifact types considered for collection include items with trademarks or manufacturer's marks, items which indicate the ethnicity of the site's occupants, unusually modified items, and unusual or immediately unidentifiable materials. Classes of historically manufactured items may have only a small sample collected from the field and subsequently curated, due to each item's redundancy. These include sanitary cans, window glass fragments, bottle fragments lacking embossment, nails, barrel hoops, or unidentifiable fragments of cloth, paper, metal, or wood.

5.3.2 Subsurface Investigations

Where subsurface cultural materials are suspected or considered possible, surface investigations will be followed by subsurface investigatory methods. All subsurface investigations will be conducted by means of hand-excavated units. The location of all excavation units will be plotted with a GPS unit to sub-meter accuracy.

5.3.2.1 Hand Excavation Units

Subsurface investigations will be conducted using hand excavation units (EU) in locations where the presence of *intact, stratified* deposits are suspected. Each EU will measure 1 x 1 meter, although multiple 1 x 1 meter units may be excavated adjacent to each other in order to open a larger "block" where appropriate, such as when there is the possibility for reconstructing "living surfaces," to expose large or interrelated feature sets, or to obtain a larger sample of an unusual or rare specimen. In such cases, each 1 x 1 meter unit will still be individually excavated for the purposes of maintaining artifact and feature provenience. Contiguous units will be excavated using similar techniques to preserve each unit's inter-comparability. Each unit will be hand excavated using shovels, trowels, brushes, picks, or rock hammers, as appropriate, and oriented to cardinal directions whenever possible. Standardized forms, noting date, excavators, depth of level, materials identified, features identified, and sediment composition will be completed for each level within each EU. In the absence of identifiable cultural or natural strata, EUs will be excavated in arbitrary 10 cm levels. Features will be sketched and photographed, and screened and bagged separately. Sediments from historic components will be passed through ¼-inch mesh screen unless conditions or identified material warrant use of $^{1}/_{8}$-inch mesh, while all prehistoric components will be screened though $^{1}/_{8}$-inch mesh.

Artifacts identified within EU levels *in situ* will be plotted on level records, and collected and bagged separately from the remaining materials collected from that level. A variety of samples may also be retrieved including sediment samples for macro- and micro-constituents. If samples are collected, the location of the collected material will be plotted on level forms.

5.3.3 Safety Protocol

As a result of the amalgamation process used historically across the Comstock, large amounts of hazardous materials, specifically mercury, have been released into the environment. The project area is located within Carson River Superfund Site, within Gold Canyon. Historically, Gold Canyon was home to many of the early Comstock Mills. Soil testing will occur prior to any sub-surface investigations to determine the level of contamination at each site. Should contamination be present, safety protocols for handling hazardous waste will be followed. These protocols are outlined by Reno et al. (2001), and specify protection measures deemed appropriate for mitigation of archaeological resources within the Carson River Superfund Site. The following protection measures will be followed to ensure a safe workplace for all persons involved. Additional precautions may be taken depending on the type and level of site contamination including:

1) Tyvek suits and nitrile gloves

2) Half mask respirator with mercury filters

3) Water sprays for dust control

4) Saranex coveralls if visible mercury is encountered

5) Proper disposal of all site waste

6) All employees on site will have 40 hour HAZWOPER training

7) Onsite monitoring of mercury levels

5.3.4 Collections Management

All collected artifacts and samples will be bagged in sealable plastic bags with artifact tags identifying collector, date, provenience, and material. For both surface and subsurface investigations, a master Bag Log will be maintained and completed with all appropriate information for each collected item. During surface collection, bagged materials will be cross-referenced with Sector Collection Forms. During subsurface investigations, bagged materials will be cross-referenced with their appropriate Level/Unit Excavation Forms. Bags will be placed in lots, corresponding to provenience, and kept in cardboard boxes for transport back to the KEC artifact laboratory in Reno.

5.3.5 Historic Laboratory Protocols and Analyses

Following surface collection and the excavation of subsurface units, artifacts recovered from data recovery efforts will be transferred to the KEC archaeology laboratory located at 1140 Financial Boulevard, Suite 100, in Reno, Nevada. There, the items will be accessioned, with all documentation attached including level records, feature records, sample records, bag catalogs, photograph records, individual bag tags, and, in some cases, copies of field notes, maps, and/or stratigraphic profiles. Materials will be processed to standards that meet or exceed those outlined in the Nevada State Museum Curation Agreement (Appendix B) made between the Nevada State Museum and KEC.

Prior to processing, a thorough check-in inventory will be conducted by the laboratory manager as part of the laboratory accessioning procedure. Materials are associated according to unit number or grouped with respect to collection strategy (surface collection sectors, hand excavation units). The presence of each item will be checked using the level record and bag catalogue as controls. Particular attention is paid to finding missing data and to inventorying bags, should there be missing items.

When a group of items is deemed complete, it will be boxed along with its bag catalogue and sent to the washing station. Each item is examined before being washed to determine whether washing is appropriate. Items such as animal bone, friable materials, other organic materials, cloth, or soil samples are not washed. A system of trays is employed to retain provenience information during washing. This is accomplished by clipping artifact tags and the original field bag directly to the tray. During washing, items are gently scrubbed with a soft toothbrush to dislodge soil still adhering following an initial rinse. After all items are thoroughly air-dried, they are placed back in their original bags along with their tags, then reboxed and formally catalogued.

Cataloguing is initiated when each cataloguer is assigned a unit and then checks the bag log to make sure all materials from the unit are present. Each bag representing a single provenience then is sorted into class, object, type, and material categories. Each separate category is assigned a unique catalogue number. This consists of the site number plus a sequential number beginning with the number "1." Objects are formally classified by senior archaeologists based upon criteria derived from standardized historic artifact typologies. Most items are catalogued according to their object name alone (e.g., can, glass, barrel hoop, stove part, bone fragment, etc.).

After items from a field bag have been sorted and assigned catalogue numbers, artifact provenience and classificatory information for each are entered onto catalogue sheets, along with data regarding material(s), count(s), and weight(s). Each catalogued item then is placed into an unused permanent container and receives its final acid-free inventory tag. Most items have their unique catalogue number written upon their surface in permanent ink. The cataloguer then checks to make sure that data on the item tag matches data on the catalogue sheet and the artifact, that there are no duplicate or missing catalogue numbers, and that all items are packaged neatly and efficiently.

The laboratory manager conducts numerous quality control checks to insure item processing is carried out using procedures defined as deemed appropriate by both KEC's and the Nevada State Museum's accessioning standards. Following cataloguing, items are shelved in numeric order. Catalogue sheets are then sent to data entry to be entered into the *Access*® data base for subsequent inventory, analytical manipulation, and catalogue/inventory production. Following data entry, a final quality assurance check is conducted of the printed catalogue to assure its correctness before materials are made available for analysis. All recovered materials will be curated by the project proponent at the Nevada State Museum, Carson City (see Section 6.3).

5.3.6 Historic Artifacts

Analysis of historic artifacts generally includes determining a system of classification which identifies artifact function. Stanley South (1977) devised a hierarchical classification system with artifacts grouped first by function, and then by class within each function. Others (Hardesty 1988; Hull-Waski and Ayres 1989; Sprague 1981) have generated their own systems following similar formats, with function being the prime determinant.

The classification system used by KEC employees includes a combination of the South and Hardesty systems. There are seven functional "groups" including: Kitchen, Furnishings, Architecture, Clothing, Personal, Activity, and Unknown. The term "Class" refers to the use of the objects. For instance, the kitchen group includes classes such as consumption, preparation, serving, and storage. Artifacts such as bottles and tin cans can fit into two classes in the kitchen group alone. These objects may also be found in the personal and activity groups. Where function but not class can be determined, the term "unknown" will be used. Table 5.1 shows the function, class, and object categorizations used. Function and class codes may be assigned to each artifact, or group of artifacts.

Table 5.1 Historic Function, Class, and Object Classification

Function	Class	Object
Kitchen	Consumption	Bottles, jars, tin cans (beverages, food, condiments), bone that has been cut (machine or otherwise), peach pit, pine nut, eggshell
	Preparation	Pots, pans, utensils
	Serving	Ceramics - "dishes," glassware – "dishes," flatware - eating utensils
	Storage	Ceramics - crocks, jars - canning, tin cans - canning
Furnishings	Furniture	Beds, chairs, tables, springs, upholstery tacks
	Lighting	Lamps, lamp chimneys, lanterns, candlesticks, light bulbs
	Stove	Stove, parts of stoves
	Other Furnishings	Rugs, clocks, electrical parts (wiring), mirror, linoleum, vases
Architecture	Construction Hardware	Nails (cut/wire), roofing tacks, spikes, corrugated fasteners, grommets/washers (tent, tarpaper, siding), door hardware (knobs, escutcheons, locks, hinges)
	Construction Material	Window glass, lumber, sheet metal, tarpaper, shingles/shakes, mesh screen
	Fixtures	Plumbing (pipes, toilet parts), lighting (fuses, insulators, sockets), electrical (insulators)
Clothing	Clothes	Coats, jackets, pants, dresses, undergarments (corset stays), fabric
	Footwear	Shoes, boots, galoshes, nails, leather fragments, grommets, boot hooks
	Accessories	Loose buttons, hooks, eyes, clasps, belt buckles, belt leather, purse
	Sewing/Mending	Needles, straight pins, thimbles, safety pins
Personal	Health/Hygiene	Proprietary/patent/pharmaceutical medicines, cosmetics, powders, perfumes, toothpaste/powder, toothbrushes, combs
	Indulgences	Smoking accessories, opium paraphernalia, tobacco tins/jars
	Jewelry	Rings, pins, earrings, beads, hairpins, pocket watches
	Coins/Tokens	Coins, tokens
	Games/gaming	Poker chips, game pieces
	Music	Phonograph records, musical instruments
	Toys	Jacks, ceramic tea set parts, dolls, small sized flatware, balls, marbles
	Other Personal	Luggage, umbrellas, fans (hand)
Activity	Communication	Paper, glue, newspaper, paper fasteners, ink jars/bottles, telegraph/electrical (wiring, jars)
	Firearms/Ammunition	Pistol/revolvers, cartridges (bullet, casing), shotgun shells, percussion caps, powder flasks
	Mining	Ore car/track parts, augers, air hose parts, spent blasting caps, blasting cap tins, other equipment

Function	Class	Object
	Miscellaneous Hardware	Nuts, bolts, rods, wire, braces, washers
	Other Tools	Axes, shovels, pickaxes, hammers, saw blades, files/rasps, bladers
	Other Activity	Buckets, laundry items (clothespins, starch tins, bleach bottles), cleaning items (Lysol bottles), fuel (kerosene, coal, charcoal)
	Other Industrial	Blacksmith related items (stock iron, hand-forged items, anvil, tongs), logging, sawmilling
	Transportation	Horseshoes, horseshoe nails, harness/tack, wheels, tires, wagon parts, car parts,
Unknown	Unknown	Any artifacts, fragmented or intact, that cannot be identified or placed in any specific function

Analysis of historic artifacts also includes the identification of the marks, labels, and (occasionally) patterns found on the recovered artifacts. Along with these identifications is the determination of date ranges for when an artifact may have been used. For bottles and ceramics this may be subjective because of curation and recycling practices.

Other items with subjective date ranges are those with patent information. Between 1861 and 1995, utility patent terms were good for 17 years (Dobyns 1997:157; USPTO 2003; 2005:22-23). The inclusion of patent (utility and design) numbers or dates on products is not governed by patent laws. Moreover, some patented items, particularly trademarks, may have been used for several years prior to being patented. Finally, some patent dates included on artifacts have no association with the company manufacturing the item. These were patents acquired for defensive purposes. Without information regarding when the item was manufactured, there is no definitive means of accurately dating these items.

An area of importance to the analysis of any historic artifact assemblage is the examination of morphological attributes resulting from manufacturing techniques. Below is a brief discussion of some of those techniques and attributes, many of which provide date ranges, for several types of artifacts: bottle glass, tin cans, window glass, nails, buttons, ceramics, and glassware.

Bottle Glass. In addition to marks, labels, patterns, and patent information, other means of determining a date range for artifacts derive from manufacturing information. Particular morphological characteristics that result from technological innovations have specific manufacturing periods associated with them. These are particularly important in the analysis of bottles and tin cans. When examining bottles, an analyst looks at several of these morphological characteristics.

Mold seams determine the type of mold used, as well as how it was made (e.g., hand blown versus automatic machine blown). Present in the some artifact assemblages are turn mold (a process where the mold seams are removed from the exterior surface of the bottle), cup-bottom and post-bottom molds (molds used in full-height molds including the three-part leaf mold that leaves seams on the heel or base, respectively), plated or slug plates (mold-made bottles with embossed product manufacturer information), and press molds (the interior is shaped by a plunger). Molds with plates were used between 1850 (or the 1860s) and the 1920s. Press molds were used in jar manufacture predominantly between 1890 and 1960. The other molds appeared in the 1870s, with continued use until the 1920s (Fike 1987:4; IMACS 1992:472.18; Jones and Sullivan 1989:17-49; Munsey 1970:39-40; Rock 1990:5-7).

The process for blowing glass into the mold is either by mouth (i.e., hand blown), or by machine (i.e., semi-automatic and automatic). A hand blown bottle has no seams in the finish, whereas semi-automatic and automatic machine blown bottles do display seams. The primary difference between a semi-automatic and an automatic bottle machine (ABM) is that automatic machine-made bottles are made completely by machine. Semi-automatic machine made bottles, on the other hand, required the glass gob to be supplied and operated by hand (Miller and Sullivan 1981:2-3).

According to Fike (1987:5), in 1917 only 50 percent of all bottles manufactured in the United States were ABM made, 5 to 10 percent were hand blown, and 40 to 45 percent were made by semi-automatic bottle machine. Many companies could not afford to purchase the automatic bottle machines. However, during the early twentieth century, new devices, such as the Brooke's Continuous Stream Feeder (patented in 1903) and the Paddle Gob Feeder (patented in 1918) provided a relatively inexpensive means of stepping-up the process of automation. Unfortunately, standardization of design and manufacturing techniques in the 1920s brought an end to the "unique distinction" of bottles (e.g., colors, embossing, and shapes). The last year that bottles were hand blown commercially was 1938 (Fike 1987:5).

Other characteristics of bottles that assist in determining date ranges are finishes and closures, as well as color. Finishes requiring a cork closure were the dominant type until the 1920s, again because of standardization in manufacturing techniques. These types of finishes were made by hand with tools such as lipping tools, or a separate mold by machine. Lipping tools were used between the 1870s and the 1920s (IMACS 1992:472.12; Rock 1990:13). It was during the 1920s and 1930s that several innovations in cap closures appeared, including special caps fitted with brushes, daubers, and rods (Lief 1965:35). These produced resultant changes and improvements in bottle finishes, such as threaded, lug, and seal finishes.

The crown finish was created after the invention of the crown cap in c. 1892, and it has remained basically unchanged. The cap, on the other hand, has undergone changes in the interior lining from cork to plastic, and can now be removed by twisting rather than by bottle opener (IMACS 1992:472.10; Lief 1965:17-20). Other closures in Nevada artifact assemblages are lightning stoppers (in use since 1882), zinc threaded canning caps (used from 1858 to c. 1943), screw band canning caps (in use since 1864), band and metal cap with gasket seal (introduced by Kerr Glass Manufacturing Co. in 1915), aluminum threaded cap (in use since 1924), glass liners for canning jar lids (used between 1869 and the 1940s), and glass stoppers (used between the 1870s and the 1950s) (Brantley 1975:57; Jones and Sullivan 1989:151-154; Lief 1965:12, 15-16; Toulouse 1977:109, 111, 116, 120, 126; Viklund 1991; Zumwalt 1980:239).

Employing glass color as a taxonomic, functional, and chronological factor is not completely accepted. Jones and Sullivan (1989:12-14) discuss these issues at great length, stating that color cannot be used as a specific means of dating or determining use or glass type such as lead, soda, and lime glass. In fact, the best use of glass color is for ascertaining the minimum number of bottles present, as well as assisting in bottle reconstruction.

However, based on observations made by others (Cleeland 1984; Eastin 1965; Fike 1987; Kendrick 1971; Lockhart 2006; Miller and Pacey 1985; Newman 1970), color can be used in a limited way to aid in dating a bottle as well as for identifying the contents. For example, cobalt blue glass was used primarily for medicines, cosmetics, and specialty items from the 1890s to the 1960s, when plastics took over the packaging market. Milk glass, or white opaque, also has been used for medicines, cosmetics, toiletry, and specialty items, such as meat products, from 1890 to 1960. Amber or brown glass generally has been associated with beer, whiskey, and bitters bottles since about 1860. Aqua glass bottles contained many different products, including medicines and alcoholic beverages. The dates given for aqua glass are from c. 1800 to ca. 1910. However, aqua glass continued to be used into the early 1980s in limited applications such as 5-gallon water bottles.

Since the late 1800s, consumers wanted to identify the contents of bottles easily, particularly in canning jars, and colorless glass was the best means of providing this feature for them. Manganese dioxide was the first decolorizing agent used to eliminate the iron impurities in the silica. It may have been used as early as 1810 and as late as 1925 in bottle glass, but the generally accepted time frame is from the 1880s to c. 1920s. Selenium appeared as a decolorizing agent in c. 1910 and was used until the 1930s. Arsenic was in use by 1930 (IMACS 1992:472.7-8, 18-19; Lockhart 2006:40(2)50-54; Miller and Pacey 1985:19(1)44-45; Munsey 1970:55). Of these three decolorizing agents, arsenic is the only one that is not affected by the ultra violet rays in sunlight. Manganese dioxide "turns" colorless glass amethyst, while selenium "turns" it yellow or straw-colored.

Tin Cans. Early tin can manufacturing techniques that survived into the twentieth century consist of lap side seams and stamped ends (Rock 1989:37, 59). Both are found on hole-in-cap cans, and lap seams also have appeared on crimped end cans, including fish tins. Innovations of the late nineteenth century may have been in use during the 1890s, but definitely were incorporated into tin can manufacture by the early 1900s. Two important techniques were the internal rolled or double sided seams and crimped ends. Both were German inventions, and both used gaskets instead of solder. These were later improved upon by the American Max Ams Company between 1888 and 1901. Manufacturers of the hole-in-cap can, one of the earliest types of cans made (1823), improved it with the addition of the internal rolled side seam. This transitional can was manufactured until about 1940.

The can type utilizing both internal rolled side seams and crimped ends is the open top can, more commonly known as the sanitary can. Although machinery for making this can was available in 1901, it did not appear until about 1904 when the Sanitary Can Company in California began production. Other cans with an internal rolled side seam include the vent hole can, dating from c. 1901, used primarily for evaporated milk after 1914 to about 1985; and the upright pocket tobacco tin, also dating from about 1901 to 1988 (Rock 1984:18(2)101, Table 1; 1987:21; 1989:40, 56, 60-62, 150). A third innovation of this period was the two-piece drawn can, which had no seams. These were used for fish tins, possibly as early as 1897 (Rock 1989:140).

Another datable tin can attribute is the method of opening. One method is the key-wind side strip, first used on tapered meat tins in the 1890s, on vacuum-packed coffee tins with a re-closable lid, commonly used between the 1920s and 1960s, and the key-wind top strip on fish tins, where most or all of the top was removed, from as early as 1866. Although developed in 1870, the cutting wheel or rotary can opener did not have widespread use until the advent of the sanitary can in 1904. Another can opener from the 19th century was the hopper (patented in 1896), which left a hole in the center of the cut end. Bayonet type openers appeared at the turn of the century (19th and 20th), while the "church key" was invented as a novelty to open flat top beer cans in 1935 (Rock 1989:139, 188-194).

Some can types can also be dated. Included in Nevada artifact assemblages are flat pocket tobacco tins with hinged lids that were used between 1892 and about 1920; lunch pail tobacco tins with external friction lids that were available from c. 1890 to the 1940s and could be reused to carry lunches or other items; and telescopic tobacco tins, tins that collapsed as the tobacco was used to keep it fresher, patented in 1930, and used until the 1940s (Rock 1989:148-52). Another shape is the flat oval fish tin introduced in 1918 and used for large sardines (Rock 1989:140).

Window Glass. Window glass, also known as flat glass, is often neglected as a means of establishing a relative date for a structure. However, several studies (Roenke 1978; Moir 1987; Mires and Bullock 1995) have demonstrated that flat glass thickness changes over time, thus providing an additional chronological indicator for historic sites. It also has been found that there may be a correlation between the color and thickness of the glass (Ball 1983; Grimes 1995:93-96), suggesting that both color and thickness represent chronological changes in the manufacture and evolution of window glass.

Nails. With few exceptions (tent flats, log, or heavy timber frame construction), nails can be found at any historic site where there were structures. There are three major types of nails: hand-wrought, cut, and wire, each with morphological attributes that can assist in the relative dating of a site. Unless the site predates 1790-1830, the transition period from wrought to cut nails, wrought nails are not likely to be present unless they were reused or there was limited access to a market. The sites in Nevada date from the Civil War up until the 1950s. Thus, there should be few, if any, wrought nails. Wire nails, manufactured as early as the 1850s, became the dominant nail type during the 1890s to about 1900. Calculating the ratio of cut to wire nails can sometimes furnish a rough temporal estimate for structures and features.

A second purpose of nail analysis is ascertaining nail function. The size and shape of a nail are indicators of its purpose. A study done by Jurney (1987) of several historic standing structures and trash deposits in Texas examines the correlation between nail size and function. For example, nail size was associated with building floors, roofs, wainscots, joists, and other construction components. However, when structures were remodeled, there was the possibility of overlapping size and function. In addition, he found that the number of nails in an archaeological assemblage, provided they were from a discrete locale, could be used to identify the complexity of the structure from which they were derived.

Some of Jurney's (1987:87, 95) data indicate that nails ranging in size from 3.1 cm to 3.8 cm were used on wood shakes, and flooring nails were 4.4 cm to 6.3 cm in length, while large nail sizes were associated with "outbuildings, fences, and structures such as stockpens or chicken coops." He also found that there was a range of densities (number of nails per unit) associated with specific types of structures or refuse areas. For instance, extremely high density areas were indicative of either extensive remodeling/repair or reuse of structures for firewood, while low density areas suggested log structures with frame roofing and flooring (Jurney 1987:95).

Buttons. Clothing fasteners, dominated by buttons, are another group of artifacts generally found at domestic sites. Morphological attributes of interest to button analysis include material (e.g., shell, glass, ceramic, metal), type of button (e.g., whistle, sew-through, rivet), size (diameter is measured in lines or *lignes*, although measurements by fractions of an inch, as well as tenths of an inch, also are used), and function (e.g., clothes, footwear, or gloves). Further areas of study with regard to buttons are the types of clothing from which the buttons came, such as overalls, denim jeans, undergarments, or fancy dress items.

The type of clothing, footwear, or gloves occasionally identifies characteristics of the wearer. This, however, is not always a definitive conclusion, particularly as some buttons were used on more than one type of clothing. For example, small (16 lignes, $^3/_8$ inch or 0.36 inch) shell and ceramic buttons were used on female undergarments, as well as baby clothing.

Dating the period of use for buttons is based on material and type. For instance, metal buttons have a long history of use, but rivet type metal buttons found on work clothing are fairly recent, appearing in the last half of the nineteenth century, with continued use to the present. Ceramic buttons, on the other hand, were not manufactured until the 1840s and enjoyed a period of extensive use for about 70 years before being replaced with less expensive synthetic buttons (Pool 1991:11).

Material and type also serve as consumer indicators. After distinguishing its source, an analyst knows a date range for the button, possibly the type of clothing, as well as how costly the original clothing might have been. Decorated buttons, made of black glass, jet, or mother-of-pearl, are indicative of fancy clothing and would be representative of a higher valued item than utilitarian, or undecorated, buttons of the same materials.

Shell buttons present another aspect to the issue of consumerism, particularly as mother-of-pearl, or ocean shell, buttons were imported to the United States. Imported items often initially cost less than locally made items, but the passage of import taxes, such as the McKinley Tariff Act of 1891, altered the market. Although imported ocean shell buttons continued to be sold through catalogues and on clothing, the domestic freshwater shell button industry centered in Iowa and other places along the Mississippi River commanded the market by the 1890s. Both types of shell buttons continued to be popular until the 1920s, when more durable plastic buttons replaced them as the consumers' choice (Claassen 1994:28[2]:79-80; Pool 1991:6-7, 11).

Ceramics. Beginning in the eighteenth century, British potters worked to create a white ware similar to the more expensive porcelain imported from China. By 1813, a new ware termed "Ironstone" was developed (Wetherbee 1996:17-18), a term also used in reference to a stylistic trend popular in the United States during the second half of the nineteenth century. British manufacturers dominated the market because American potters had not yet reached a level of technological and marketing stability to compete successfully.

However, American potters began producing their own ironstone between 1870 and the 1920s, frequently imitating both British wares and marks (IMACS 1992:473.4; Wetherbee 1980:18-19; 1996:164-66). The United States government assisted American potters with the passage, in 1891, of the McKinley Tariff Act, which imposed high taxes on imported goods. In addition, the act stipulated that all imports include the country of origin, either alone or as part of a mark (Kovel and Kovel 1986:229). Formation of the American Potters Guild in 1898 further assisted in eliminating the British monopoly as major producers of white ware, which, by this time, included a new sturdy, simply decorated ware known as "Hotel China" (IMACS 1992:473.3-4). By the turn of the century, these wares were considered utilitarian when compared to the more desirable Austrian, Bavarian, and German porcelain (Wetherbee 1980:120). However, based on the identifiable marks found in Nevada's artifact assemblages, American potters were not totally ignored during the early twentieth century. The majority of marks seem to be from East Liverpool, Ohio, potteries (DeBolt 1994; Gates and Ormerod 1982).

In addition to the identification of ceramic ware type, other attributes of importance are function and decoration. The function of ceramic artifacts is not limited to dishware, although the majority of ceramic sherds found at historic sites were once part of plates, bowls, pitchers, or other vessels used in serving food. Other uses appearing in late nineteenth century and early twentieth century sites are very likely to include electrical (e.g., insulators) and plumbing fixtures (sometimes called "sanitary ware") made of inexpensive porcelain. If the site is domestic, with women and children present, there are likely to be toys such as parts of dolls, figurines, and possibly specialty items, such as containers or trays used to hold personal items. All of these artifacts provide the analyst with a means of more clearly defining the site or feature under study.

Decoration of ceramic artifacts is another attribute that relates information concerning the people who used the items. This is of particular importance in the study of ceramic dishware, where the type of decoration, as well as the technique used, is correlated with consumerism. For example, owning ironstone dishware, especially decorated settings, is indicative of wealth. Methods of decoration include relief mold (a raised surface design made by mold), transfer print (generally a single-color design transferred from paper to the vessel surface during firing), decalcomania (a polychrome pattern made of many raised dots applied to the vessel surface after glazing), gilding (a solid line or series of swirls painted onto the rim of a vessel after glazing), and hand painting (applied before or after glazing, depending on the paints used). Some ceramic sherds exhibit combinations of these techniques.

Miller (1980, 1991) discusses decoration techniques on a variety of wares (creamware, pearlware, ironstone) in relation to the cost of the items. He was able to rank the value of a particular type of ware in relation to the technique used to decorate it. Transfer prints, some hand painted, and relief mold designs could be very expensive, whereas other patterns made by the same techniques were of lesser value, but still more valuable than an undecorated ware. The twentieth century presents a new twist on the study of consumerism in that promotions and premiums have provided the average buyer with a means of purchasing quality wares less expensively. This has been augmented by the use of manufacturers, such as Japanese potters, to produce imitations of the more expensive imports, such as German and Austrian porcelains (White 1994:7).

Glassware. Technological innovations during the 1920s encouraged the development of two new industries: cooking and table glassware. The innovations important to the glassware industry involved changing from a pressing mold to an automatic mold manufacturing process. The glassware eventually named "depression glass" was made between 1920 and 1940. It was decorated with relief designs cut or etched into the mold resembling acid-etched patterns. The designs were inspired by, and imitations of, patterns from such nineteenth century companies as the Sandwich Glass Company. These patterns came in a variety of colors that enhanced its popularity and also served to hide flaws in the glass (Klamkin 1973:2-3, 9, 13-15).

A major selling point with glass tableware was the low cost of acquiring entire services. One method was glass tableware as promotional items to bring customers into furniture stores, movie theaters, or to sell a service. Another was as premiums in cereal boxes. Although depression glass reached its peak of popularity in 1929, some patterns continued to be manufactured well into the 1960s (Klamkin 1973:2-5).

6.0 PROPOSED TREATMENT MEASURES

General treatment protocols have been presented above in Chapter 5 for historic archaeological sites determined eligible or remaining unevaluated for the National Register of Historic Places. The following section details proposed treatment measures for *each individual* site, based on the general protocols previously defined. The four Historic Properties that will be adversely affected by the Undertaking include: CrNV-03-1489/4371 (26St602); CrNV-03-4378 (26St609); CrNV-03-4408 (26St611); and CrNV-03-8915 (26St628) (Table 6.1; Appendix A: Figure 6.1).

Table 6.1 Adversely Affected Historic Properties

Site No. CrNV-63-	Trinomial	Site Type, Name	Eligibility Determination	Virginia City Historic District
1489/4371	26ST602	Historic- Justice Hoisting Works	Eligible: Criterion A and C	Contrib.
4378	26St609	Historic - Justice Mine	Eligible: Criterion A, C, and D	Contrib.
4408	26St611	Historic - Domestic Refuse Scatter	Eligible: Criterion D	Contrib.
8915	26St628	Historic - Residential Foundation	Eligible: Criterion A, and D	Contrib.

6.1 SITES

6.1.1 CrNV-03-1489/4371 /26St602

Site Type: Historic - Justice Hoisting Works.
Date: 1859-1930s
NRHP: Eligible: Criterion A, and C
VCHD: Contributing

This site is the shaft foundation of the hoisting works and ore bin for the Justice Shaft (Figure 6.2). It lies on either side of State Route 342 (SR 342), in Gold Canyon. The main component of this site was previously recorded in 1991 by Archaeological Research Services (Reno et al. 1991). As originally recorded, the site was described as including the Justice Shaft and multiple foundations for the steam powered hoisting works that once served the underground workings (the ore bin was not included in the previous documentation). The foundations were noted to be in a good state of preservation, serving as a good representation of Comstock Bonanza Era hoisting works. This site was recommended eligible for nomination to the National Register of Historic Places (NRHP) under criteria A, C and D. The site was relocated as part of the baseline cultural resource inventory conduced for CMI (Spidell et al. 2014) and a full update was completed. Since the 1991 documentation, the site had been impacted by modern mining activities. A haul road was constructed to the west of the hoisting works, impacting the western and northern portion of the site. Specifically, this impact has likely adversely affected what Reno et al. (1991) recorded as a blacksmith shop/ debris scatter, several refuse dumps, as well as the waste rock that lies to the northwest of the hoisting works.

The site consists of nine features and an estimated 400 mostly fragmentary artifacts. Feature 1 is the complex of cut-stone blocks and anchor bolts that served as the foundation for the hoisting works. The blocks were recorded as seven separate footings (Footing 1-7). Each footing is constructed of hewn stone blocks set on stone foundations. The complex of anchor bolts likely held supports for cable reels, whereas Footings 1 and 2 likely supported the hoist engines. Footings 4-7 lie to the north of Footing 3 but their function is unclear.

Feature 2 is the Justice Shaft. Feature 3 is a burnt/stained area that was recorded in the original site record as the blacksmith shop and currently is described as a stained area with charcoal, slag, and brick fragments. Feature 4 is a large metal pipe that is exposed as it exits the cut above SR 342. Feature 5 is a brick and mortar area that was recorded by Reno et al. (1991) as a brick and mortar mound. It is now apparent mostly as soil staining and likely has been impacted since the 1991 recordation. Feature 6 is a large waste rock pile and Feature 7 is a retaining wall that is retaining a portion of Feature 6. Feature 8 is the Justice Ore Bin. It is a wood-framed structure located in a ditch adjacent to the east side of SR 342. It was initially thought to be associated with the Keystone Shaft, which is nearby to the north (CrNV-03-9087/26ST542). However, further research revealed that it is more likely associated with the Justice Hoisting Works. At what point, and for whatever reason, it was transported to the east side of the road, remains unclear. While the ore bin is visually similar to the ore bin depicted in the 1870s Carleton Watkins photograph *The Justice Hoisting Works*, further archival research is needed to determine temporal affiliation. The presence of wire nails on the structure suggests a later construction date, or rehabilitation of the original ore bin, post 1880s. Artifacts here include tin cans, nails, and fragmented glass and ceramics. A 25% inventory of artifacts was conducted yielding 96 artifacts. The few diagnostic artifacts indicate a date range from c. 1864 to c. 1940, but documentation indicates a more probable end date during the 1930s.

Figure 6.2 Site CrNV-03-1489/4378(26St602) Overview (333 degrees).

The claim for the Justice property was staked in 1859, and the shaft was sunk in the mid-1860s (NBMG et al. c. 1940:121). Between 1875 and 1924, reported silver-gold production for this shaft was 206,000 tons. In the 1930s, the property was leased to the Dayton Consolidated Mining Company (Ansari 1989:60). Research did not definitively identify when the hoisting works were disassembled and production stopped. However, no records were identified post-dating 1942. The site lies on the Justice and Independent Consolidated Mining Company's claim on the Comstock Lode (Mine Survey No. 48, Office Record No. 175). This claim was officially surveyed in February of 1869, and patented at an unknown date (Patent No. 69). The plat map indicates the Justice/Independent hoisting works where this site lies.

The site is located in a region extensively modified by mining activities. As such, the soils on site are waste rock. Vegetation on site consists of tall sagebrush with an occasional rabbitbrush. The slope of the site is 28 degrees at an aspect of 88 degrees. The site was observed to be in fair condition, with part of the site being impacted by the construction of a mine road and the terracing of the hill slope.

<u>National Register Eligibility Determination:</u> The Justice Hoisting Works was determined eligible for the National Register of Historic Places under Criterion A, and C. The Justice Hoisting Works was also determined as a contributing element of the Virginia City Historic District.

The 2013 site recordation (Spidell et al. 2014) indicated that the site demonstrates a clear association with the development of the regional mining industry and meets the requirements for eligibility under Criterion A. The hewn stone foundation of the hoisting works showcase part of the mining system used at the Justice Shaft and retain integrity despite the impacts to the site as a whole. The foundational remains of the Justice Hoisting Works, as well as the remains of the Justice Ore Bin, convey eligibility under Criterion C as they are representative of a type, period and method of construction.

<u>Site Treatment Measures</u>

The Justice Hoisting Works CrNV-03-1489/4371(26St602) has been determined eligible for the National Register of Historic places under Criterion A and C. Furthermore the Justice Hoisting Works has been determined as a contributing element of the Virginia City Historic District.

The Justice Hoisting Works is located on private lands and has been altered since the last documentation of the site. Partial mitigation of the site was conducted and is on-going as part of site stabilization efforts resulting from an effort to preserve the actively collapsing Justice Shaft and the Justice Hoisting Works.

Following the recommendation presented in *An Historic Properties Treatment Plan for Three Historic Properties in the Keystone-Justice Claim Group*)Spidell and Kautz 2013(, the Justice Hoisting Works was visually documented using high resolution digital photography and physically documented using engineering level locational documentation. The locational data was captured using Real Time Kinematic (RTK) survey on a Trimble R6 GNSS antenna and a Trimble TSC3 data collector with the base station within 1 mile of the survey area resulting in an accuracy greater than 0.1 inches. Each stone was documented and tagged with a metal label and recovered using a crane fitted with cradle strap ropes, and rubber flashing to minimize damage to any stone (Figure 6.3). The foundation stones of the Justice Hoisting Works were then shipped to the *Cabin In The Sky* for temporary storage. The locational information and photographs are on file at CM and KEC in order to facilitate easy reconstruction of the hoisting works following stabilization of the Justice Shaft and reclamation of the Justice Pit.

To mitigate the remaining eligible portions of the sites as part of the Undertaking, and to address mitigation of the site under Criterion A and C the following treatment measures are recommended.

Figure 6.3 Removal of the Justice Hoisting Works Foundation Stones.

Criterion A: An interpretive marker highlighting the history of the Justice Mine will be created and placed at the visitors' center at the *Cabin in the Sky*. The Interpretive Marker will be reviewed by the BLM, and SHPO. The media format will adhere to BLM Media Design Standards and a 1550-8 form will be completed and submitted for pre-approval/concept signatures, and for approval signatures on the final product. Following approval of the sign form the agencies, a Certificate of Appropriateness (C of A) will be applied for from the Comstock Historic District Commission (CHDC). The interpretive marker will allow for public interaction with the resource and fulfill treatment under Criterion A.

Criterion C: The remaining component of the site eligible under Criterion C is the Justice Ore Bin (S1009). The Justice Ore Bin is located outside the area of direct effects for the Undertaking, will not be adversely affected, and is currently planned for avoidance and preservation. The Justice Ore Bin will be documented by a qualified architectural historian. The documentation will include comprehensive photographic documentation, a thorough narrative description, site and sketch plans, as well as a historic context relating to the building and the site. The results of this documentation will be produced as a stand-alone report, and sections may be incorporated into the interpretive marker discussed under Criterion

A. The report will refine the age and affiliation of the Justice Ore Bin. Copies of the documentation report will be distributed to the BLM, NVSHPO, and the Comstock Historic District Commission. This documentation will be curated to provide the baseline information for BLM to monitor the resource as require in the MOA.

Feature 7 of site CrNV-03-1489/4371(26St602) is a wood retaining wall located along SR342. As part of the Undertaking the retaining wall will be rehabilitated to continue serving as a retaining wall for the waste rock from the Justice Shaft. Although this resource does not possess integrity as a historic resource, the retaining wall has importance to local residents and can be rehabilitated in place and thereby avoided by the Undertaking. To aid in the rehabilitation efforts of the retaining wall, high resolution photographs and land survey level data will be collected and incorporated into the archival data set established for the reconstruction of the Justice Hoisting Works.

6.1.2 CrNV-03-4378 /26St609

Site Type: Historic - Justice Mine
Date: 1869- c. 1942
NRHP: Eligible: Criteria A, C, and D
VCHD: Contributing

This is a large mining complex located on the northern slopes of Hartford Hill, south of Gold Hill, Nevada (Figure 6.4). The current site boundary for the site established by Spidell et al. (2014) includes two previously recorded sites. CrNV-03-4378 (26Ly851) and CrNV-03-4392 (26Ly856) which have been combined to create a larger site under the new inclusive designation of CrNV-03-4378 (26Ly851). Although the sites were previously issued Lyon County trinomials (Reno et. al 1991), the site is located in Storey County, Nevada and has been reassigned the trinomial CrNV-03-4378 (26St609). Site CrNV-03-4378 (26Ly851) was originally recorded in 1991, as a small mine hoist engine house with associated shaft and artifact scatter (Reno et al. 1991). The site consisted of mine shafts, prospect pits, roads, tailings piles and a standing hoist engine house. The features were not given feature designation numbers. A large trash scatter "Trash Locus 1" was observed to contain older artifacts including cut nails, bottle glass, crockery, ceramics, food cans, wire, and wood. A small trash scatter was located near the hoist structure where artifacts associated with the structure were dominated by sanitary cans with a few vent hole cans present. Modern debris (i.e. a car's bench seat) was also noted within the site boundary. The hoist house was constructed from wooden framing, sheet metal, and wire nails. The hoist engine itself was not found, likely having been removed and re-purposed. The artifacts around the hoist house dated to the 1920s, though the house itself was not dated. The site, in general, dated from 1859 to 1950+. Smaller "looter's pits" were seen throughout the site but not mapped. The site was observed to be in fair condition with impacts from roads, structural decay, and vandalism. It was determined to be not eligible for the NRHP under any criteria.

Site CrNV-03-4392 (26Ly856) was recorded in 1991 as a mining site consisting of three adits and associated artifacts. The adits were aligned with each other with the center adit having been filled. Artifacts observed in association with the site included corrugated sheet metal, 10 gallon galvanized cans, lumber fragments, a rusted and flattened stove pipe, a 55 gallon drum with an off-centered 10 inch diameter pry-up lid. The site was determined to be Not-Significant and Not-Eligible for the NRHP under any criteria. During the current survey the two sites were observed to be fewer than 20 meters away from each other. They also are located within the same mineral patent. Therefore, the two sites were combined under the designation CrNV-03-4378 (26St609). The site is now described as consisting of sixteen mining features (Features 1-3;5-16), one habitation feature (Feature 17), two roads, and artifacts representative of a variety of activities and periods of occupation. Feature 4 is a tourist advertising sign depicted on the original sketch map of site CrNV-03-4378 (26Ly851) that reads, "See The Famous Suicide Table" The features in the original form lacked numbers and therefore numbers were assigned to features during the more recent recordation.

Figure 6.4 Site CrNV-03-4378 (26St609) Overview (0 degrees).

At present, it was observed that the site is bisected by modern mine disturbance. Fewer artifacts were noted during the recent survey as a result of the extensive impacts form modern mining activities. Specifically, "Trash Locus 1" and a modern trash dump, as well as several terraced benches were not relocated. Artifacts include hole-in-cap food cans, numerous glass sherds in a variety of colors, ceramic sherds, a decorative button, and a Mercury Head dime dated 1935. Three roads were observed to be related to the historic mining features, none of them being depicted on a historic document. The site lies partially within the boundary of two mineral patents. It is partially located on the *Caledonia Lode* which was patented in 1924 by the Comstock Merger Mines, Inc (MS 4599). No features appear to be depicted on this patent. The site also lies partially within the boundary of the Justice and Independent Consolidated Mining Company claim (MS 175). This patent was issued in 1869. None of the features recorded herein are depicted on the patent. Features 10 and 17 generally correlate to mapped locations of similar features depicted on the 1879 *Outline Map of Washoe District, Nevada*. The features and artifacts on site suggest a general date range of c. 1869 to the passage of L-208 in1942.

The artifacts and features point to this site being used principally as a mining location. Several periods of use are indicated by the features, the artifacts, and historical records. The stone lined foundation (Feature 17) and an adit (Feature 10) appear to be depicted on the *1879 Outline Map of Washoe District, Nevada.* These features date to the Comstock Bonanza (1859-1879). Many of the remaining features appear to represent mining activities related to the post boom renewal (c. 1901-c. 1942) on the Comstock. Historical records indicate the Woodville and Justice claim group was acquired by the

Dayton Consolidated Mining Company in 1935 and systematically worked until the passage of L-208 in 1942 (Stoddard and Carpenter 1950). The site is located on the top and slopes of northern Hartford Hill. Soils are colluvial in nature and consist of silty sands with 40% surface gravels. Slope is 15 degrees and aspect is 20 degrees . Vegetation is dominated by a sagebrush community with pinyon-juniper, and various grasses present. The site is observed to be in fair condition with impacts from modern mining. Since the last recordation in 1991, a large portion of the site has been altered by modern mining. The most notable impact was the removal of the previously described "hoist engine house" that once stood at Feature 1. Currently, what remains of this feature, a shaft, is located immediately to the north of modern mining disturbance. Additional impacts include the construction of a haul road by Plum Mining LLC sometime around 1999, later expanded by Comstock Mining Inc. between June 2, 2003 and November 1, 2004, and again expanded between November 1, 2004 and October 12, 2006. These impacts to the site have occurred for the most part on private lands. A comparison with the original site form suggests that portions of the site that have been disturbed by the haul road described above, contained "Trash Locus 1" and a modern trash dump, as well as several terraced benches.

<u>National Register Eligibility Determination:</u> Site CrNV-03-4378 (26St609) was determined eligible for the National Register of Historic Places under Criterion A, C, and D. Site CrNV-03-4378 (26St609) was also determined as a contributing element of the Virginia City Historic District.

One feature at the site (Feature 17), is a structural foundation in the vicinity of multiple residential structures depicted on the 1879 *Outline Map of Washoe District, Nevada.* This feature is expected to represent the archaeological remains of one of the structures dating to the Comstock Bonanza (1859-1879). Therefore, this site contains a feature that demonstrates an association with the original settlement Gold Hill (Criterion A). Furthermore Feature 17 is expected to contain intact subsurface deposits and has the potential to provide information to address research questions developed under the research themes of *People,* and *Community Planning and Development*. The remain surface assemblage was noted to have been impacted, and did not possess sufficient integrity to convey eligibility under Criterion D.

The mining features present on site represent peripheral exploration and mining activities associated with multiple periods of occupation and do not support the historical significance of the District. However, the site contains numerous mining related features that are visible across the landscape. Collectively, these mining related features contribute to the character of the mining landscape of the Comstock (Criterion C).

<u>Site Treatment Measures</u>

<u>Criterion A</u>: Mitigation of effect under Criteria A will be accomplished by the creation of an educational unit for historic mining on the Comstock. This will allow for public interaction with the resource and fulfill mitigation requirements under Criterion A.

The educational unit will be all inclusive, meaning that all materials would be provided to the teacher. The educational unit will be age appropriate, targeting students in grades 6-8. It will be Common Core aligned, as well as, meeting Nevada state Social Studies and English Language Art (ELA) standards. Formative and summative assessments will be included in the unit, along with a short pre-test. The unit will come in two sections; the first section will be for the teacher or educator and will include directions, background information, ways to vary instruction, and the lesson plans. The second section will include all the documentation that students will need (ex. workbooks, printouts).

After creation of the unit, it will be reviewed by the BLM and SHPO, and sent to *The Board of School Trustees of Storey County* for consideration as a "Supplemental Textbook." Adjustments will be made to the lessons as necessary. The approved unit will then be given to the middle school for use in the classroom setting. Communication among KEC, BLM, and SHPO staff, and the middle school educators will be kept open, as to the effectiveness of the lessons. Adjustments will be made as necessary. Digital copies of the educational unit will be available from the BLM, KEC or CMI.

Criterion C: Mitigation of CrNV-03-4378 (26St609) under Criterion C will include field documentation of the resource using high resolution digital photography and the collection of land survey level data of the mines adits, shafts and waste rock platforms; all considered elements of the *rural historic landscape* of the VCHD. These components of site CrNV-03-4378 (26St609) are located outside the area of direct effects for the Undertaking, will not be adversely affected, and are currently planned for avoidance and preservation. The land survey data and high resolution photos will be curated to provide the baseline information for BLM to monitor the resources per the MOA, and to reconstruct site features in the event of an adverse effect. This information will be filed with the BLM to provide the necessary information for accurate reconstruction of landscape features.

Criterion D: The eligible component of the site under Criterion D is Feature 17, a foundation for a Bonanza period residence. This site feature has been determined eligible under Criterion D for its temporal association with the Comstock Bonanza (1859-1880) and the information potential presented by subsurface deposits associated with the feature to address research questions developed under the research themes of *People,* and *Community Planning and Development*. Therefore, treatment of the site under Criterion D will focus on Feature 17. The remaining surface assemblage of the site was determined to lack sufficient integrity to convey eligibility under Criterion D.

Feature 17 is a stone lined foundation that measures 12 ft. east to west by 21 ft. north to south. Data reconvey is considered the most appropriate method of mitigation for resources determined eligible for listing in the NRHP under Criterion D. Field investigations at this site will begin with detailed surface feature and artifact mapping. All artifacts on the surface will be recorded, and GPS-located when appropriate, and collection protocols will adhere to the procedures outlined in Chapter 5. This activity will attempt to differentiate the occupations of the site, assign periods of use for the feature and define the behavioral and temporal association of the site in relation to the VCHD. Surface activities will also attempt to identify any previously unidentified features that may have been missed such as privies. All observed features will be fully documented with measurements, descriptions, and photographs obtained to properly ascertain function and period(s) of occupation. Once the periods of occupation for this site are refined, the site's association with the VCHD will be re-assessed.

Following the surface treatment measures, excavation of the feature will be accomplished by the equivalent of no fewer than 8 excavation units measuring 1 x 1 meter in size. The units will be excavated in 10 cm arbitrary levels to a minimum depth of 50cm, with 20 cm of "sterile" soil beyond any buried cultural deposits. An estimated 4 cubic meters of sediments will be excavated in this manner.

Excavation methods will conform to those outlined in Chapter 5. Materials from these excavations will be transported to the KEC Historic Laboratory in Reno, where they will be analyzed using the methods outlined in Chapter 5, and any necessary archival research will be conducted. Archival research will be used specifically in conjunction with the materials collected on the site to establish the site's name, dates of use and occupation, and function. The results of the data recovery program will be presented as a final product in report format.

6.1.3 CrNV-03-4408 /26St611

Site Type: Historic
Date: 1870s - 1930s
NRHP: Eligible: Criterion D
VCHD: Contributing

This site is a multi-component lithic scatter and prospecting area located on a hill top south of Gold Hill, Nevada (Figure 6.5). The site boundary established by Spidell et al. (2014) encompasses two previously recorded sites, CrNV-03-4408 (26Ly865) and CrNV-03-4409 (26Ly866). These sites have been combined to create a larger site, under the designation of CrNV-03-4408 (26Ly865). Although the sites were previously issued Lyon County trinomials (Reno et. al 1991), the sites are located in Storey County, Nevada and were re-assigned the designation CrNV-03-4408 (26St611).

Figure 6.5 Site CrNV-03-4408 (26St611) Overview (0 degrees).

Site CrNV-03-4408 (26Ly865) was originally recorded in 1991 as a prehistoric milling stone location and a prospecting locality with associated artifacts (Reno et al. 1991). The prehistoric component was described as a metate, a metate fragment, and a single obsidian biface thinning flake. The historic features were described as three prospect pits and a rock alignment with soil piled in the site center. The historic artifacts included bottle glass, food cans, tobacco tins, fuel cans, car parts, and ceramic fragments. Some of the artifacts were said to be associated with the prospecting features, though many were noted in association with the nearby American Flat Road. Modern debris was also observed along the road. The site was dated from 1860 to the present. It was observed to be in fair condition with impacts from road use. Both components were determined to be not eligible for the NRHP under any criteria.

Site CrNV-03-4409 (26Ly866) was originally recorded in 1991 as an historic debris scatter and one prospect pit (Reno et al. 1991). Artifacts observed at the site included a ceramic pipe fragment, bottle glass, food cans, a coffee pot, a horseshoe, a barrel hoop, a steel bowl, and a seal from an ale bottle. The site dated between 1870 and 1890. The dump appeared to have been partially burned and part of the site had been vandalized by bottle hunters. The site was judged to be in fair condition. It was recommended eligible for the NRHP under Criteria A and D. This was suggested as the artifact assemblage appeared to be a secondary dump representing a single household, dating to the Comstock boom period, and exhibiting the potential to yield significant data of past behavior.

The sites were observed to be fewer than 20 meters away during the 2013 update (Spidell et al. 2014) from each other, erosional processes having further blurred the demarcation between the two sites. Therefore they were combined into site CrNV-03-4408 (26St611). The site is different than the original recordation and is now described as a multi-component historic prospecting location and lithic scatter. Neither the metate or metate fragment were observed during the current survey. Many of the historic artifacts were relocated including barrel hoops, glass bottle bases, vent hole cans, and hole-in-cap cans. The ceramic pipe and the coffee pot are among the historic items that were not relocated. The site was observed to contain a total of eight features and three artifact concentrations. The previously described features were re-labeled, though the previously described Feature 3 at site CrNV-03-4408 (26Ly865), was not relocated and is presumed destroyed. Because a cluster of prospect pits were recorded near the center of the site, it is difficult to assign any particular pit to the previous designation of Feature 2. Currently, Features 1, 2, 3, 7, and 8 are prospect pits. Feature 4 is a rock-shored platform, composed of the waste rock from the prospect pits. Feature 5 is a hearth and Feature 6 is a claim marker. While prospecting appears to have taken place within the site, the vast majority of artifacts are related to domestic life, some of which indicate gender. Buttons 4 and 5 may be from either dresses or vests. The hearth (Feature 5) contains burned bone and is located within a domestic artifact scatter. Although mining operations began in c. 1849, and there are several artifacts with long periods of manufacture, the suggested general site dates between the 1870s and the 1930s. It is located on the *Caledonia Lode* which was patented in 1924 by the Comstock Merger Mines, Inc. (MS 4599). Unfortunately, no features are depicted on the patent. It is likely that the prospect pits failed, and with shafts located nearby, this site became either a temporary camp area and/or the dumping location for the people living near the shafts. Deposition was noted within the hearth feature. The prehistoric component appears to have been impacted by historic occupation of the site and was noted to be in only fair condition.

The prehistoric component includes five flakes and two bifaces. Material types observed within the assemblage included obsidian and cryptocrystalline silicate (CCS). The maximum density of artifacts does not exceed one per meter square. The location of the site on a hill suggests that the assemblage may have been impacted by erosion. The depositional context suggests that intact subsurface deposits are not likely for the prehistoric component of the site.

The site is located on a hill top and slope. Soils are a colluvial sandy loam with a gravelly surface. Slope and aspect vary. The site was observed to be in good condition with impacts from mining and erosion. Three roads were recorded in within the site. Two roads are modern haul roads of Plumb Mining LLC and Comstock Mining Inc. , while the third is a short two track that leads to the survey marker on site (Road 1). A review of aerial photography indicates that the Plumb Mining LLC haul road was constructed between 1999 and 2003, serving to connect the Lucerne pit to American Flat. This road was widened between June 2, 2003 and November 1, 2004. This road passes though the site and appears to have destroyed a previously recorded prospect pit (Feature 3 described in site 26Ly865). Aerial photography indicates that the Comstock Mining Inc. haul road was constructed between November 1, 2004 and October 12, 2006 and serves to bypass the steep grade of the original Plum Mining LLC haul road. This road is situated north and east of the boundaries of the previously recorded sites, and does not impact the current recorded site.

<u>National Register Eligibility Determination:</u> The historic component of site CrNV-03-4408 (26St611) was determined eligible for the National Register of Historic Places under Criterion D. Site CrNV-03-4408 (26St6611) was also determined to be a contributing element of the Virginia City Historic District. The prehistoric component was determined to be not eligible for inclusion in the National Register of Historic Places.

The artifacts present on site are unique to the region and are representative of many aspects of domestic life. These artifacts were not found in association with any habitation features, however the nature of the assemblage suggests they are the byproducts of a prolonged occupation of temporary structures or possibly a dump representing refuse from nearby residences such as were located in

Gold Hill or American Flat. The artifacts located on site were located in three concentrations, each interpreted as representing temporally isolated events. These artifacts indicate this site was occupied during the defined period of significance of the Virginia City Historic District. Subsurface deposits, while not expected across much of the site, may be present within the three concentration. If determined to be present, these deposits, in addition to the surface artifacts noted, have the potential to yield information to address research questions developed under the theme of *People* (Criterion D).

<u>Site Treatment Measures</u>

<u>Criterion D:</u> Mitigation efforts for site CrNV-03-4408 (26St6611) will focus on the data potential presented in Artifact Concentrations 1, 2, and 3. Data Reconvey is considered the most appropriate method of mitigation for resources determined eligible for listing in the NRHP under Criterion D. Field investigations at this site will begin with detailed surface feature and artifact mapping and recordation. All artifacts on the surface will be recorded, and GPS located when appropriate, and collection protocols will adhere to the procedures outlined in Chapter 5. This activity will attempt to differentiate the individual occupations of the site, assign periods of use for the features and concentrations, and define the behavioral and temporal association of site features in relation to the VCHD. Surface activities will also attempt to identify any previously unidentified features such as privies. All observed features will be fully documented with measurements, descriptions, and photographs to properly ascertain function and period(s) of occupation. Once the periods of occupation of this site are refined, the site's association with the VCHD will be re-assessed.

Following the surface treatment measures, data recovery of the site will be accomplished by the equivalent of no fewer than 15 excavation units measuring 1 x 1 meter in size placed within the three concentrations. The number of units placed in each concentration will be allotted by the surface area of the concentration and will represent a 2 percent sample of the total surface area. Many of the features on this site, such as prospect pits, and cairns will not be assessed using subsurface investigations, due to the nature of their construction and use. The units will be excavated in 10 cm arbitrary levels to a minimum depth of 30cm, with 20 cm of "sterile" soil beyond any buried cultural deposits. An estimated 4.5 cubic meters of sediments will be excavated in this manner.
Excavation methods will conform to those outlined in Chapter 5. Materials from these excavations will be transported to the KEC Historic Laboratory in Reno, where they will be analyzed using the methods outlined in Chapter 5, and any necessary archival research will be conducted. Archival research will be used specifically in conjunction with the materials collected on the site to establish the site's name, dates of use and occupation, and function. The results of the data recovery program will be presented as a final product in report format.

6.1.4 CrNV-03-8915 /26St628

Site Type: Historic
Date: c. 1880- c. 1925
NRHP: Eligible: Criterion A, and D
VCHD: Contributing

This is a residential site with associated artifacts located on the southeast facing slope of a hill, south of Gold Hill, Nevada (Figure 6.6). The site is located in close proximity to the Gold Hill Cemetery. The site was observed to contain a single stacked rock foundation and associated artifacts. The site was documented during to the baseline cultural resource inventory conducted for CMI by Spidell et al. (2014). A complete inventory yielded 39 artifacts, mostly related to food or food consumption. The cut nails are the only non-consumable materials recorded within the site boundary and were likely used in the construction of the structure. A structure is depicted 20 meters from this location on the 1879 *Outline Map of Washoe District, Nevada*. It is probable that this site represents the archaeological remains of that structure. The artifacts on site date to the correct time frame, between c. 1880-c.1925. Deposition is possible within the dugout, however, the site is located fairly close to Highway 342, leaving the site vulnerable to looting and vandalism.

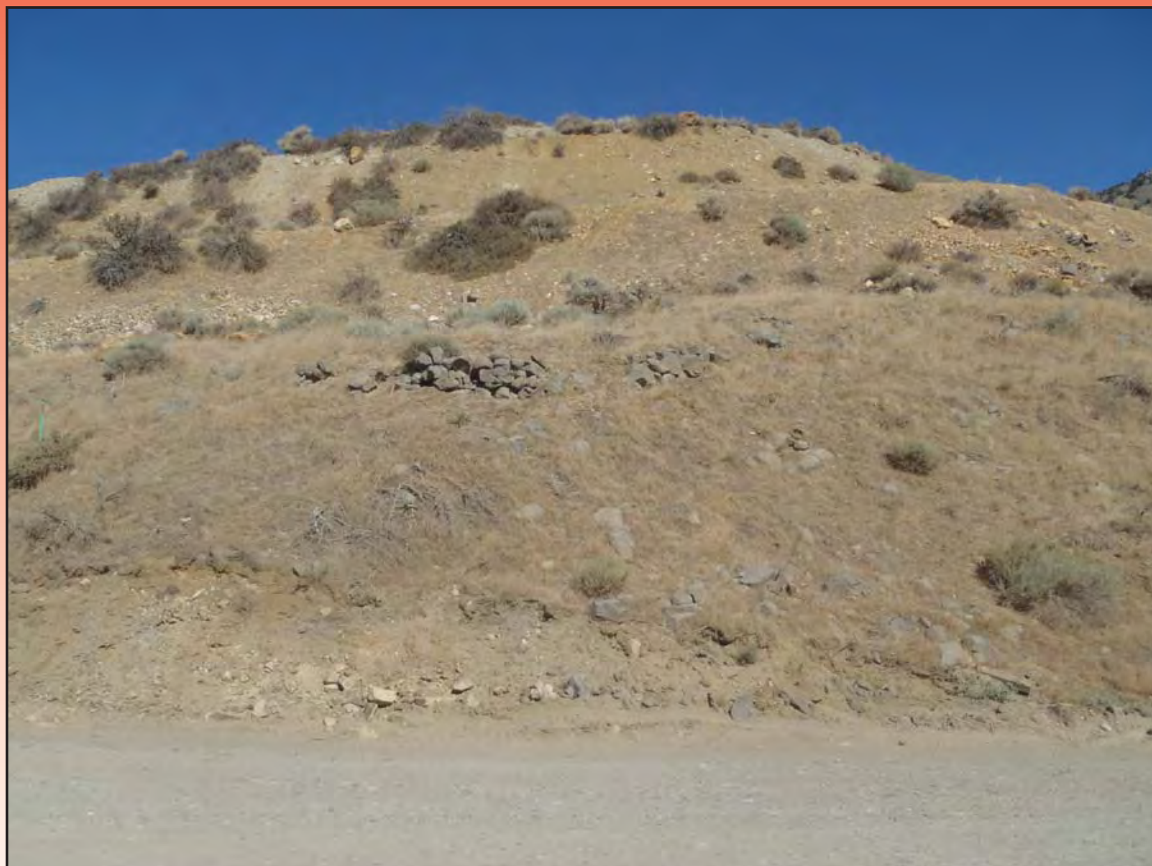

Figure 6.6 Site CrNV-63-8916 (26St628) Overview (285 degrees)

The site is located on a hill slope. The slope is 28 degrees and aspect is 110 degrees. Soils are colluvial in nature consisting of silty loams with 30% surface gravels. Vegetation is dominated by sagebrush and cheatgrass. The site was observed to be in fair condition with impacts from roads and erosion. This site is located north west of the main access road to the Con Chollar. As depicted on aerial photography, impacts to the site from road construction appear to date to the development of the Con Chollar mill, prior to1948. The roads within vicinity of the site as depicted on aerial photography dating from c. 1990 to c. 2011 indicate no change in the alignment of the road.

National Register Eligibility Determination: The historic component of site CrNV-03-8915 (26St628) was determined eligible for the National Register of Historic Places under Criterion A, and D. Site CrNV-03-8915 (26St628) was also determined to be a contributing element of the Virginia City Historic District.

This site consists of a small habitation feature and associated artifacts located on the southeast facing slope of a hill, south of Gold Hill, Nevada. A residential structure is depicted 20 meters from this location on the 1879 *Outline Map of Washoe District, Nevada, Nevada*. This site appears to represent the archaeological remains of that structure. This site is the foundation of a residential structure dating to the Comstock Bonanza(1859-1879) and is associated with the early settlement of Gold Hill (Criterion A). The foundation is expected to contain intact subsurface deposits and has the potential to address research questions developed under the themes of *People,* and *Community Planning and Development* (Criterion D).

Site Treatment Measures

Criterion A: Mitigation of the effect to the site under Criteria A will be accomplished through the creation of an educational unit for historic mining on the Comstock. The data recovered from mitigation of the site under Criterion D, will provide a source of information for the educational unit to draw from. This will allow for public interaction with the resource and fulfill mitigation under Criterion A.

The educational unit will be all inclusive, meaning that all materials will be provided to the teacher. The educational unit will be age appropriate, targeting students in grades 6-8. It will be Common Core aligned, as well as, meeting Nevada state Social Studies and ELA standards. Formative and summative assessments will be included in the unit, along with a short pre-test. The unit will come in two sections; the first section will be for the teacher or educator and will include directions, background information, ways to vary instruction, and the lesson plans. The second section will include all the documentation that students will need (ex. workbooks, printouts).

After creation of the unit, it will be reviewed by the BLM and SHPO, and sent to *The Board of School Trustees of Storey County* for consideration as a "Supplemental Textbook." Adjustments will be made to the lessons as necessary. The approved unit will then be given to the middle school for use in the classroom setting. Communication among KEC, BLM, and SHPO staff, and the middle school educators will be kept open, as to the effectiveness of the lessons. Adjustments will be made as necessary. Digital copies of the educational unit will be available from the BLM, KEC or CMI.

Criterion D: Site CrNV-03-8915 (26St628) is a stone lined foundation that measures 18 ft. north to south by 21.5 ft east to west. Data reconvey is considered the most appropriate method of mitigation for resources determined eligible for listing in the NRHP under Criterion D. Field investigations at this site will begin with detailed surface feature and artifact mapping and recondition. All artifacts on the surface will be recorded, and GPS located when appropriate, and collection protocols will adhere to the procedures outlined in Chapter 5. This activity will attempt to differentiate the occupations of the site, assign periods of use for the feature and define the behavioral and temporal association of site in relation to the VCHD. Surface activities will also attempt to identify any previously unidentified features, such as privies. All observed features will be fully documented with measurements, descriptions, and photographs to properly ascertain function and period(s) of occupation. Once the periods of occupation of this site are refined archival research will attempt to further refine information about the structure and the site's association with the VCHD will be re-assessed.

Following the surface treatment measures, excavation of the feature will be accomplished by the equivalent of no fewer than 12 excavation units measuring 1 x 1 meter in size. The units will be excavated in 10 cm arbitrary levels to a minimum depth of 50cm, with 20 cm of "sterile" soil beyond any buried cultural deposits. An estimated 6 cubic meters of sediments will be excavated in this manner.

Excavation methods will conform to those outlined in Chapter 5. Materials from these excavations will be transported to the KEC Historic Laboratory in Reno, where they will be analyzed using the methods outlined in Chapter 5, and any necessary archival research will be conducted. Archival research will be used specifically in conjunction with the materials collected on the site to establish the site's name, dates of use and occupation, and function. The results of the data recovery program will be presented as a final product in report format.

7.0 CURATION AND PROJECT DELIVERABLES

7.1 CURATORIAL RESPONSIBILITIES

As stated above, effects to historic properties discussed here will be mitigated under the umbrella of a federal undertaking, as portions of the proposed Undertaking are located on public lands administered by the Carson City District of the Bureau of Land Management. Consequently, any cultural materials recovered during data recovery for this federal Undertaking fall under the auspices of the federal permit and will be treated equally with respect to curation, regardless of land status, unless the project proponent wishes to retain artifacts or large items such as mining equipment removed from private lands. KEC has a curatorial agreement with the Nevada State Museum, Carson City, Nevada (The Museum). All artifacts will be formally accessioned into The Museum's collections. In doing so, KEC will adhere to all requirements for transfer and accessioning as specified by The Museum. These requirements and the current contractual agreement between KEC and The Museum are contained in Appendix C.

7.2 DELIVERABLES

This mitigation program will produce a variety of documents and deliverables at various phases of work. At the termination of field activities at each eligible component, BLM will receive a post-field letter detailing mitigation efforts to ensure conformity between the proposed field treatment measures as outlined in this document and the actual treatment measures conducted. Upon receipt of these letters, BLM will make a determination of adequacy for the field activities within one week and will submit a request for concurrence to the Nevada SHPO's office. Upon SHPO's concurrence that mitigation activities were adequate to mitigate effects to the resource's National Register eligible qualities, BLM will issue a Notice to Proceed to Comstock Mining LLC. This procedure will allow Comstock Mining LLC., to move forward with anticipated ground disturbance prior to BLM and SHPO acceptance of a final report.

After the fieldwork phase of the archaeological mitigation program is completed, the cultural contractor will submit a draft archaeological mitigation report to BLM within 12 months. The final report will be submitted within a month once review has been completed and comments are received. Architectural mitigation activities (see site CrNV-03-1489/4371[26St602]) will result in preparation of a stand-alone architectural report that will be submitted to Nevada SHPO and the Comstock Historic District Commission in Virginia City, Nevada. Finally, public documents such as an interpretive marker and educational unit will be produced and distributed to the public. These documents are meant to serve and educate the public regarding the history of the Virginia City Historic District and will incorporate information from all phases of mitigation such as architectural, archival, archaeological and photographic results.

Deliverables

- Post-field letters for each resource treated
- Archaeological results report, draft and final
- Architectural results report, draft and final
- Public Outreach; Educational Unit, Interpretive Marker

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