

# EMPIRE MINE STATE HISTORIC PARK General Development Plan Amendment

## For Underground Interpretive Experience and Support Facilities

### Final

~~PRELIMINARY~~



CALIFORNIA STATE PARKS

April 1996



**T**his amendment was prepared by an interdisciplinary planning team, which included staff located in the Department's Northern Service Center, Gold Mines Sector and Gold Rush District Headquarters. The following people participated during this planning effort and contributed to the completion of this preliminary plan.

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Special thanks to the volunteers and members of the Empire Mine Park Association and Friends of Empire Mine, who were instrumental in the early planning stages and fund raising efforts for the adit project. We welcome their continued involvement and support at Empire Mine State Historic Park.

DEPARTMENT OF PARKS AND RECREATION

**STATE PARK AND RECREATION COMMISSION**

P.O. BOX 942896, SACRAMENTO, CA 94296-0001



Resolution 27-96  
adopted by the  
**CALIFORNIA STATE PARK AND RECREATION COMMISSION**  
at its regular meeting in Grass Valley on  
August 19, 1996

WHEREAS, the State Park and Recreation Commission adopted Resolution 61-77 at its regular meeting in Sacramento on November 18, 1977, approving the Department of Parks and Recreation's Resource Management Plan, General Development Plan, and Environmental Impact Report for the Empire Mine State Historic Park; and

WHEREAS, the Director of the Department of Parks and Recreation has presented to this Commission for approval the proposed Empire Mine State Historic Park General Development Plan Amendment for Underground Interpretive Experience and Support Facilities dated April 1996; and

WHEREAS, this amendment reflects the interpretive objectives and long-range development plans to provide public access underground and support facilities for the optimum use and enjoyment of the unit as well as the protection of its cultural resources and historic quality;

NOW, THEREFORE, BE IT RESOLVED that the State Park and Recreation Commission approves the Department of Parks and Recreation's Empire Mine State Historic Park General Development Plan Amendment dated April 1996, subject to such environmental changes as the Director of Parks and Recreation shall determine advisable and necessary to implement the provisions and objectives of said amendment.



**CALIFORNIA ENVIRONMENTAL QUALITY ACT  
NOTICE OF DETERMINATION**

TO: Office of Planning and Research  
1400 Tenth Street, Room 121  
Sacramento, CA 95814

FROM: California Department of Parks and  
Recreation  
P.O. Box 942896  
Sacramento, CA 94296-0001

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 of the Public Resources Code.

Project Title: EMPIRE MINE STATE HISTORIC PARK - GENERAL PLAN AMENDMENT

State Clearinghouse Number: 96062097

Contact Person: ROBERT UELTZEN

Phone Number: (916) 323-0975

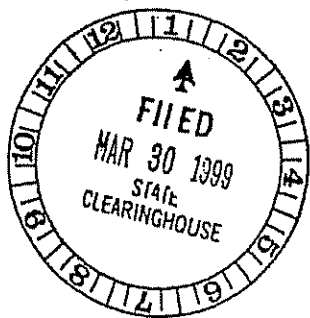
Project Location: EMPIRE MINE STATE HISTORIC PARK, NEVADA COUNTY

Project Description: GENERAL PLAN AMENDMENT FOR THE CONSTRUCTION AND OPERATION OF AN INTERPETIVE HORIZONTAL MINE ENTRANCE (ADIT) INTERSECTING THE MAIN SHAFT OF THE HISTORIC EMPIRE MINE.

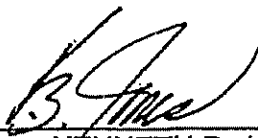
The California Department of Parks and Recreation has approved the project and has made the following determinations regarding the project:

1.  The project will not have a significant effect in the environment.  
 The project will have a significant effect on the environment.
2.  A Negative Declaration was prepared and adopted pursuant to the provisions of the California Environmental Quality Act (CEQA).  
 A Final Environmental Impact Report has been completed in compliance with CEQA and has been presented to the decision-making body of this Department for review and consideration of the information contained in the Final EIR prior to approval of the project.
3. Mitigation measures  were  were not made conditions of project approval.
4. A Statement of Overriding Considerations  was  was not adopted for this project.
5. Findings  were  were not made on environmental effects of the project.

The EIR or Negative Declaration and record of project approval may be examined at the Resource Management Division, California Department of Parks and Recreation located at 1416 Ninth Street, Room 917, Sacramento, CA.



Date Received for Filing

  
Signature KENNETH B. JONES  
DEPUTY DIRECTOR, PARK STEWARDSHIP

Title

3-7-99  
Date



EMPIRE MINE STATE HISTORIC PARK  
**General Development Plan Amendment**  
For  
Underground Interpretive Experience  
and Support Facilities

April 1996

**PRELIMINARY**

PETE WILSON  
GOVERNOR

DOUGLAS P. WHEELER  
SECRETARY FOR RESOURCES



**CALIFORNIA STATE PARKS**

DEPARTMENT OF PARKS AND RECREATION

DONALD W. MURPHY  
DIRECTOR OF PARKS AND RECREATION  
P.O. BOX 942896  
SACRAMENTO, CA 94296-0001

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## PHOTOS

*Historic photos and captions are from original photographs in NOBS COLLECTION. Taken in 1941 by Stanley and Kenneth Nobs, sons of Fred Nobs, General Manager of Empire Mine for 23 years.*

## EXECUTIVE SUMMARY

*The purpose of Empire Mine State Historic Park is to preserve, interpret and manage resources significant to its historical and natural environments in order that this and future generations can appreciate and enjoy their heritage as it is exemplified at the Empire Mine Complex (Declaration of Purpose, Empire Mine S.H.P., 1977).*

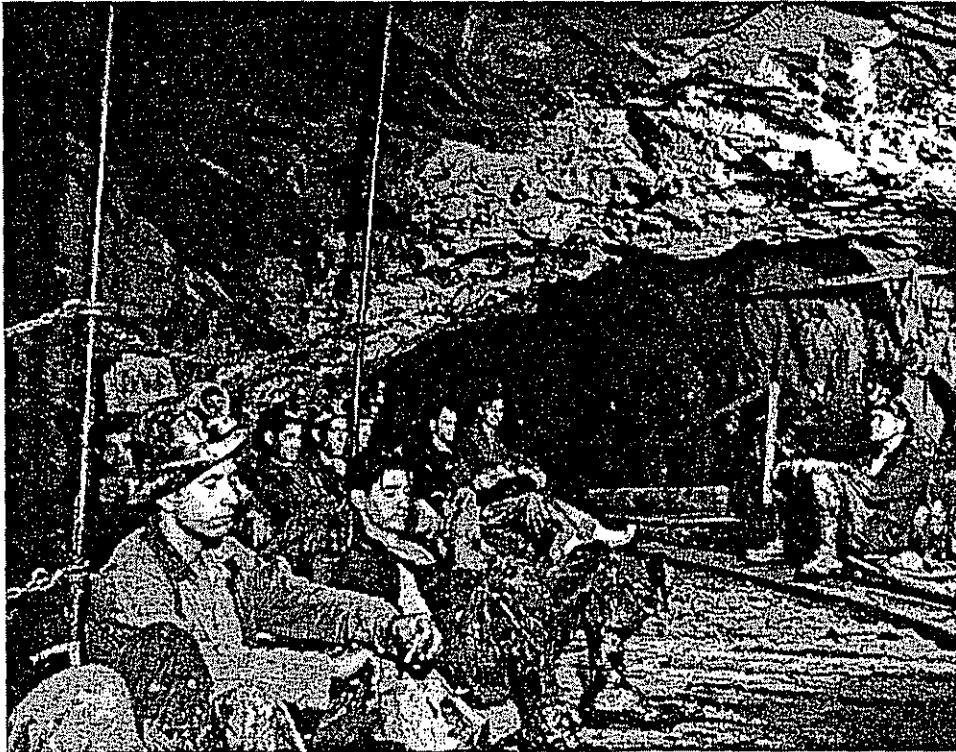
*The Empire Mine has played a significant role in the history and development of California. The basic goal in the interpretation of this story is to provide an historic environment that is representative of hard rock gold mining (Empire Mine S.H.P., General Development Plan, 1977). This environment cannot be actualized on the surface, it must be created underground. While the 1977 General Development Plan for Empire Mine S.H.P. continues to provide invaluable guidance for the interpretive evolution of the park, the concept of providing park visitors with a high quality underground interpretive experience was never addressed. It is therefore deemed necessary to amend the original plan to enable the fulfillment of the park's primary interpretive goal.*

*The proposed adit (nearly horizontal entrance to a mine) and its intersection with the main Empire shaft will provide the physical setting for the public to experience and truly understand hard rock gold mining. The visitors' world will be transformed almost instantaneously as they don their hard hats with mining lights and travel by electric tram into the confines of the adit. Their new world, underground, will enliven their every sense. They will see and feel the confining structure of the mine: rock, timbers, darkness. They will smell the dankness, hear mining sounds: drilling, blasting, mucking, miners talking, machinery working and water dripping. They will begin to understand the arduous, confined life of the hard rock gold miner.*

*Formal interpretation will augment the experience of being underground in the Empire Mine through a series of exhibits, displays and a narrative by a tour guide. As the visitors progress into the adit,*

they will journey, technologically, back in time. The first exhibits will be representative of mining in the 1930s, showing equipment, clothing and safety gear. The second exhibit will take participants back to about 1905, a time of significant innovations. The third will feature the technology of the 1870s, a period of major expansion of the Empire Mine. At the intersection with the main shaft, each person will experience the workings actually excavated in the 1860s and early 1870s.

The public underground tour, along with improvements in accessibility and parking will expand the educational potential of Empire Mine State Historic Park to an extraordinary level. Regardless of future possible enhancements to the interpretive scene, such as reconstruction and use of the hoist works and/or headframe, the adit would of necessity be an integral part of any additional development. An underground tour of the Empire Mine will be an experience remembered for a lifetime.



A station waiting area. When all the loose rock has been shoveled into the cars and tools put away, the miners come out to the main shaft and wait for the 'skip' to be removed and the flat cars hooked up to haul them to the surface.

## INTRODUCTION & PURPOSE

Empire Mine State Historic Park was established primarily to preserve and interpret the significant historic resources related to hard rock mining operations in California; specifically at Empire Mine in Grass Valley. In the fall of 1977 the California State Park and Recreation Commission approved the Resource Management Plan, General Development Plan and Environmental Impact Report prepared for this unit. This document has effectively guided the park's management, development and interpretation for nearly twenty years, and is considered by some to be one of the better general planning documents prepared by the Department for a state historic park.

*One major goal of our reconstruction and interpretive program at this historic unit is to pursue the interpretation of hard rock gold mining by providing visitors with the opportunity of being deep underground. A horizontal mine entrance (adit) is being proposed to intersect with a historic drift that connects with the Empire Mine decline shaft, providing the physical setting to show visitors what hard rock mining was really like. The general development plan (GDP) identifies various methods and media to interpret the park's primary themes, but does not describe this specific development project and its related support facilities. Therefore, the Department determined that an amendment to the general development plan was necessary. As amended, the general development plan will continue to provide management policy and guidelines for all park development in accordance with the unit's classification and declared purpose.*

## PROJECT SCOPE

This amendment will supplement the existing Empire Mine SHP Resource Management Plan and General Development Plan by addressing the proposed adit project, its interpretive purpose, and its effect on the park's natural and historic resources.

The Area of Study for this amendment is limited to the core historic area and the adjacent parking lot (see Vicinity Map, page 4). This amendment describes the relationship between the proposed development and existing facilities, historic features, and the overall park interpretive program.

An Environmental Impact Report is included as part of this general development plan amendment. The Environmental Impact Report, included herein, page 37, describes the impacts of the proposed development concept and the alternatives that were considered during this planning process. Site specific development and resource management projects will be subject to subsequent CEQA compliance as they are proposed.

## GOALS AND OBJECTIVES

Specific goals and objectives were developed in the preparation of this amendment, primarily to reaffirm the original goals and interpretive objectives of the 1977 resource management plan (RMP) and general development plan (GDP), and to guide further planning and interpretive development at Empire Mine State Historic Park.

Goal: Interpret hard-rock mining in California

Objectives: Preserve, restore, and reconstruct historic features.

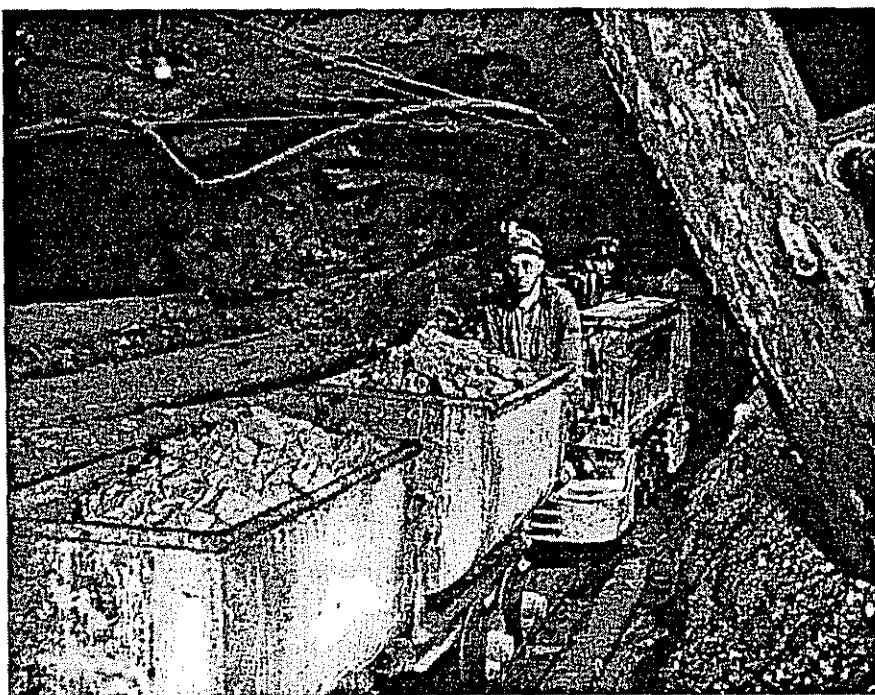
Interpret historic mine structures and activities associated with the Empire Mine operations.

Develop alternative interpretive methods, media, and facilities.

Goal: Enhance interpretation by providing visitors the opportunity to view underground mining techniques while experiencing the underground environment.

Objectives: Determine safe methods of providing visitor access into an underground mine shaft.

Explore methods for providing underground interpretive tours and opportunities for demonstrating mining techniques.



*Electric tram. At the main level track an electric motor picks up all the cars from the sidings and hauls them to the shaft where they are dumped into another bin. The 'skip' (ore car that operates in the shaft) hauls the rock to the surface.*

Goal: Provide for needed support facilities, compatible with the unit's classification and its cultural and natural features.

Objectives: Provide guidelines for the development of the proposed adit and related support facilities.

Describe the visitor orientation, parking and circulation.

Goal: Amend the general development plan to serve as an information document for continuing historic preservation and interpretive development.

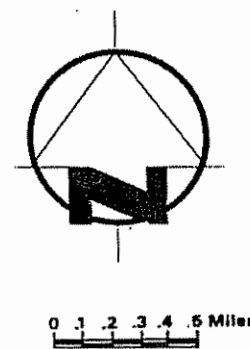
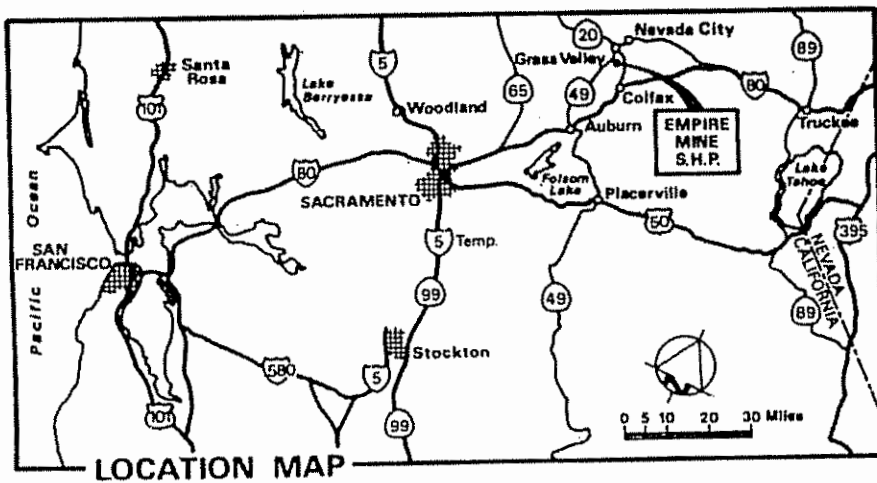
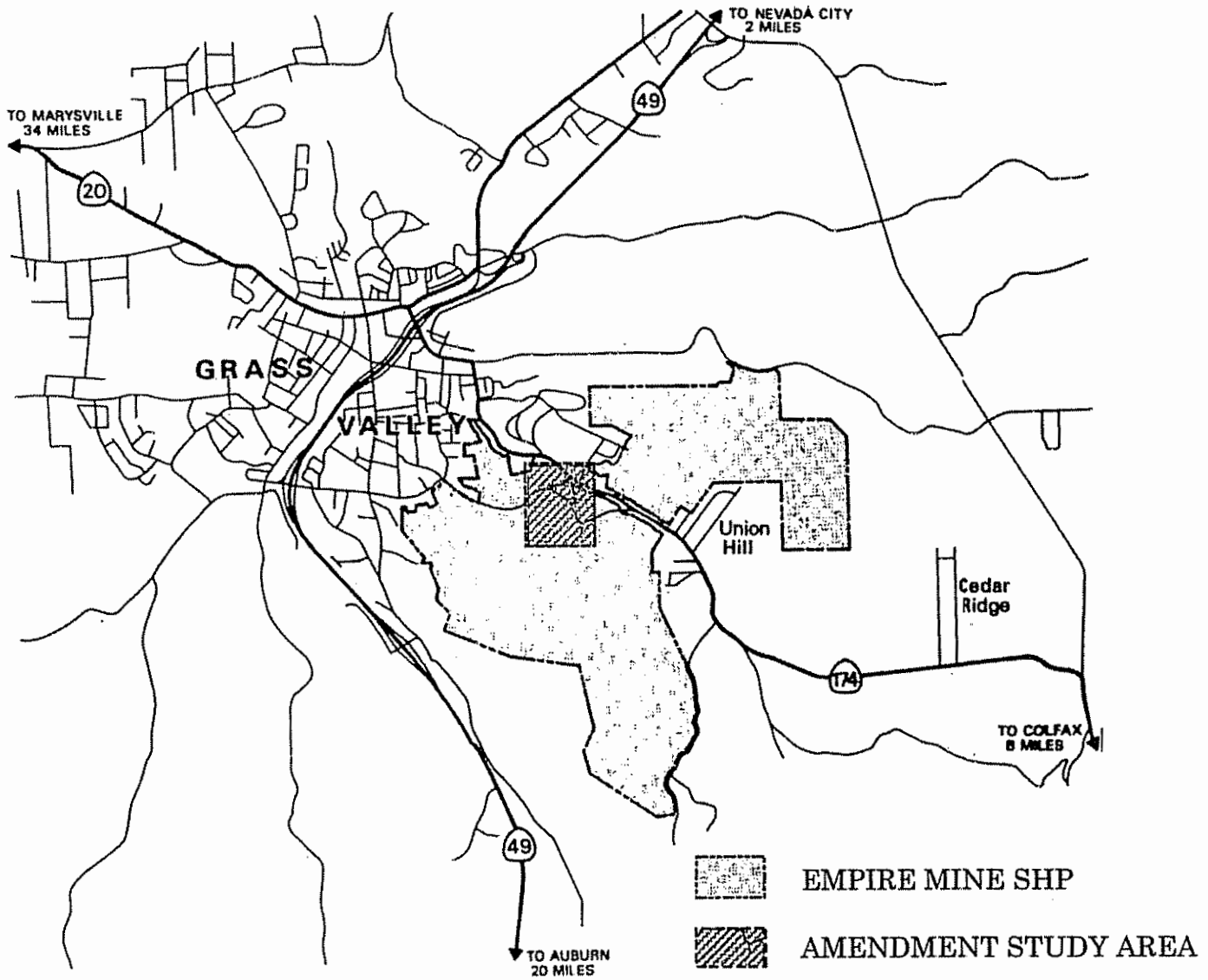
Objectives: Reaffirm the unit's historic restoration and reconstruction priorities.

Determine the potential environmental impact of the proposed facilities.

Make recommendations for any additional studies needed beyond the scope of this document.

## **UNIT DESCRIPTION & OWNERSHIP**

Empire Mine State Historic Park is located in Nevada County adjacent to the southeast edge of the town of Grass Valley. The park property consists of two large parcels bisected by Highway 174. North of the highway lies the smaller, 272-acre portion of the park called the Union Hill Area. This area is managed as scenic open space and for low intensity visitor use of hiking and equestrian trails. The larger, 531-acre parcel, south of Highway 174, is comprised of the primary historic area and the open space known as the Osborn Hill Area. This area contains the complex of Empire Mine structures, as well as the park's administrative, maintenance, and visitor support facilities. Since the 1977 general development plan, an additional 30 acres was acquired between Empire Street and Highway 174. Together, these parcels now total 803 acres (see Vicinity Map, page 4).



# Empire Mine State Historic Park VICINITY MAP

## **RESOURCES**

### **ENVIRONMENTAL SETTING**

#### **Introduction**

Empire Mine State Historic Park is located in the Sierra Nevada foothills at approximately 2500-2900 feet in elevation. The climate is typical for the foothills area offering summer temperatures in the 80s and low 90s, cooler evenings and mild, wet winters with an occasional snow. Rainfall averages 55 inches per year. The geographical location and elevation of the park provide seasonal changes that add to the beauty of the park unit. The spring season offers colorful displays of blooming exotic and native vegetation while the native and introduced oaks and maples turn brilliant colors in the fall.

The significant cultural resources of the park are set within a landscape of natural features that enhance the visitors' experience of the park. An open ponderosa pine forest serves as a backdrop for the park operations. The natural areas of the park also include native black oak forests and riparian habitat along the Wolf Creek drainage. In addition to the native vegetation, the cultural features are further complemented by the beautiful formal gardens and grounds that consist of a dramatic blend of exotic and native vegetation. Visitors to the park can enjoy access not only to the historic resources but also to an extensive system of trails that offer recreational opportunities in the natural zones of the park. While walking, running, bicycling or riding horses, the visitor will also see remnants of mining activities scattered throughout the park.

The proposed adit project, which is the subject of this amendment, is located within the historic core area of Empire Mine in a small drainage near the historic cyanide processing plant (see map on page 28). The original plant structures no longer exist other than remaining building foundations consisting of concrete and metal reinforcement. The adit entrance and proposed interpretive facilities would be located downslope in a seasonal drainage area, southwest of the foundations. This small watershed drains to the west into the sand tailings ponds. The adit tunnel entrance is to be located on the north side of this drainage, approximately 100 feet west of the cyanide plant. The trestle from the adit would extend south across the drainage and down to the interpretive center and office, which would be located on the hillside approximately 80 feet to the south. The track then travels an additional 200 feet to the southwest to the proposed maintenance shop and administrative parking area. The office and the maintenance shop would be located at 2,580 ft. elevation; the adit entrance at approximately 2,590 ft.



## **CULTURAL RESOURCES**

Gold was discovered in California in January of 1848. By 1849, the California Gold Rush was on, with thousands of people pouring into the area from around the world. By the 1850s, gold seekers had fanned out seeking gold throughout the water courses of California and beyond. And early on, these seekers sought gold not only in the river gravels, but in the earth, following veins, as well.

There were three kinds of gold ore extraction methods used from the 19th to the 20th centuries in California: placer mining, hydraulic mining, and hard rock mining. The first gold mining was placer mining, done by a number of techniques, ranging from simple mining with gold pans and baskets to more complex devices. As the easy-to-get gold in the river gravels, or placers, played out, more technologically advanced and expensive methods and techniques were used. One of these other methods was hydraulic mining. It was used until the 1880s when the federal court "Sawyer Decision" effectively stopped most hydraulic mining activity. This method used large hoses and directing devices called monitors to wash away whole hillsides to process ore. Since this was clogging rivers and ruining agriculture, the courts directed mining outfits to contain the debris. While such mining continued on a smaller scale into the 20th century, the rules were such that it was too expensive to pursue. The third major method of getting out gold ore was hard rock mining.

While placer mining and hydraulic mining are depicted respectively at the Marshall Gold Discovery and Malakoff Diggins historical units of the state park system, Empire Mine State Historic Park was acquired and is being developed to preserve and interpret to visitors hard rock mining in California.

The Empire Mine is significant in that it continued to be worked for more than a century. The start of what was ultimately to be known as the Empire Mine occurred when George E. Roberts discovered gold on Ophir Hill in 1850. Operations continued until 1956, a period of 106 years.

An important part of the mining interpretation involves getting visitors underground in the mine's excavated areas so that they can experience firsthand the underground environment of hard rock mining.

As is discussed elsewhere in this general plan amendment, the only feasible way to do that is to place an adit (horizontal mine entrance) into the ground to connect with a historic drift (internal, horizontal excavation) that connects with the Empire's main, decline shaft. In the area of cultural interest, this contemporary adit is a portal to the past, and is, in part, an interpretive facility that is compatible with the historic features of the Empire Mine.

While the research and planning in the 1970s was well done, more is now known about the historic properties at Empire Mine State Historic Park. For example, many features southward from the Empire shaft listed as "unknown" in the unit's resource management and general development plan, can now be identified (e.g., Orleans Mine, Heuston Hill Mine, Sebastopol Mine, Prescott Hill Mine). Following the guidelines of the 1977 plan, much preservation work has been done. The Bourn Cottage, grounds, gardens, and greenhouse have all been stabilized and restored. Likewise, in the working area of the mine, restoration has occurred for those items identified in the general development plan, such as the mine manager's office, machine shop, hoist house, and the engineer's office. A number of facilities identified for reconstruction in the plan have been reconstructed - e.g., the blacksmith shop, welding shop, compressor house, and Warehouse 34B of the miscellaneous structures category. Nevertheless, all such facilities are above-ground facilities. These are important to the hard rock mining story, but the purpose of such a mine is to go underground to get the gold.

Although visitors can stand at the top of the main shaft to look into it, they cannot actually go into the underground workings of the Empire Mine. Thus, the declared purpose of this unit, which is in part "...to preserve, interpret, and manage..." the resources, cannot be completely fulfilled, because visitors do not have an opportunity to experience the daily working environment of the hard rock miner. Completing the proposed project will provide that opportunity, and in doing so, will better meet the interpretive goals for this state historic park.

By placing an adit into the ground from a point southwesterly from the main mining complex above ground, a historic drift can be intercepted. This drift, in turn, connects with the Empire's main decline shaft. This permits visitors to have two entrances to Empire Mine's underground historic properties, which fulfills health and safety requirements, and fulfills, in part, the interpretive goal as declared for this unit.

## NATURAL RESOURCES

### Vegetation

No rare or endangered plants have been found in the project area nor are any sensitive species listed for this area with the California Department of Fish and Game's Natural Diversity Data Base. Resource staff did not expect to find any such species mainly due to the destructive history of the site and the lack of any unusual soil or geologic formations. The natural vegetation on this site has been greatly disturbed due to the

## **EMPIRE MINE STATE HISTORIC PARK**

### **General Development Plan Amendment**

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past mining activities. The original ponderosa pine forest was removed during the mine development. Subsequently a mixed forest of pine, incense cedar, white fir, Douglas fir, black oak, live oak and madrone has become reestablished in the last 50 to 60 years. Thick underbrush areas of manzanita have expanded into the altered sites and, due to lack of natural fires, have become very dense stands. Exotic species introduced by the settlers and miners are also present in the landscape including: eastern maples, black locust, Himalaya blackberry, vinca, ivy, and cherry and apple trees.

The drainage zone is dominated by native willows, alders, and cottonwoods, limited to those areas that retain moisture for most of the year. Little plant growth is found within most of the creek zone due to the seasonality of rain and soil sterilization as a result of the old cyanide plant. In addition to willows, some herbaceous species are beginning to grow in these barren areas. As this drainage proceeds toward the sand tailings ponds, riparian species are reestablishing on the site and creating new habitat.

### **Wildlife**

No rare or endangered birds are listed for the adit site with the California Natural Diversity Data Base. The wildlife of the area has been affected by the decades of mining activity and continuing urbanization. Vast areas of forest were removed for development requiring some species to move to more remote habitat. Many of the mammals common to the Sierra Foothill regions have now reoccupied the once disturbed sites. Common mammals to the proposed adit site include the California mule deer, gray fox, coyote, raccoon, western gray squirrel, Beechy ground squirrel, striped skunk, black-tailed jackrabbit, opossum, brush rabbit, wood rat and deer mouse. Ring-tailed cats and flying squirrels have also been observed close to this area. The birds found on the adit site are common to the rest of the park unit and are listed in the general development plan. The recovering riparian habitat of the sand dam area is developing into excellent habitat for bird species attracted to wetland areas. As the creek habitat downstream from the old cyanide plant continues to recover, bird life in the area will increase. To date the only species considered sensitive that occurs locally is the pileated woodpecker.

An updated list of the wildlife species and native plants present on the site can be found in Appendix B.

## Soils

The soils of Empire Mine have been previously described in the resource management plan and general development plan of 1977. The eight soil series were described and mapped by the U.S. Soil Conservation Service. Upon reviewing the soils map, the adit area was generally described as tailings consisting of "waste material from underground mineshafts and the by-products of gold ore processing. As part of the proposed adit development, a subsurface investigation was initiated in 1989 to further analyze the soils and the geology of the site specifically. The purpose of the study was to provide preliminary data for the adit design and cost estimating purposes. The preliminary exploration program was conducted by a geologist with Kleinfelder, Inc. in March and April of 1989. Borings were drilled to depths of 9 to 104 feet below the existing site grade; depth of boring was related to the bottom of the proposed adit floor. (McDonnell, May 1989, Appendix D)

The Kleinfelder geologist classified the near surface soils as medium, stiff, sandy clay to depths of 7 to 23 feet below the existing site grade. Below this layer to 35 to 40 feet, diabase bedrock was encountered. A subsurface section from this report is included in Appendix C. (Bakker, Dec. 1990)

A subsequent reevaluation of the project was necessary a year later due to the high cost of the proposed design and a conflict of the design with the historic period of the park. Additional exploratory work was undertaken in July of 1990 by Vector Engineering. Sandy clays were again encountered at the surface to depths of 15 feet 20 feet northwest of the old cyanide plant. North of the cyanide plant, the sandy clays were overlaid by a layer of fill ranging from 0-15 feet below the surface presumably from the stamp mill foundation and access roads. Another site close to the cyanide plant contained fill believed to be material from a pre-existing sediment pond. The sandy clays appear to have formed in part from the intense chemical and mechanical weathering of the underlying bedrock. The clays are very stiff, moist to very moist (if located near drainage features), and appear to exhibit low to moderate plasticity.

### Soil Characteristics

The sandy clays of the adit area belong to the Sites series of soils in the Sites loam phase. Typically these soils are well drained. Permeability is moderately slow or moderate. Runoff is slow to medium. Available water-holding capacity is 6 to 12 inches. The hazard of erosion is slight to moderate. Tillage on the contour or across the slope helps to control the erosion. Plants in these soils respond to applications of nitrogen and phosphorus.

Locating and building roads is fairly easy. Roads need to be graveled (minimum standard) for year-round use and protected from runoff water. Main roads require ditches and culverts. Temporary and minor roads should be outsloped and grades should be sloped downward toward the watercourse for a short distance on both sides of the creeks or draws. When constructing roads, adequate erosion-control measures are needed.

Soils at the project site have the following characteristics: medium to low water retention, medium to low strength on embankments, medium to low permeability when compacted, fair to poor road fill material, high to low sensitivity to piping, and a moderate shrink-swell potential.

## **Geology**

The geology of the Empire Mine area was formed over millions of years involving a complex deposition of eroding sediments and igneous rock by volcanoes, interspersed with uplifting, compression, cracking, and erosion. A detailed explanation of the deposition of gold-bearing veins in relation to the geologic history can be found in the general development plan (GDP) of 1977.

According to the Geology Map of the GDP, the adit site is composed of igneous rocks of porphyrite and diabase. This rock type occupies the greatest portion of the park; including the Empire Mine area. Just to the west of the adit, a sharp boundary of granodiorite can be found.

The geology of the adit site was evaluated by Vector Engineering in 1990-1991 for purposes of engineering analysis and recommendations for adit support. The project was limited to an evaluation of the geotechnical aspects of the adit construction. The company undertook limited boring exploration and site reconnaissance; a complete assessment could not be fully evaluated by isolated borings. Geologic mapping will be necessary during the adit construction to evaluate various bedrock conditions. Vector Engineering (1991) identified the adit site as metavolcanics consisting chiefly of amphibolite schist and diabase. Because the <sup>metavolcanics</sup>volcanics of these rock types are younger than the surrounding intrusive granitic rocks, they were later subjected to bed by bed injections of granodiorite and quartz. The quartz veins often contained gold and this led to the development of the Empire Mine.

There are no fault zones within the park; the nearest earthquake fault is located west of the park paralleling Highway 49. This is recognized as an old fault (2 million years old) and has no history of recent disturbance.

The terrain of this area is gentle with 0-15% slopes.

## RESOURCE SENSITIVITY & CONSTRAINTS

### Introduction

This Resource Sensitivity and Constraints section addresses specific resource issues that could affect the adit construction and/or impacts of the proposed project on the natural or cultural resources of the unit. The construction of the adit might also provide mitigation solutions for existing resource problems, which are a result of previous mining activities.

### Soil Conditions

Current soil conditions surrounding the cyanide plant and downslope from the site, are the result of the gold milling and extraction processes used at the Empire Mine. Mining activity produced by-products of waste rock and slurry from the milling process. The brief discussion of the process that follows will aid in describing current soil issues and the mitigation being undertaken by the Department.

Ore removed from the mine was crushed by a primary rock crusher. This crushed ore was then transferred to a stamp mill for further processing. The stamp mill crushed the ore into very fine sand which was washed over copper tables coated with mercury. The gold was captured by the mercury; the tables were scraped periodically to remove the amalgam of gold and mercury. Prior to the 1900s, the amalgam was heated until the mercury vaporized. After 1910, a cyanide process was installed that involved adding sodium cyanide to the crushed ore to dissolve and separate the gold from sulfides and deposit it as a coating on zinc chips. The material was then mixed with purifying chemicals and heated in a furnace at the refinery. The molten material was then poured into a mold; contaminants floated to the top, leaving the gold at the bottom.

Once the gold was extracted, the waste materials were stockpiled south of the former cyanide plant or allowed to run off in the drainage below the cyanide plant. The estimated physical dimensions of the stockpiled tailings were 270 x 100 x 11 feet. The tailings material contained elevated levels of heavy metals and inorganics (lead, arsenic, mercury and sulfides) which had been either present in the ore, or had resulted from the milling process. Further testing by the Department of Health Services (DHS) verified high concentrations of heavy metals in the tailings pile.

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**EMPIRE MINE STATE HISTORIC PARK**  
**General Development Plan Amendment**

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The cyanide tailings pile, although considered by DPR to be an important cultural resource of this historic park, contained potentially hazardous material and needed to be removed. The Empire Mine Park Association (through special legislation) contracted with Argo Minerals West, Inc. (together with Homestake Mining) in 1989-90 to have the tailings removed and transported off-site to Lake and Napa counties for advanced gold processing.

Some residual contaminants remain in the soils below the old tailings pile and in the immediate vicinity and below the cyanide plant. DPR will remediate these contaminated areas to eliminate airborne and contact concerns. Rock removed from the adit construction will be placed over the soils in the drainage below the cyanide plant. Southeast of the adit project, in the old tailings areas, the proposed access road to the adit parking and facilities will be paved. In areas where testing has shown that residual sulfides still occur, clay will be placed over the soils to create an impenetrable layer, with the adit rock materials spread over the clay.

DPR staff feel confident that the sealing treatment method, coupled with the brief exposure time of park visitors and staff, and the reduced levels of soil contaminants will remediate any remaining toxic concerns. The Department of Toxic Substances Control (DTSC) has also concurred with this mitigation proposal.

## **Waste Rock**

Waste rock from the proposed adit will be composed of two rock types: highly weathered diabase and massive diorite. This material is significantly different from the mine "tailings". The tailings were composed of heavily mineralized, fine-grained rock which had been processed to remove gold. Acidic conditions occurred after this process which led to leaching of heavy metals. The adit material would consist of unmineralized rock of larger grain size and unprocessed. Therefore, adit rock is not acid-generating and the potential for leaching heavy metals is very low.

Vector Engineering, from Grass Valley was hired to extract core samples from the adit site and submit them to a certified lab for analysis of total levels of arsenic, lead, mercury, acid neutralization potential and acid-generation potential. The analysis looked at the concentration of metals in the waste rock and the potential for leaching with precipitation. The results indicated that the total arsenic and lead levels in the rock are non-hazardous and mercury was non-detectable.

Additional testing was conducted on lead with respect to leaching under acid rain conditions. The contractor concluded that "while lead is present in the rock to be removed from the adit, it is insoluble at conditions normally found at the surface. In our opinion, lead in rock removed from the adit would present no hazard to public health or ground water".

Located in the Appendices of this amendment, are copies of the Preliminary Endangerment Assessment (PEA) (Harding Lawson Assoc., 4/27/1992); Results of Chemical Analysis of Rock Cores (Vector Engineering, Inc., 12/14/1990); and Subsurface Investigation Report (Kleinfelder, Inc. 5/26/1989).

## **Visual Impacts**

The proposed adit is located within the historic zone of Empire Mine SHP. Concern has been expressed over the construction of new above-ground facilities related to the adit construction within the viewshed of the core of the park. In actuality, the adit project is located downslope to the southwest of the main yard and grounds and is not visible from the mine yard or landscaped grounds. Additionally, the project site is vegetated with trees and shrubbery, providing a natural screen for this area.

Visual impacts would be minor, consisting of a tram station and individual tram vehicles shuttling visitors between the two areas. Vehicles would be visible from the core area, but only for brief periods of time. The tram loading and unloading platform would be designed as an addition to the restoration of an historic shed, adapted for use as public restrooms.

## **Plants and Animals**

As mentioned previously in the Environmental Setting section, no known rare or endangered plants or animals occur within the adit project site. Habitat for the state endangered Scadden Flat checkerbloom does not occur within the proposed project site.

Two DFG sensitive bird species, the yellow breasted chat and the yellow warbler, could occur within the area, but the amount of construction required for the adit, interpretive facility and parking will involve minimal alteration to this habitat. The birds, if present, would most likely use the habitat around the sand dam area, downslope from the adit site.





## **INTERPRETATION**

### **BACKGROUND**

There have been a number of major changes made at the park since the general development plan was completed in 1977. In the last ten years, many of the proposed facilities have been completed and many of the interpretive programs implemented. Most of the historic structures have been either stabilized or restored, and some buildings, such as the Blacksmith and Welding shops, were reconstructed and equipped with period furnishings. The overall interpretive program has been developed along the guidelines established in the general development plan and the interpretive prospectus, and most of the more basic interpretive proposals have been initiated.

A visitor center has been installed in the historic garage building, that today functions as the "Front Door" to the park. Interpretive panels, signage, and artifact displays have been placed around the mine operations area and cottage grounds for guided and self-guided tours. A series of "Mini Centers" located throughout the park allow visitors to pick and choose according to their time limitations and interest, each concentrating on an appropriate part of the Empire Mine story.

### **INTERPRETIVE PROGRAM**

During the past several years there has been considerable discussion and planning for a new interpretive experience, an underground tour, that is not specifically detailed in the general development plan (GDP). The GDP proposes to restore the Empire Mine shaft and interpret themes such as: Geology and Gold Deposits, Evolution of Mining Technology, and the Working Life of Miners. However, the question not answered by the general development plan was: should the main mine shaft be open to the public to a depth that would realistically provide the experience of actually being in a mine shaft deep underground? The plan did suggest making the collar of the shaft available to the viewing public and this has been done. The present concept goes much further, opening a horizontal entrance (an adit) some 750 feet long from the area near the Cyanide Plant, intersecting with a historic drift just before it enters the main shaft. Fitted with protective miner's clothing, lights, and other equipment, the visitor would be transported by electric tram along a railtrack in the adit, reaching the main historic shaft at approximately the 90 foot level underground. The combination of the new adit and contact with the original drift and shaft would provide the visitor with a more comprehensive and tangible experience of historical hard rock mining in California.

## **INTERPRETIVE THEMES**

The proposed adit and interpretive tour will deal with three of the five primary sub-themes listed in the interpretive prospectus and the general development plan. These three interpretive themes are:

**Theme No. 1. Geology:** The adit, drift, and the main shaft would expose to direct view at least some of the basic geology of the Sierra Nevada gold-bearing deposits. The quartz and its rock formations would be seen in their original condition, and the visitor would be able to see the complex configuration of the rock in all its dips, faults, and layered sheets. They would be able to see the deposits just as the miners themselves saw them and begin to appreciate the massive task confronting the early gold seekers.

**Theme No. 2. Mining Technology:** During the long historical period of the operation of the Empire Mine, tremendous strides were made in the evolution of the industrial technology of hard rock mining. As visitors enter the adit and proceed inward toward the main shaft, displays of period equipment and explanations of new techniques, starting with the most modern and descending in time as they approach the historic main shaft, would be shown. Once at the main shaft, the technology of the original miners of the 1850-70s would be seen in its original context. This interpretive procedure should be invaluable to visitors in their understanding of the gold industry.

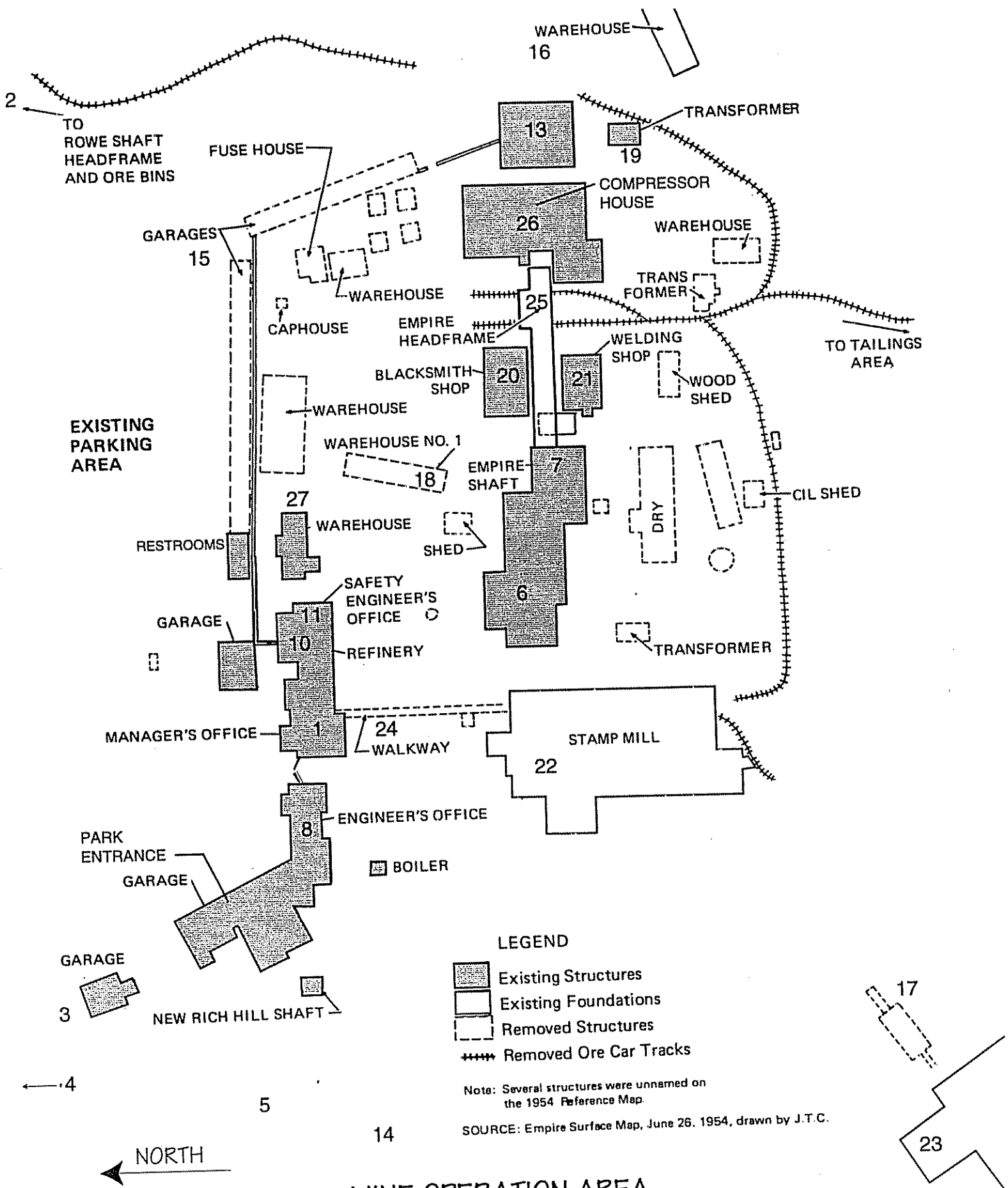
**Theme No. 3. Working Life of the Gold-miners:** The 750 feet of adit and solid rock surrounding the visitors as they journey through the adit to the main shaft would give them, in a way no other interpretive device or media can, a direct sense of what it is like to be a hard rock gold miner, both today and in the past. The dark, wet, hardness of the rock walls; the reverberating sound of clanging metal, biting drills, and breaking rock; the closeness of the air; and above all the dark, utterly lightlessness of underground spaces may be witnessed by the visitors. Thus may the visitors better understand the daily life of the Cornish miners who lived and worked at the Empire Mine. Such artifacts as miners' tools and equipment are important to illustrate this theme. The mine tour can cover detailed information about mining dangers and rewards, hours worked, daily wages, and machinery used in this unique working environment.

## PROGRAM CONSTRAINTS

The basic program would provide for the construction of an adit large enough to accommodate track, electric tram, and several small niches along the route to install appropriate equipment and displays. It will also provide new structures at the beginning of the route to house orientation space, tram maintenance, safety equipment, and an area where the guides will begin the program with the groups of visitors. These facilities are the basic tools needed to conduct the interpretive program.

There are a number of constraints either implied or explicit in this program:

1. The interpretive program will be by guided tour only. This necessitates that trained staff be available to the program.
2. Visitor and staff safety will be given a high priority. The condition of the adit walls, the rock, and equipment will require frequent inspections, as well as constant and careful evaluation of the geological and material support systems in the adit. Care should be taken to see that the safety requirements do not overcome the original interpretive message of the program.
3. Access and emergency escape facilities will be required, including provisions for people with disabilities. This will require that the decline main historic shaft remain open and made usable. Access, parking, and restroom facility design shall be guided by the document "Access to Parks", and comply with all applicable standards and regulations.
4. Under no circumstances should the adit tour become a singular interpretive event unto its own. It is not to become a "ride". The "front door" of the historic park should remain as it is presently. Visitor access to the tour will be encouraged by use of an interpretive trail, or tram, after they have passed through the main visitor center. The series of contact points, or "mini centers", throughout the park (including this new adit facility) will concentrate on different themes of the mine's history.
5. Environmental conditions in the shaft, drift, and the adit will influence both the design and placement of exhibits and also the selection of sensitive historic equipment and other artifacts to be placed underground. High humidity, dust, and the presence of insects are all factors that will limit the types of artifacts that can be exhibited underground. Monitoring of seasonal climatic changes in the adit would be used to help determine the types of objects that could be used.



**MINE OPERATION AREA  
MAP NO. 3**

Note: Numbers are keyed to structures listed on opposite page

NORTH  
Scale: 1" = 100 feet

## INTERPRETIVE DEVELOPMENT

In order to successfully implement the GDP interpretive programs proposed for this state historic park, a continuing preservation and development program is necessary. The following list is taken from page 58 in the GDP, which describes the preservation treatment proposed for historic structures in the Mine Operation Area. This list was updated in Table No. 1 to indicate the current condition of these structures or what work has been accomplished to date. Most of these structures are also shown on the Mine Operation Area Map, page 18.

Table 1

<u>Historic Structure</u>	<u>Proposed in 1977 GDP</u>	<u>Status in 1996</u>
1. Mine Manager's Office	Restore	Restored
2. Rowe Shaft Headframe and Ore Bins	Stabilize Stabilize	Deteriorated (unrepairable) Stabilized
3. Greenhouse	Stabilize	Restored
4. Empire Cottage	Restore	Restored (main floor)
5. Gardens and Grounds Area	Restore	Restored
6. Machine Shop	Restore	Restored
7. Empire Shaft	Restore	Partially restored
8. Engineer's Office	Restore	Restored
9. Magenta Drain Tunnel	Restore	Survey 1994 & re-opening (96)
10. Refinery	Restore	Restored
11. Safety Engineer's Office	Restore	Restored
12. Gardener's Residence	Restore	Partially restored
13. Hoist House	Restore	Restored (not incl. hoist works)
14. Empire Clubhouse	Restore	Restored (main floor, grounds)
15. Garages	Restore	Partially restored
16. Hoist Cable Structure	Restore	Restored
17. Diamond Drill Core Building	Restore	Restoration (unfunded to date)
18. Warehouse No. 1	Restore	Burned down 1985
19. Transformers	Restore	In storage
20. Blacksmith Shop	Reconstruct	Reconstructed 1985-86
21. Welding Shop	Reconstruct	Reconstructed 1990
22. Stamp Mill	Reconst. (partial)	Working Dwgs (Funded 1994 /95)
23. Cyanide Plant	Reconst. (partial)	Ruins
24. Walkway (Mgr.'s Office to Stamp Mill)	Reconstruct	(historic site)
25. Empire Headframe	Reconstruct	Partial reconstruction
26. Compressor House	Reconstruct	Reconstruction began 1994
27. Miscellaneous Structures (including ore car tracks)	Reconstruct	Warehouse 34B Reconst. 1989

## **PARK DEVELOPMENT**

### **MINE OPERATION AREA**

The machine shop, hoist house, blacksmith and welding shops are a few of the historic structures restored or reconstructed in the Mine Operations Area. Also, a small section of the Empire Headframe has been reconstructed, marking the entrance into the main decline shaft. Reconstruction of the Compressor House and working drawings for reconstruction of the Stamp Mill will be completed in 1996, both major components of the mining operations. The original headframe and hoist works no longer exist and several miscellaneous structures were removed from this area, as indicated on the Mine Operation Area Map, page 18. Ore car tracks, once used in the mining process for ore transport throughout the mine yard and tailing areas are also missing.

Public access to the main shaft of the Empire Mine is presently restricted beyond a viewing platform in the mine collar, where visitors can look down the lighted shaft approximately 100 feet. Historically, miners were lowered and raised in man-skips from the headframe into the mine shaft by means of an elaborate hoist mechanism. Today, tour guides tell about the past mining activities and what lies deep underground and historic photos depict what the mining scene was like during the prime interpretive period (1877-1942).

Some debris and mud have been removed from the shaft, and the mine-car rail track, baserock, and lighting were installed for the first 100 feet. Since the water level in the mine is currently about 180 feet below the ground surface, most of the existing mine shafts and drifts are flooded. The Magenta Drain Tunnel, located near this elevation, is partially blocked but allows some water to escape. Since the pumps were removed from the mine in 1957, more than 99% of the 367 miles of tunnels in the Empire Mine Complex have been flooded by ground water. Wooden steps, parallel to the tracks, currently provide mine access down to the water level for only those persons authorized to do inspections, testing, monitoring, and research. The steel cribbing inside the main shaft was determined to be structurally sound. However, air is currently being pumped into the mine shaft, due to the insufficient oxygen at the lower levels. A new mine shaft, or adit above the water level would be necessary to provide the required ventilation to the 90 foot level, without mechanical means, although mechanical ventilation is required as a safety backup. In order to take visitors into the mine shaft, an alternate entrance / exit route is also required.

## PROPOSED HORIZONTAL MINE ENTRANCE - ADIT

The proposed adit would be approximately seven feet high by seven feet wide and 750 feet long, with an approximate .25% grade. The adit would run northeast from a portal near the Cyanide Plant and intersect a historic drift before it enters the main Empire Mine Shaft (approximately 90 feet underground below the Stamp Mill ruins). The adit would provide an opportunity for interpretive tours by using an electric tram and allow park visitors an underground experience similar to what miners saw during the historic period.

Support facilities would include a Dry House that would function as a "mini-visitor center" and handle all reservations and purchasing of tickets for the adit tours. It would be the boarding and unloading point for mine tours; store the issued equipment used on tours (e.g. slickers, hard-hats, lights, etc.); house various interpretive displays (e.g. audio-visual program, mining technology, and safety equipment); and include public restrooms. A tram maintenance building is also necessary for tram storage, maintenance and repairs, and employee restrooms.

## The Mine Tour

The visitor's experience will begin in the waiting area where displays of modern mining equipment and safety devices will make the visitors aware of the current "state of the art" technology relative to hard rock mining. Visitors would be issued a hard-hats with lamps, belts with electric power packs, and slickers (if moisture conditions in the mine warrant it).

The tour group (estimated at 25 people) would enter the adit in an electric tram through the portal near the staging area. A bend near the portal would serve to isolate the visitors from the outside world, thereby immersing them totally in the underground experience. As the tour progresses inward, visitors would be transported back in time through a series of exhibits depicting mining operations in the 1930s, 1905 and the 1870s. These periods, about 30 years apart, would graphically demonstrate the advance in technology and safety considerations in hard rock mining during the prime interpretive period of the unit, 1877 to 1942.

Exhibit niches would be excavated along the adit at locations where the rock is most stable. Each of the niches (approximately 10 feet by 10 feet) would demonstrate a different mining technique in addition to the eras they represent. One could be a *raise* (upward excavation), one a *winze* (downward excavation), and one at the beginning, *stope* (excavated area where high grade ore was removed). At the intersection with the main



shaft, a "station" would be developed. This is an area where ore was transferred from one transportation system to another. From this point, visitors would walk in the shaft and drifts excavated in the 1860s and early 1870s. They could look up the main shaft to the surface and down to near the water level.

## **Adit Criteria**

The construction of an adit provides the greatest potential for safe mine tours, interpretive displays, and demonstrations for a realistic underground experience. Visitor safety is the highest priority, and an authentic visitor experience is the primary goal. Several portal locations were evaluated in determining which site best satisfied the development and program criteria:

- Portal location should be within walking distance from the core historic area.
- Adit should intersect with the main shaft above water level (180 vertical feet).
- Adit incline not to exceed 3% grade (req. for tram), with drainage to the outside.
- Adit must meet requirements for desired ground conditions (solid rock).
- Portal location should also have potential for development of support facilities, such as parking, dry house, and tram storage and maintenance building.
- Support facilities should be located out of view of the primary core historic area.
- Road access and handicapped parking requirements must be satisfied nearby.
- Development must not negatively impact significant natural and cultural features.

## **Alternatives and Future Considerations**

In order to achieve the ultimate goal of providing visitors with the opportunity of being deep underground, three different alternatives were considered:

### **1. Reconstruct the Empire Headframe and Hoist Works.**

The Empire Headframe is identified in the general development plan for future reconstruction, which would make possible the most historically accurate method of visitors entering the mine shaft. However, the steep incline requires expensive hoist works plus reconstruction of the Empire Headframe. Reconstructing the headframe would enhance greatly the historic appearance of the mine yard and the total visitor experience as they enter the mine in the traditional method. An adit similar to the one proposed in this amendment would still be required for air ventilation and to serve as an emergency exit. Historic mine drifts which intersect the main Empire Shaft cannot be used for this purpose,

because they are either flooded or would require too much shoring due to the possibility of cave-ins.

Initially, a boarding platform and hoisting mechanism could be constructed that would lower visitors into the main decline shaft by use of "modernized skip cars". However, this facility would not be historically correct and would provide little interpretive value, without reconstructing the complete headframe and hoist works. Historic and architectural integrity of mining structures must be preserved as much as possible in the historic core of the mine operation area. Also, structural modifications should not be made in the historic mine shaft to accommodate the type of exhibits being proposed for the adit. The adit proposal does not preclude the potential of mine tours either entering or exiting through the main shaft or the adit. Future consideration should be given to the reconstruction of the headframe and hoist works and how they could complement the adit facility and tour operations when additional funds become available.

## **2. Rehabilitate the Rowe Drift and restore the Rowe Shaft Headframe.**

The Rowe Shaft had all of the negative aspects of using the Empire decline shaft, plus some additional difficulties: The Rowe Shaft Headframe was determined unrepairable and would require a total reconstruction for this purpose. Also, the first 200 feet of the shaft was sealed off for public safety, which created an extremely unstable and expensive reconstruction problem.

The Rowe Drift intersects with the Empire Shaft approximately 200 feet below water level. The nearest location to place a second exit portal is nearly 1,000 feet away and passes through private property. Maintaining the historic integrity of the Rowe Shaft would preclude much of its potential for adding interpretive exhibits. People would have to go to the visitor center, then double back through the parking lot, and cross a very busy Empire Street to reach the Rowe Shaft. The guided and self-guided interpretive tours are presently focused on the mine operations area.

## **3. Construct a vertical entrance with elevators.**

Although this alternative would get people underground, it was discounted because of the lack of historic and architectural integrity, the loss of interpretive value and visitor experience traveling through an adit or being lowered down the mine shaft and also because of the visitor safety concerns related to possible mechanical failures and the difficulty of meeting the need for a required emergency exit.

## **ACCESS, PARKING, AND CIRCULATION**

### **Accessibility**

Historic buildings and outdoor areas often create physical barriers for people. The physical setting at Empire Mine State Historic Park includes graveled roads and parking areas, two-story historic buildings, mine shafts and equipment, some of which are still inaccessible by people with disabilities. Continuing effort to make these areas more accessible will be enhanced by the design of new facilities related to this amendment's proposals.

Our Department has published a document titled: Access To Parks Guidelines for Access to Programs and Facilities of the State of California Department of Parks and Recreation. These guidelines provide specific details on the requirements of the Americans with Disabilities Act of 1990 as related to park facilities and programs. The following policy has also been adopted by the Department:

***Policy** "It is the policy of the California Park Service to meet the recreational needs of all people of California, and to provide an accessible environment in which all visitors to units in the service are given the opportunity to understand, to appreciate, to participate in, and to enjoy the state's cultural, historical, and natural heritage."*

This amendment to the general development plan proposes new facilities and changes in parking and circulation within the historic area. New facilities will be designed for all levels of accessibility, while older structures are restored with modifications that make them accessible, but does not destroy their architectural integrity or the historic setting. Access and circulation between areas would be improved as result of developed parking lots, tram vehicles, and pathways that will connect the historic points of interest with park activity areas.

The following proposals and criteria are established to help guide sensitive design and construction of roads, paths, and building accessways during future state historic park development.

Access Proposals and Design Criteria

1. *Develop a hard surface path connection between the main parking lot and visitor center entrance.*
  - Path should be a barrier-free continuous path of travel from the main parking lot, with a connection to the restrooms, gate, and visitor center entrance.
  - Path should be a hard surface walkway that will easily accommodate wheelchairs and satisfy the design criteria established for Level 4 in the Access to Parks document on file with the Department. Aesthetic appearance of the surface treatment is also very important for compatibility with the type of materials used in the construction of nearby rock walls and historic buildings.
  
2. *Develop a hard surface path connection between interpretive structures throughout the Mine Operations Area.*
  - Paths should be designed for wheelchair access to building entrances, interpretive exhibits, and mining equipment displays. Loose-gravel surfacing should be modified to accommodate a compacted surface or hard surface walkway that forms a continuous interpretive path between structures and still allows for vehicle access through the area.
  - Walkway design should avoid altering historic site features, obstructing surface drainage flow, or preventing future building reconstruction.
  - Surface materials should blend in color as much as possible with existing gravel and native rock material.
  
3. *Develop an interpretive trail and tram facilities to accommodate pedestrian access and travel between the proposed adit mini-center and core historic area.*
  - Trail routes will be designed for visitors to move easily between day use and interpretive facilities. Tram vehicles will also provide transportation to the adit facility from the historic area, particularly for persons with mobility limitations. A hiking trail should be maintained for day users along the tram route from the mine operation area to the natural area beyond the proposed adit facilities.
  - Design details for access to tram loading and unloading platforms and support facilities should be integrated with trails, interpretation and building restoration plans.

4. *Develop access road to proposed adit facility, with parking lot, walkways and trail connections.*
  - Access road to the adit visitor parking lot should be a minimum width two-way surfaced roadway with narrow graveled shoulders. Road alignment shall follow existing unpaved road and contours, with surface drainage control in areas having high erosion potential. The existing trail route should be designed parallel to this roadway, with sufficient landscape buffer maintained or established between the two corridors.
  - Trail surfacing, grades, and connections to existing and proposed parking lots should allow for a continuous path of travel and conform with design criteria established as appropriate for Level 3 and Level 4 in the Access for Parks guidelines document.

## **PARKING AND CIRCULATION**

### **Existing Parking**

Visitor parking is presently developed for 75 cars at the main park entrance with vehicle access from East Empire Street, a county road. The entrance to an overflow parking area is located directly across from the main parking lot. This overflow lot will accommodate 45 cars and is filled to capacity during summer weekends and on holidays. The mine tailings area is also used for overflow parking (approximately 75 cars) during special event days.

The main visitor parking lot is paved with gravel and chip-seal and located at an elevation 10 feet above East Empire Street, with a single entrance and exit driveway for public access. No entrance kiosk is provided. The size and configuration of the main parking lot is defined by elevation changes and the location of several large trees, rock walls, buildings and other historic features. Twelve picnic sites are currently established at the parking perimeter. A service gate is located at the southeast end of the parking lot and used primarily for access by emergency and authorized vehicles. This is also the gated access to the mine tailings area used for overflow parking. Two handicapped spaces and a restroom facility are located at the southwest corner of the lot near the entrance.

The unpaved overflow parking lot is located directly across East Empire Street, with a gated access opposite the main parking lot entrance. This parking area is bordered by an old railroad levee, with pines, cedars and ornamentals accommodating 13 picnic sites. Currently used for overflow visitor parking, its location requires visitors to cross heavy traffic on East Empire Street to reach the park entrance.

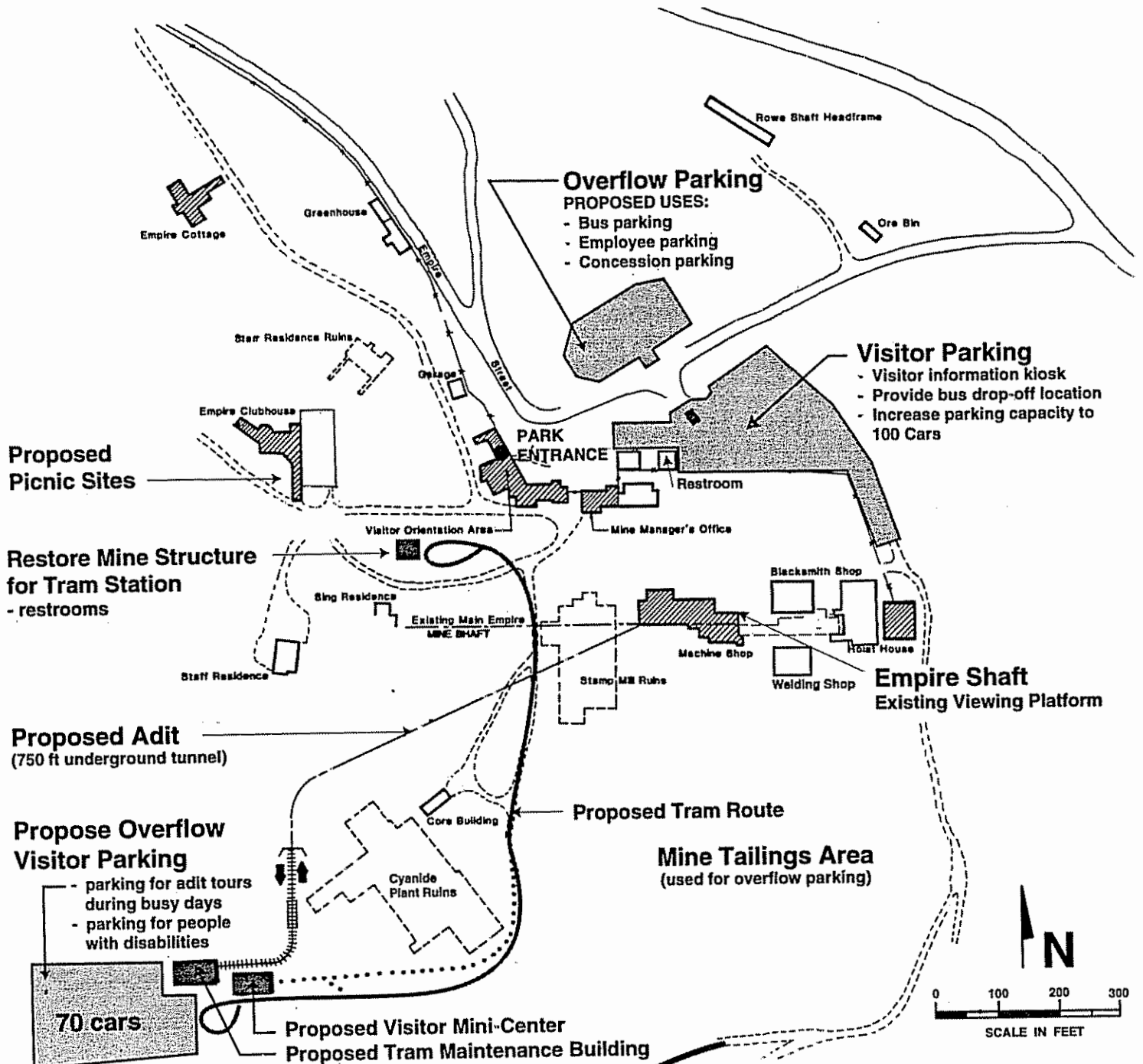
The visitor parking proposed in the 1977 general development plan included 100 spaces at the park entrance and 15 spaces in two other locations designated for hiking and equestrian use in the park. The current developed parking capacity, including the overflow lot, is consistent with the general development plan and considered adequate for the current number of visitors without such visitor attractions as the proposed adit tour. As historic buildings and mining structures are restored and reconstructed, new interpretive programs and tours will increase the visitor's interest, visitation, and subsequent parking demand. This already requires the use of the overflow parking lot on a regular basis during the summer months and on weekends.

Existing parking lot capacities can be increased slightly by reconfiguring parking spaces, removing existing picnic sites, or changing the road alignment through the park. Only with the road closed to non-visitor traffic could parking be consolidated into one area and eliminate the need for pedestrians crossing East Empire Street.



*Park staff directs traffic and parking in the main parking lot*

# EMPIRE MINE STATE HISTORIC PARK GENERAL DEVELOPMENT PLAN - 1996 AMENDMENT



**70 cars**

## LEGEND

- Existing Fence / Wall
- Existing Paved Roads
- Existing Unpaved Road
- Existing Building Ruins
- Existing Buildings
- Visitor Mini-centers
- Proposed Buildings
- Proposed Parking
- Proposed Road

## PROPOSED ADIT FACILITIES

MAP NO. 4

## Proposed Parking

Future parking needs are based on the estimated daily visitor attendance and capacities recommended for park buildings and outdoor areas. Our Department's planning staff estimates a 60% increase in park visitation due to the proposed development of the adit. This increase would not be immediate, but gradual as the adit facilities and tours reach full operation. This will require provisions for 60 to 75 cars above the existing parking capacity, based on the size and frequency of adit tours. This parking demand would occur during peak use periods and in close proximity to the proposed adit entrance and interpretive facility.

Alternative parking sites were evaluated in the mine tailings area, cyanide tailings area, and the manzanita flat south of the cyanide plant ruins and proposed adit. The area south of the proposed adit was selected because it has sufficient size, is relatively flat, out of view from the mine operation area, has good access from the existing road and trail and would not threaten sensitive natural or cultural resources. Other sites are more visible from the historic core.

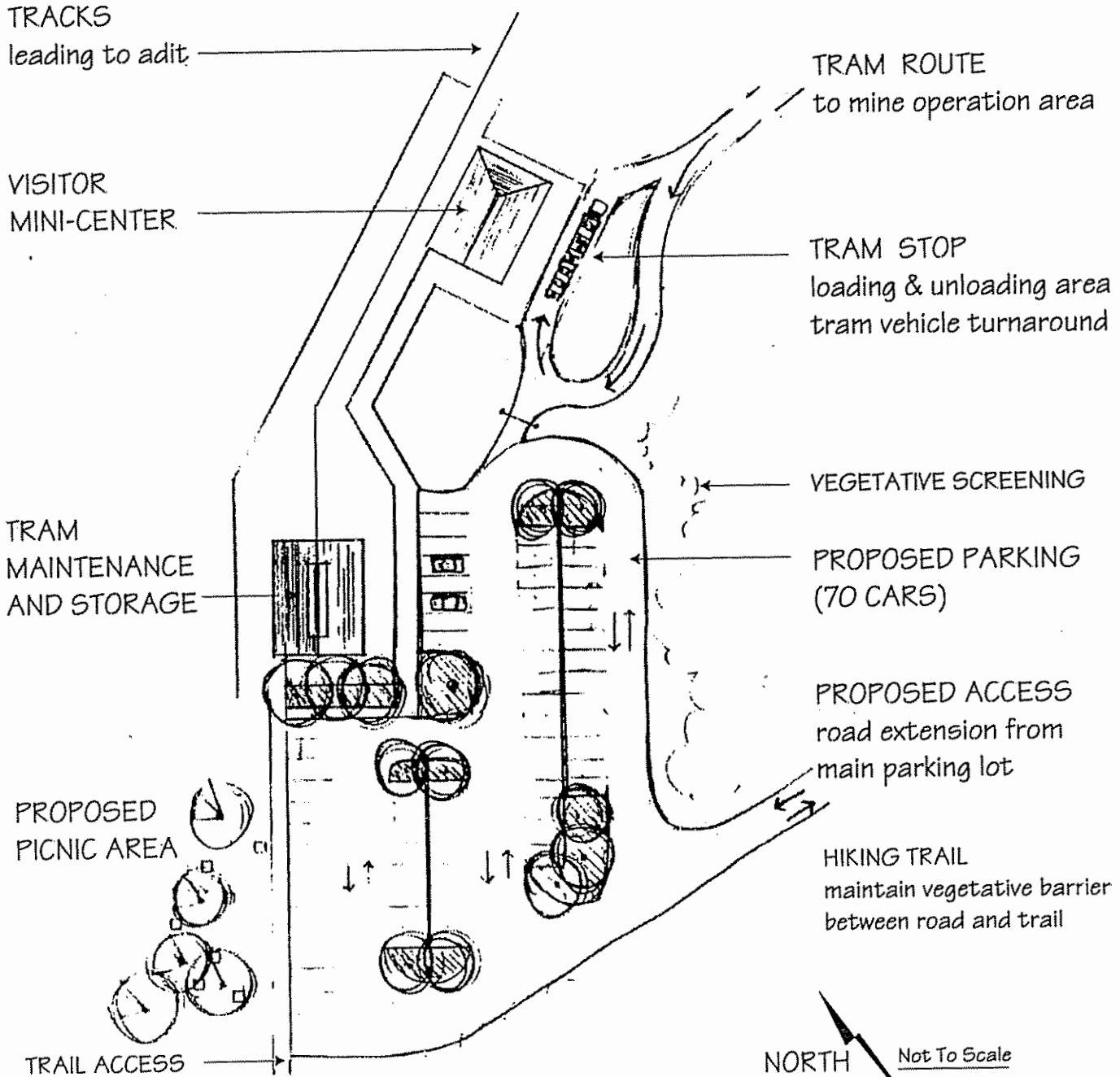
- 1. This plan proposes additional parking for 70 cars near the proposed adit facility. Vehicular access will be developed from the main parking lot via an existing unpaved road extended to the adit parking lot. This road also provides access to the mine tailings area, which may continue to be used for overflow parking during special events.*
- 2. The Main Parking Lot should be improved to accommodate 100 cars and space for a bus drop-off area. A few picnic sites will be relocated or removed from around the parking lot to allow for this increased parking capacity. Additional picnic sites will be developed in the vicinity of the proposed adit facility.*
- 3. At the time when visitor parking is developed near the adit, the existing overflow parking lot, located across Empire Street, should be used only for bus parking, employee vehicle parking, and for other authorized vehicles.*

## Proposed Circulation

One objective of this plan is to provide convenient access and accommodate people in parking lots close to interpretive facilities and visitor orientation centers. This will occur by allowing vehicle access below the historic mine operations area to the adit parking lot and by providing a tram vehicle to shuttle people between these two areas. Roads, parking, and tram facilities must be designed to accommodate visitor needs but shall not visually or physically impact the historic setting.



**NOTE:** This plan is intended to be a graphic representation of the concept proposed in the text for the adit parking and circulation. Different variations are possible and should be designed and developed based on actual field conditions.



# Empire Mine State Historic Park ADIT PARKING CONCEPT PLAN

Figure No. 1

Initial visitor contact should be made in the main parking lot upon their arrival, so that parking and tour directions can be easily given and also avoid unnecessary traffic movement between parking areas. Visitors with adit tour reservations will have vehicle access through the main parking lot through the control gate to the adit road, or they may park in the main lot, enter the visitor center and walk or shuttle to the adit entrance and interpretive facility.

### Circulation Proposals

- 1. Establish an entrance kiosk in the main parking lot and design the parking and circulation to accommodate vehicle access to the proposed adit road.*
- 2. Restore a former mine shed, located near the Sing Residence, for adaptive use as a tram station with public restrooms and a tram loading platform. Develop a narrow roadway between this station and the proposed adit parking lot. The road alignment will follow an existing trail and former mine road, with turnarounds at each end and near the Core Building for interpretive purposes.*
- 3. The proposed tram route may double as an interpretive trail, with pullouts for interpretive panels and benches to view the cyanide plant ruins. This road and trail will also serve hikers for access to the natural area beyond the proposed adit.*



*Overflow parking is directed to this tailings area during special events*

**EMPIRE MINE STATE HISTORIC PARK**

**General Development Plan Amendment**

**Parking Capacity  
Table 2**

<u>Location</u>	<u>Existing</u>	<u>Proposed</u>	<u>Comments</u>
Main Parking Lot	75 cars	100 cars	+ 25 cars
Overflow Parking Lot	45 cars	55 cars	authorized use + bus parking
Mine Tailings Area	70 cars	70 cars	special event days only
Adit Parking	0	70 cars	+ 70 visitor spaces (peak use)
Other (Penn Gate)	<u>20 cars</u>	<u>20 cars</u>	day use & equestrian staging
<b>Totals:</b>	<b>210 cars</b>	<b>315 cars</b>	

Bypass Road

Page 67 of the general development plan identified a suitable route for a bypass road between Highway 49 and Highway 174 near the Empire Crossroad. If implemented, a portion of East Empire Street could then be converted into a park interior road. That proposal would serve two functions: (1) It would eliminate the problems created by a mixture of traffic entering the park and through traffic, and (2) it would enhance the quality of the park entry experience. The bypass road proposal was never adopted by the Nevada County Regional Transportation Commission and is not listed in their current five-year highway construction program.

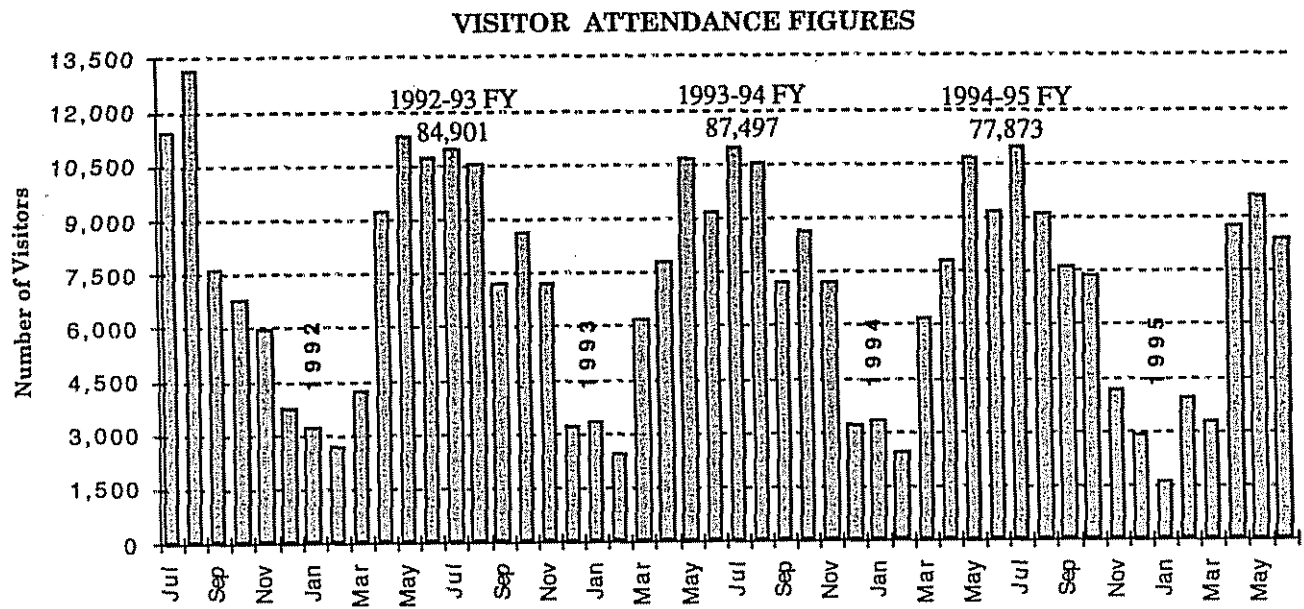
During this amendment process of evaluating potential parking locations and circulation, the bypass road proposal was again discussed. Its potential benefits were considered for consolidating parking and eliminating the need for visitors crossing Empire Street traffic. Realignment of Empire Street near the parking lot was another alternative being considered to achieve similar objectives. Either alternative would increase the opportunity for improved parking lot design and vehicle circulation, but only the bypass road proposal would allow for an increase in the overall parking lot size and capacity, due to the physical constraints surrounding the present road alignment. Nevertheless, the status of either alternative is not currently a priority with Nevada County or the California Department of Transportation, and this is not expected to change in the near future.

Since the bypass road proposal is included in the park's general development plan, it is recommended by this amendment that the Department continue to coordinate with the Nevada County Transportation Commission, Grass Valley Planning Department, and other related public agencies to adopt a suitable bypass route in its Regional Transportation

Plan. If the bypass road is constructed and Empire Street becomes a park road, then the Department should expand the main visitor parking lot and design for appropriate entrance facilities as indicated in the general development plan.

**VISITOR ATTENDANCE**

Visitor attendance figures are shown below in Figure 2. During the years between 1991 and 1995, the annual attendance varied between 75,000 and 90,000 visitors per year. The group use at the park averages about 4% of the total, or 3,200 people per year (mostly school groups). The summer months and weekends between April and November are the most popular for day users, due to the improved weather conditions.



**Figure 2**

**EMPIRE MINE STATE HISTORIC PARK**  
**General Development Plan Amendment**

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*Empire Mine Aerial View taken in 1941*

## OPERATIONS

The Public Underground Tour Project described in this amendment will affect Empire Mine State Historic Park in several ways. First, this development will allow a more complete realization of the interpretive goals of the park. Each park visitor who participates in the tour underground will not only receive an interpretive narrative and view displays / exhibits, but will also experience what it was like to be underground in a hardrock mine, as were the miners during the 106 years of operation of the Empire Mine. Second, visitation to the park will greatly increase as the underground experience becomes known, thereby increasing attendance at current interpretive programs and facilities.

The operation of the underground tour and the enhanced visitation will create a much greater workload than the current level of staffing can undertake. Minimal levels of staffing at the other two units in the Gold Mines Sector (Malakoff Diggings SHP and South Yuba River Project) preclude the redirection of personnel to cover even a portion of this workload. Additionally, because of the commitment to provide the highest level of both safety and educational experience on a consistent basis, trained, professional staffing is essential to the operation of the tour and support facilities.

## STAFFING

To insure the necessary operation and maintenance of all aspects of the underground interpretive program and support functions associated with this program, the following skills are needed by park personnel:

1. Tour conducting and interpretation of historical features.
2. Supervision of guides.
3. Daily safety inspections of underground facilities and workings.
4. Maintenance and repair of both underground and surface facilities.
5. Maintenance and repair of systems and equipment.
6. Maintenance, curatorial treatment, and periodic replacement of objects on exhibit.

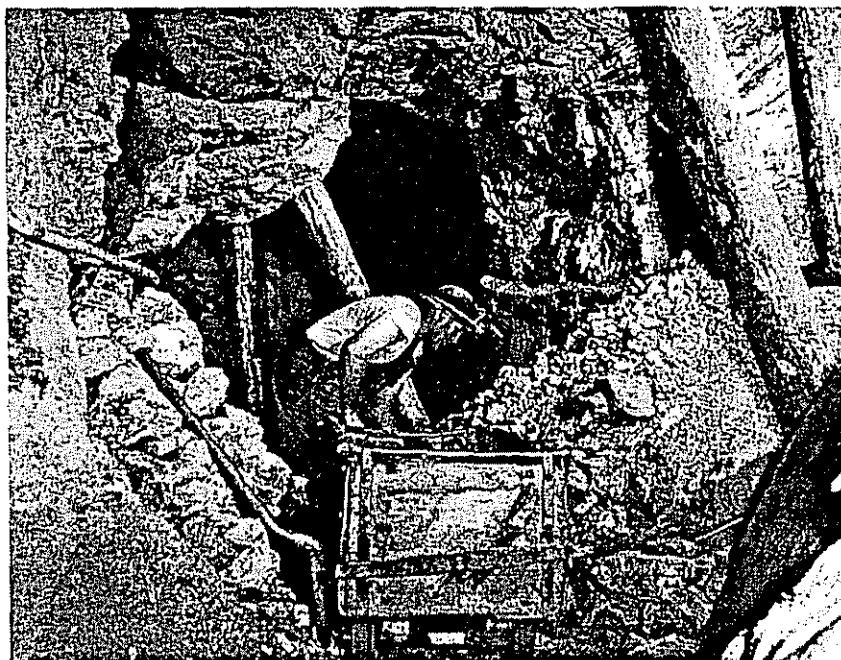
## EMPIRE MINE STATE HISTORIC PARK

### General Development Plan Amendment

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7. Housekeeping and refuse disposal.
8. Tour reservation administration.
9. Public information services, public relations and advertising.
10. Historical research.
11. General administration of tour program and staff support services.
12. Operation of park visitor shuttle service.

Because of a variety of factors (specifically, relatively great distances between primary interpretive locations, steep terrain, the full gamut of weather conditions) it will be necessary to provide some type of internal transportation system for park visitors to get around the park. The principal concern is assuring that visitors at both the underground tour location and Mine Yard are encouraged and are provided the opportunity to experience what each area has to offer. To fully implement the primary interpretive goals of the park, it is essential that each park visitor be exposed to the facilities and programs at both areas.



*Mucker loading rock in the Empire Mine*

## **ENVIRONMENTAL IMPACT REPORT**

### **SUMMARY**

The General Development Plan Amendment, with all its sections, constitutes an environmental impact report (EIR), as required by Public Resources Code Sections 5002.2 and 21000 et seq. This EIR is for the approval of the General Development Plan Amendment.

This General Development Plan Amendment (GDPA) is proposed to address a specific facility; however, other changes to the GDP are necessary to accommodate this specific proposal. The Department is proposing to excavate an adit and provide interpretive tours of the adit. Associated with the tours and adit are parking facilities, access road, day use facilities, visitor mini-center, tram station and route, and maintenance building. The mini-center, maintenance building and adit entrance are located near the foundations of the cyanide plant. The potential significant environmental impacts are (1) exposure to toxics and (2) esthetics impacts of the new construction and parking in conflict with the historic views. The mitigation proposed is (1) capping of the tailings areas with the adit waste, and (2) locating new facilities out of view from the mine yard and using historically compatible materials and design.

### **PROJECT DESCRIPTION**

The proposed project is described in the Interpretation and Park Development sections.

### **DESCRIPTION OF THE ENVIRONMENTAL SETTING**

The 1977 general development plan and resource management plan provides a description of the environment. The Resources section of this amendment contains more specific information regarding the impact site and environmental setting. The Resource Sensitivity and Constraints section describes the issues of soil toxicity.



## **SIGNIFICANT ENVIRONMENTAL EFFECTS OF THE PROPOSED PROJECT**

1. Construction activities and visitor traffic may release lead, arsenic, and mercury into the air. The waste materials from the cyanide plant were stockpiled southeast of the former cyanide plant. The Department of Parks and Recreation has posted signs directing the public away from the impact area (the cyanide plant, the waste stockpile, and drainage to the sand dam) due to the concern that traffic (vehicle, equestrian, and pedestrian) could liberate lead, arsenic and mercury into the air. This is in conformance with requirements of the Department of Health Services (now the Department of Toxic Substances Control of the California EPA).

A Preliminary Endangerment Assessment (PEA) was conducted to assess whether the concentrations of heavy metals could pose risk to health and the environment. The PEA found that arsenic did exceed the acceptable ratio; however, this ratio assumes a lifetime exposure. The screening ratio for arsenic, cadmium, lead, and mercury exceed the acceptable level for children. However, again, this assumes lifetime exposures and an uncapped condition of the area; visitors would be on-site only for short periods of time.

2. New facilities may adversely contrast with the historic views. The proposed project is within the zone of primary cultural interest as identified in the 1977 general development plan. The tram will travel into the historic core area as often as every half hour to coincide with the adit tour schedule. New materials, unweathered and undamaged, could conflict with the older, used appearances of the historic structures.

## **MITIGATION MEASURES**

1. The waste rock from the new adit, approximately 1450 cubic yards, will be placed over the sand dam drainage and adit entrance facilities area to prevent lead, arsenic, and mercury release from the soils due to traffic, construction and visitors. If necessary, the waste rock may be crushed to provide a better barrier. The access road which crosses the tailings site will be gravelled or paved to reduce release of toxics to the atmosphere.

2. Facilities will be designed to complement the historic mining structures' appearance. Corrugated galvanized iron siding and roofing can be used to be compatible with historical mine structures. Materials, construction, and design details should reflect the style, materials, and texture of the primary interpretive period.

3. Facilities will be located out of view of the historic mine yard.

## ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED IF THE PROJECT IS IMPLEMENTED

There are no unavoidable impacts other than the impact to the historic fabric of the main shaft for the provision of an emergency exit for the adit. This impact is not considered significant.

## ALTERNATIVES TO THE PROPOSED PROJECT

The objectives of this project are to provide for the public the opportunity to experience the feeling of entering a hardrock mine, experience the underground environment of mining, and provide additional interpretive opportunities. Four alternatives described below meet those objectives with varying degrees of success; the No Project alternative does not.

### 1. Improve access to existing Empire Main Shaft

#### Description

Interpretive exhibits would be created along the main shaft. An elevator or new adit, would be constructed to provide an emergency exit required by law. The sand dam area could be capped with the waste from the emergency exit. New headframe, hoist house and air circulation equipment would be installed. No tram would be necessary.

#### Impacts

This alternative would have a greater adverse impact to the historic fabric of the main shaft for the construction of interior interpretive exhibits, modifications for public safety, and railway development. Visitation increase impacts would be similar to the proposed project. The addition of modern hoisting and air circulation equipment at the entrance to the main shaft could conflict with the historic appearance. If the headframe is accurately reconstructed, this would provide the visitor with the most historically correct entrance to the mineshaft.

## 2. Develop access to the Rowe Shaft

### Description

Interpretive exhibits would be created along the shaft. Modifications to the Empire main shaft, or new adit, would be constructed to provide an emergency exit required by law. The sand dam area could be capped with the waste from the emergency exit. The historic headframe would be removed and a new headframe, hoist house and air circulation equipment would be installed. Use of the Rowe headframe would require removal of the cap placed in the shaft and reconstruction of the Rowe headframe which is not repairable. The fill in the shaft would have to be removed and cave-ins reexcavated and supported. The Rowe Shaft intersection with the Empire main shaft is approximately 200 feet below the water table and would require regular pumping.

### Impacts

The removal of the historic Rowe headframe would be an irreversible and significant impact. Visitation increase impacts and modifications to the Empire main shaft for an emergency exit would be similar to the proposed project. The use of the Rowe headframe and shaft would also create a safety hazard with the public crossing of East Empire Street, or a tram would be employed to provide safe transportation of the public to the Rowe shaft.

## 3. Elevator access to the Empire Main Shaft

### Description

An elevator shaft would be excavated. A hoist house and head frame would be constructed. A crosscut could be excavated to provide the interpretive areas. Depending on the location of the elevator shaft, the main shaft could be developed as an emergency exit. The interpretive experience would be reduced because of the non-historic nature of the elevator.

### Impacts

In order to use the main shaft as an emergency exit, the elevator shaft and attendant structures would need to be developed in the mine operation complex. This would create a large, non-historic intrusion in the historic scene. The visual impact could be partially mitigated by the placement of the facilities in a reconstructed historic structure (i.e. a warehouse). Visitor use impacts would be similar to the proposed project. There would be no need for a tram or access road.

Additional parking would be required. Expansion of the main parking area to accommodate the total parking demand would likely require the removal of a significant number of mature trees.

#### 4. Alternative locations of facilities

Three alternative sites for parking were considered (1) south of the main mining complex or in the waste rock tailings, (2) expansion of the existing parking area north of the mining complex, or (3) development of formal parking at the Penn Gate entrance which is now used for day use and equestrian trailer parking. These alternative parking sites were rejected for their visual impact and impact on traffic patterns. The third alternative was rejected because it would require additional tram travel, and initial visitor contact and orientation would be far removed from the start of the adit tour. The proposed project includes some expansion of the existing main parking area; however, to provide all the necessary parking, additional parking is proposed at the adit mini-visitor center.

Alternative tram routes were considered in conjunction with the parking alternatives. A route heading south around the east end of the hoist house for the main shaft and then turning west toward the proposed adit mini-visitor center would interfere with auto traffic traveling to and from the mini-visitor center.

#### No Project alternative

##### Description

No improvements would be constructed to provide additional visitor experience or access to the mining shaft. The Department will cap the cyanide tailings area.

##### Impacts

There would be no impacts to vegetation, wildlife, water quality, historical appearances, traffic. The opportunity for public experience of the underground mining environment and interpretation would not be available. Capping of tailings soils would continue to inhibit release of airborne toxics.

The environmentally superior alternative is the no project alternative; however this alternative does not meet the objective of providing the mining interpretive experience which is consistent with the interpretive goals identified in the 1977 general development plan.

## **RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY**

The purpose of Empire Mine as a state historic park is "to preserve, interpret and manage resources significant to its historical and natural environments in order that this and future generations can appreciate and enjoy their heritage as it is exemplified at the Empire Mine Complex" (Declaration of Purpose). The proposed interpretive adit advances this purpose.

There are short-term impacts to the esthetics and viewshed, air quality, and soil erosion, resulting from construction of facilities. The long-term effects would be a reduction of the toxics hazards through the capping of the tailings and sand dam area.

## **Significant Irreversible Environmental Changes if the Project is Implemented**

Facilities and trails can be removed and sites restored to an essentially pre-project condition if necessary. The cap and mine waste would remain to contain toxics. The adit entrance could be covered or gated. Throughout the mine's operation, facilities were constantly being improved or upgraded to improve safety or production.

## **Growth Inducing Impact of the Proposed Project**

The proposed project may have a minor cumulative impact on growth inducement in the area. Any improvement or increase in capacity can encourage increased use which translates into additional tourism and its attendant demand for services.

## **Effects Found Not to be Significant**

1. Traffic impacts were not found to be significant. The traffic generated by the project will be limited to the hours of operation of the adit tours (1000 to 1625 hours) which predominantly falls outside of the peak rush hour periods. The traffic will be distributed throughout the day rather than a single peak period. During the peak season 300 people per day are projected to use the adit tour. Assuming these users are an addition to existing use and there are 3.5 people per vehicle, the average daily traffic (ADT) will increase by 86, but would be spread over a 7-hour period.

2. The impact to vegetation is not considered significant. There are no sensitive species present. The site has been heavily disturbed by mining activities. There will be some removal of vegetation for the construction of facilities (parking, roads, trails, day use facilities, and tour support buildings).

3. The impact to wildlife is not considered significant. As stated above the site has been heavily disturbed by mining. Two sensitive bird species may be present in the project area; however, the impact is not considered significant given the limited area of impact.

4. No significant geological impacts are projected. Initial investigations have found no geological hazards present that should create a safety hazard. The adit and mechanical equipment will be inspected daily in accordance with mine safety requirements.

5. Water consumption would increase by approximately 212,500 gallons per year (42,500 additional visitors annually using 5 gallons). Peak day use increase would be 1500 gallons per day. Sewage requirements would increase by approximately 1250 gallons per day maximum. A leach field will provide the necessary sewage treatment requirements.

6. Assuming 0.4 pounds or .07 cubic feet of solid waste per visitor, the solid waste requirement for the unit would increase by 17,000 pounds per year, about 2975 cubic feet per year or an average of 8 cubic feet per day.

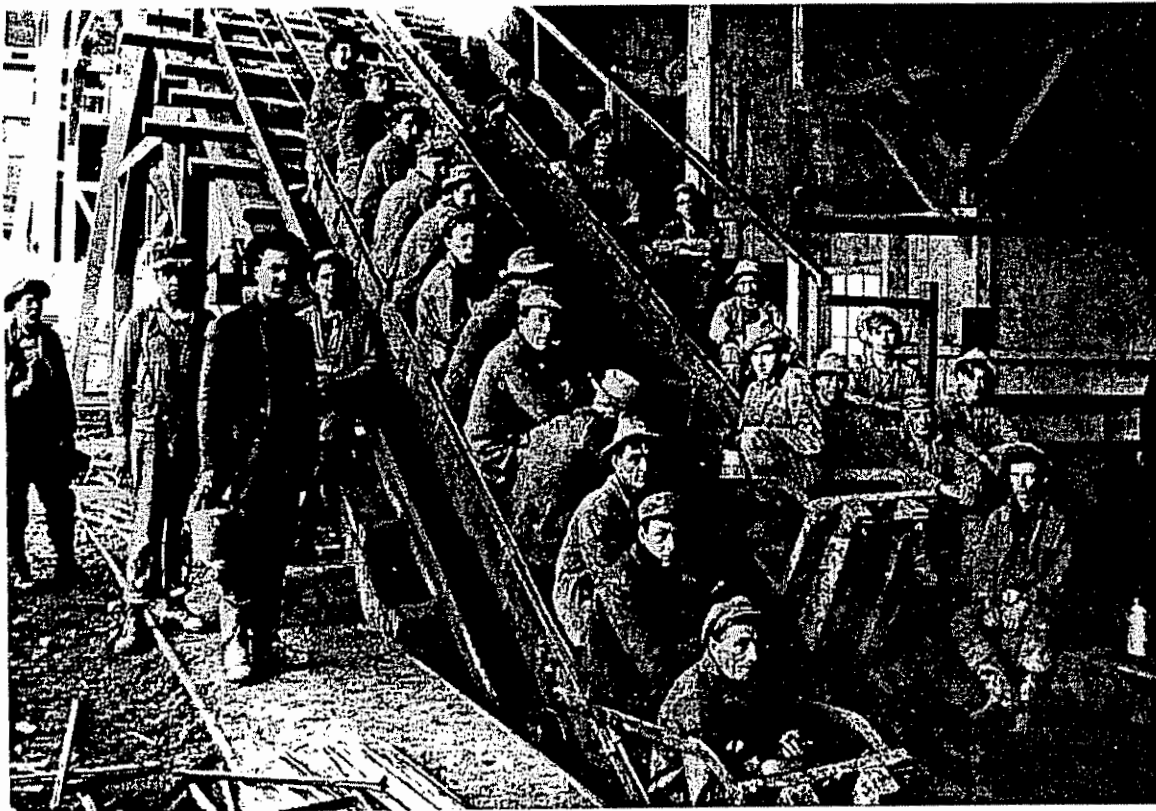
7. A second emergency vehicle access to the adit entrance area is provided by the tram route.

8. There will be no direct impacts to Little Wolf Creek. Capping of the sand dam drainage area with waste rock from the adit excavation would reduce transport of contaminated sediments to the creek. Harding Lawson Associates prepared a Preliminary Endangerment Assessment for the Department. Levels of arsenic, lead, cyanide, and sulfide in Little Wolf Creek were below or slightly above the laboratory detection limits, but did not exceed their respective maximum concentration level in water samples.



*Powder magazine "You climb 500 feet to another level and walk 500 yards and come to the powder magazine where the powder monkey draws powder for the day's blasting"*

## APPENDICES



*Loaded mancar "You go down in a position much like sitting side ways on a step ladder. In places the 'hanging wall' (ceiling) was so low that you have to almost lay flat to keep your head from being knocked off."*

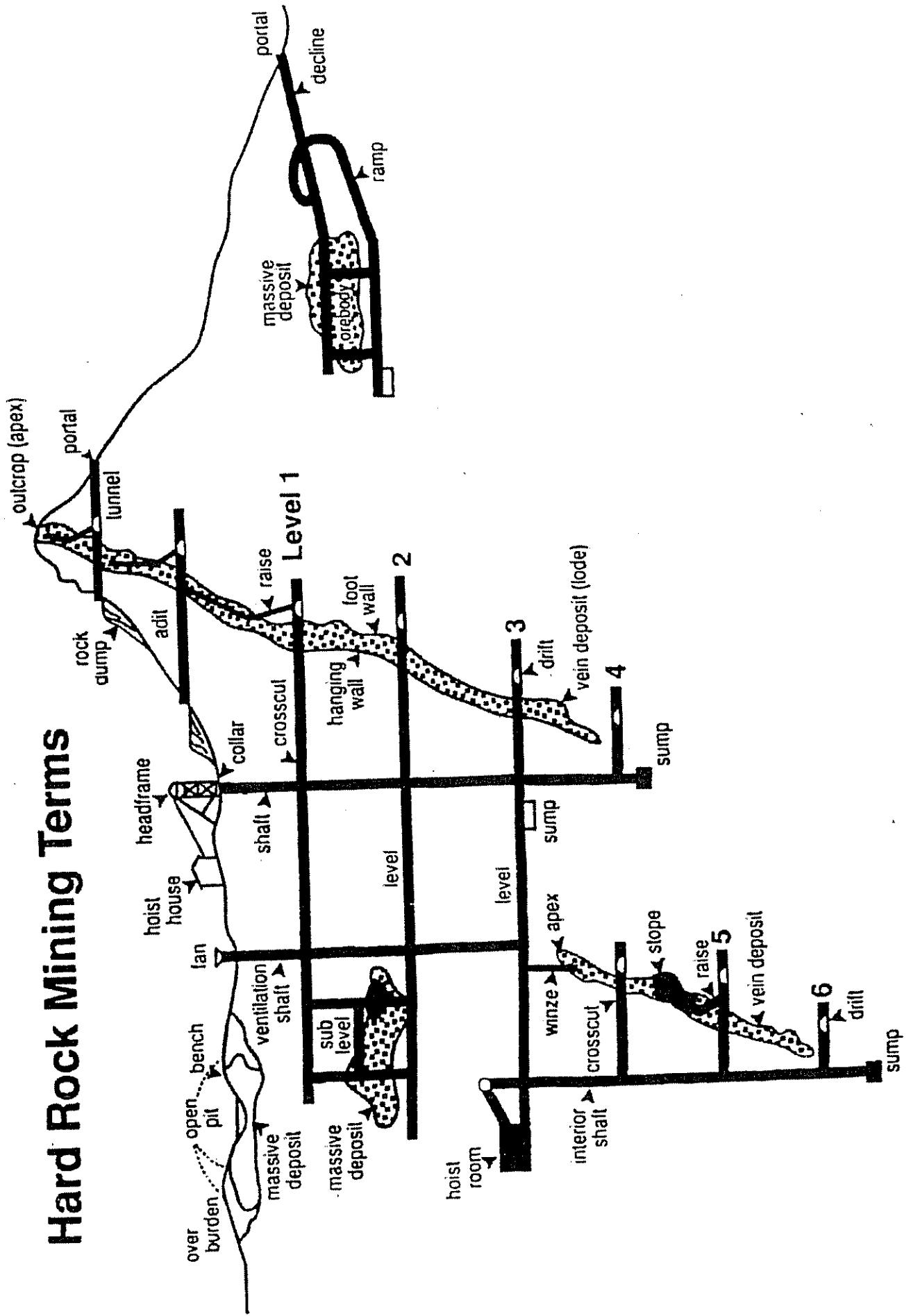


## APPENDIX A

### HARD ROCK MINING TERMS AND DEFINITIONS

<b>Adit</b>	An almost horizontal entrance to a mine (One access point).
<b>Drift</b>	A horizontal or nearly horizontal secondary passageway between two main shafts or tunnels.
<b>Tunnel</b>	A <u>through</u> passage (two access points).
<b>Shaft</b>	A <u>vertical</u> underground passage
<b>Collar</b>	Shaft entrance
<b>Portal</b>	Entrance to adit or tunnel
<b>Stope</b>	Excavated area where high grade ore was removed.
<b>Winze</b>	Downward excavation
<b>Raise</b>	Upward excavation
<b>Hanging wall</b>	Overhead or hanging wall surface
<b>Foot wall</b>	Lower end of wall
<b>Decline shaft</b>	Moving downward (enter from above)
<b>Incline shaft</b>	Moving upward (enter from below)

# Hard Rock Mining Terms



## APPENDIX B

### A List of Native Plants Observed at Empire Mine State Historic Park

Family	Botanical Name	Common Name
<b>TREES</b>		
Aceraceae (Maple)	<i>Acer macrophyllum</i>	Big-leaf maple
Betulaceae (Birch)	<i>Alnus rhombifolia</i>	White alder
Cornaceae (Dogwood)	<i>Cornus nuttallii</i>	Mountain dogwood
Cupressaceae (Cypress)	<i>Calocedrus decurrens</i>	Incense-cedar
Ericaceae (Heath)	<i>Arbutus menziesii</i>	Madrone
Fagaceae (Beech)	<i>Quercus kelloggii</i>	California black oak
	<i>Quercus lobata</i>	Valley oak
	<i>Quercus chrysolepis</i>	Canyon live oak
Pinaceae (Pine)	<i>Pinus lambertiana</i>	Sugar pine
	<i>Pinus ponderosa</i>	Western yellow pine
	<i>Pseudotsuga menziesii</i>	Douglas-fir
Salicaceae (Willow)	<i>Populus fremontii</i>	Fremont cottonwood
	<i>Salix spp.</i>	Willow
Simaroubaceae (Quassia)	<i>Ailanthus altissima</i>	Tree-of-heaven
<b>SHRUBS</b>		
Asteraceae (Sunflower)	<i>Baccharis salicifolia</i>	Mule fat
Caprifoliaceae (Honeysuckle)	<i>Symphoricarpos albus</i> var. <i>laevigatus</i>	Snowberry
Ericaceae (Heath)	<i>Rhododendron occidentale</i>	Western azalea
	<i>Arctostaphylos patula</i>	Greenleaf manzanita
	<i>Arctostaphylos viscida</i>	Whiteleaf manzanita
	<i>Genista monspessulana</i>	French broom
Fabaceae (Pea)	<i>Cytisus scoparius</i>	Scotch broom
	<i>Sidalcea malvaeflora</i>	Checkerbloom
Malvaceae (Mallow)	<i>Ceanothus cuneatus</i>	Buck brush
Rhamnaceae (Buckthorn)	<i>Ceanothus integerrimus</i>	Deer brush
	<i>Rhamnus californica</i>	Coffeeberry
	<i>Rhamnus ilicifolia</i>	Holly-leaf redberry
	<i>Rosa gymnocarpa</i>	Wood rose
Rosaceae (Rose)		
<b>GROUND COVER</b>		
Apiaceae (Carrot)	<i>Sanicula spp.</i>	Sanicle, Snakeroot
Apocynaceae (Dogbane)	<i>Apocynum androsaemifolium</i>	Bitter dogbane
Aristolochiaceae (Birthwort)	<i>Asarum hartwegii</i>	Wild ginger
Asclepiadaceae (Milkweed)	<i>Asclepias cordifolia</i>	Purple milkweed
	<i>Asclepias eriocarpa</i>	Indian milkweed
	<i>Achillea millefolium</i>	Yarrow
Asteraceae (Sunflower)	<i>Agoseris grandiflora</i>	Large-flowered agoseris
	<i>Centaurea solstitialis</i>	Barnaby's thistle
	<i>Eriophyllum lanatum</i>	Wooly sunflower
	<i>Hieracium spp.</i>	Hawkweed
	<i>Rafinesquia californica</i>	California chickory
	<i>Tragopogon porrifolius</i>	Salsify, Oyster plant
	<i>Cynoglossum grande</i>	Hound's tongue
Boraginaceae (Borage)	<i>Lithospermum californicum</i>	Stoneseed
	<i>Campanula prenanthoides</i>	Harebell
Campanulaceae (Bellflower)	<i>Lonicera hispidula</i>	Wild honeysuckle
Caprifoliaceae (Honeysuckle)	var. <i>vacillans</i>	
	<i>Silene californica</i>	Indian pink
Caryophyllaceae (Pink)		

Family	Botanical Name	Common Name	
Ericaceae (Heath)	<i>Chimaphila menziesii</i>	Little prince's pine	
	<i>Chimaphila umbellata</i>	Prince's pine	
	<i>Pyrola picta</i>	White-veined wintergreen	
Grossulariaceae (Gooseberry)	<i>Ribes roezlii</i>	Sierra gooseberry	
Hydrophyllaceae (Waterleaf)	<i>Eriodictyon californicum</i>	Yerba santa	
Hypericaceae (St. John's Wort)	<i>Hypericum perforatum</i>	Klamath weed	
Iridaceae (Iris)	<i>Iris macrosiphon</i>	Sierra iris	
Lamiaceae (Mint)	<i>Prunella vulgaris</i>	Selfheal, Wild ajuga	
	<i>Salvia pratensis</i>	Meadow sage	
Fabaceae (Pea)	<i>Salvia sonomensis</i>	Creeping sage	
	<i>Lathyrus latifolius</i>	Perennial sweet pea	
	<i>Lathyrus nevadensis</i>	Sierra pea	
	<i>Lathyrus sulphureus</i>	Sulfur pea	
	<i>Lotus grandiflorus</i>	Large-flowered hosackia	
Liliaceae (Lily)	<i>Calochortus monophyllus</i>	Yellow star-tulip, Mouse ears	
	<i>Chlorogalum pomeridianum</i>	Soap plant	
	<i>Dichelostemma capitatum</i>	Blue dicks	
	<i>Dichelostemma multiflorum</i>	Wild hyacinth	
	<i>Dichelostemma volubile</i>	Twining brodiaea	
	<i>Fritillaria micrantha</i>	Brown bells	
	<i>Fritillaria recurva</i>	Scarlet fritillary, Red bells	
	<i>Lilium humboldtii</i>	Humboldt lilly	
	<i>Lilium pardalinum</i>	Leopard lilly, Panther lilly	
	<i>Trillium chloropetalum</i>	Giant trillium	
	<i>Triteleia ixioides</i>	Pretty face	
	Orchidaceae (Orchid)	<i>Corallorhiza maculata</i>	Spotted coralroot
		<i>Corallorhiza striata</i>	Striped coralroot
Papaveraceae (Poppy)	<i>Goodyera oblongifolia</i>	Rattlesnake plantain	
	<i>Eschscholzia californica</i>	California poppy	
Polygalaceae (Milkwort)	<i>Dicentra formosa</i>	Bleeding heart	
	<i>Polygala cornuta</i>	Sierra milkwort	
Portulacaceae (Purslane)	<i>Claytonia perfoliata</i>	Miner's lettuce	
Primulaceae (Primrose)	<i>Trientalis latifolia</i>	Starflower	
Ranunculaceae (Crowfoot)	<i>Aquilegia formosa</i>	Columbine	
	<i>Ranunculus occidentalis</i>	Buttercup	
Rhamnaceae (Buckthorn)	<i>Ceanothus prostratus</i>	Squaw carpet	
Rosaceae (Rose)	<i>Chamaebatia foliolosa</i>	Mountain misery	
	<i>Horkelia tridentata</i>	Horkelia	
Rubiaceae (Madder)	<i>Rubus leucodermis</i>	Blackcap raspberry	
	<i>Galium spp.</i>	Bedstraw	
Saxifragaceae (Saxifrage)	<i>Heuchera micrantha</i>	Alumroot	
Scrophulariaceae (Figwort)	<i>Mimulus guttatus</i>	Common monkeyflower	
	<i>Penstemon heterophyllus</i>	Foothill penstemon	
Violaceae (Violet)	<i>Verbascum thapsus</i>	Woolly mullein	
	<i>Viola purpurea</i>	Mountain violet	
	<i>Viola lobata</i>	Pine violet	

A Partial List of Wildlife at  
Empire Mine State Historic Park

Family	Common Name	Scientific Name
<b>MAMMALS</b>		
Didelphidae (opossums)	Virginia opossum	<i>Didelphis marsupialis</i>
Vespertilionidae (Vespertilionid bats)	Hoary bat	<i>Lasiurus cinereus</i>
	Big brown bat	<i>Eptesicus fuscus</i>
Leporidae (rabbits & hares)	Brush rabbit	<i>Sylvilagus bachmani</i>
	Black-tailed jackrabbit	<i>Lepus californicus</i>
Sciuridae (squirrels)	California ground squirrel	<i>Spermophilus beecheyi</i>
	Western grey squirrel	<i>Sciurus griseus</i>
	Douglas' squirrel	<i>Tamiasciurus douglasii</i>
	Northern flying squirrel	<i>Glaucomys sabrinus</i>
Geomyidae (pocket gophers)	Botta's pocket gopher	<i>Thomomys bottae</i>
Cricetidae (Cricetid mice)	Brush mouse	<i>Peromyscus boylii</i>
	Deer mouse	<i>Peromyscus maniculatus</i>
	Pinyon mouse	<i>Peromyscus truei</i>
	California vole	<i>Microtus californicus</i>
	Norway rat	<i>Rattus norvegicus</i>
Muridae (Murid rats & mice)	Porcupine	<i>Erithizon dorsatum</i>
Erithizontidae (porcupines)	Coyote	<i>Canus latrans</i>
Canidae (coyote, foxes)	Grey fox	<i>Urocyon cinereogenteus</i>
Procyonidae (raccoons)	Raccoon	<i>Procyon lotor</i>
	Ringtail	<i>Bassariscus astutus</i>
Mustilidae (skunks & weasels)	Striped skunk	<i>Mephitis mephitis</i>
Felidae (cats)	Bobcat	<i>Lynx rufus</i>
Cervidae (deer & elk)	Mule deer	<i>Odocoedeus hemionus</i>
<b>REPTILES</b>		
Emydidae	Western pond turtle	<i>Clemmys marmorata</i>
Teiidae	Western whiptail	<i>Cnemidophorus tigris</i>
Anguillidae (alligator lizards)	Southern alligator lizard	<i>Gerrhonotus multicarinatus</i>
Iguanidae (lizards)	Western fence lizard	<i>Sceloporus occidentalis</i>
	California horned lizard	<i>Phrynosoma coronatum</i>
Colubridae (most U.S. snakes)	Gopher snake	<i>Pituophis melanoleucus</i>
	California mountain kingsnake	<i>Lampropeltis getulus</i>
	Western terrestrial garter snake	<i>Thamnophis elegans</i>
Viperidae (pit vipers)	Western rattlesnake	<i>Crotalus viridis</i>
<b>FISH</b>		
Centrarchidae (sunfish)	Bluegill	<i>Lepomis macrochirus</i>
Cyprinidae (minnows)	Goldfish	<i>Carassius auratus</i>
Salmonidae (trout & salmon)	Rainbow trout	<i>Salmo gairdnerii</i>
<b>AMPHIBIANS</b>		
Salamandridae (salamanders)	California newt	<i>Taricha torosa</i>
Bufoidea (true toads)	Western toad	<i>Bufo boreas</i>
Hylidae (tree frogs)	Pacific tree frog	<i>Hyla regilla</i>
Ranidae (true frogs)	Bull frog	<i>Rana catesbeiana</i>

Family	Common Name	Scientific Name
<b>BIRDS</b>		
Charadriidae (plovers & killdeer)	Killdeer	<i>Charadrius vociferus</i>
Cathartidae (American vultures)	Turkey vulture	<i>Cathartes aura</i>
Accipitridae (hawks & eagles)	Red-tailed hawk	<i>Buteo jamaicensis</i>
	Sharp-shinned hawk	<i>Accipiter striatus</i>
	Northern goshawk	<i>Accipiter gentilis</i>
	California quail	<i>Callipepla californica</i>
Phasianidae (grouse & quail)	Mountain quail	<i>Oreortyx pictus</i>
	Mourning dove	<i>Zenaidura macroura</i>
	Band-tailed pigeon	<i>Columba fasciata</i>
Columbidae (pigeons & doves)	Rock dove	<i>Columba livia</i>
	Barn owl	<i>Tyto alba</i>
	Great-horned owl	<i>Bubo virginianus</i>
Tytonidae (barn owls)	Western screech owl	<i>Otus kennicottii</i>
	Flammulated owl	<i>Otus flammeolus</i>
	Northern saw-whet owl	<i>Aegolius acadicus</i>
Strigidae (all other owls)	Common nighthawk	<i>Chordeiles minor</i>
	Anna's hummingbird	<i>Calypte anna</i>
Caprimulgidae (goatsuckers)	Rufous hummingbird	<i>Selasphorus rufus</i>
	Allen's hummingbird	<i>Selasphorus sasin</i>
	Northern flicker	<i>Colaptes auratus</i>
Trochilidae (hummingbirds)	Acorn woodpecker	<i>Melanerpes formicivorus</i>
	Downy woodpecker	<i>Picoides pubescens</i>
	Hairy woodpecker	<i>Picoides villosus</i>
	Pileated woodpecker	<i>Dryocopus pileatus</i>
	Ash-throated flycatcher	<i>Myiarchus cinerascens</i>
	Olive-sided flycatcher	<i>Contopus borealis</i>
	Pacific-slope flycatcher	<i>Empidonax difficilis</i>
Picidae (woodpeckers)	Gray flycatcher	<i>Empidonax wrightii</i>
	Stellar jay	<i>Cyanocitta stelleri</i>
	Scrub jay	<i>Aphelocoma coerulescens</i>
Tyrannidae (flycatchers)	Mountain chickadee	<i>Parus gambeli</i>
	Chestnut-backed chickadee	<i>Parus rufescens</i>
	Plain titmouse	<i>Parus inornatus</i>
	Common bushtit	<i>Psaltriparus minimus</i>
Aegithalidae (bushtits)	White-breasted nuthatch	<i>Sitta carolinensis</i>
	Red-breasted nuthatch	<i>Sitta canadensis</i>
	Brown creeper	<i>Certhia americana</i>
Certhiidae (nuthatches)	House wren	<i>Troglodytes aedon</i>
	American robin	<i>Turdus migratorius</i>
Troglodytidae (wrens)	Townsend's solitaire	<i>Myadestes townsendi</i>
	Wrentit	<i>Chamaea fasciata</i>
Muscicapidae (thrushes & wrentits)	California thrasher	<i>Toxostoma redivivum</i>
	Cedar waxwing	<i>Bombycilla garrulus</i>
Mimidae (mockingbirds & thrashers)	European starling	<i>Sturnis vulgaris</i>
	Yellow warbler	<i>Dendroica petechia</i>
Bombycillidae (waxwings)	Wilson's warbler	<i>Wilsonia pusilla</i>
	Fox sparrow	<i>Passerella iliaca</i>
Sturnidae (starlings)	Dark-eyed junco	<i>Junco hyemalis</i>
	Western tanager	<i>Piranga ludoviciana</i>
	Northern oriole	<i>Icterus galbula</i>
	Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>
	Red-winged blackbird	<i>Agelaius phoeniceus</i>
	Brown-headed cowbird	<i>Molothrus ater</i>
	Black-headed grosbeak	<i>Pheucticus melanocephalus</i>
	House finch	<i>Carpodacus mexicanus</i>
	Lesser goldfinch	<i>Carduelis psaltria</i>
	American goldfinch	<i>Carduelis tristis</i>
Emberizidae (warblers, sparrows, etc.)	House sparrow	<i>Passer domesticus</i>
	Emberizidae, con't.	
Emberizidae (warblers, sparrows, etc.)	House sparrow	
	House sparrow	
Fringillidae (finches)	House sparrow	
	House sparrow	
Passeridae (house sparrows)	House sparrow	
	House sparrow	

## APPENDIX C

# VECTOR

ENGINEERING, INC.

12438 Loma Rica Drive, Suite C, Grass Valley, CA 95945  
(916) 272-2448 FAX (916) 272-8533

December 14, 1990  
Job No. 90192.0

Dave Hammond  
Associate Civil Engineer  
State of California  
Division of Parks and Recreation  
P. O. Box 1450  
Lodi, California 95241-1450

RECEIVED

SEP 02 1993

GOLD MINES

**RE: Results of Chemical Analysis of  
Rock Cores from the Empire Mine  
State Historic Park  
Proposed Adit Project**

Dear Mr. Hammond:

The purpose of this letter is to inform you of the results of the chemical analysis of the rock cores collected from the area of the proposed adit at the Empire Mine State Historic Park, located in Grass Valley. A site location map is enclosed as Plate 1. There has been some concern with the potential of the waste rock to be removed from the adit to leach hazardous concentrations of certain heavy metals and that these metals might present a danger to public health if the waste rock were used for surface fill material. Vector Engineering, Inc. (Vector) was contracted to select sections of two cores drilled through the location of the proposed adit and submit them to a certified laboratory to be analyzed for total levels of arsenic, lead, mercury, acid neutralization potential (ANP), and acid generation potential (AGP). These analyses would evaluate the concentrations of metals in the waste rock and the potential for leaching due to action by precipitation.

Short sections - approximately six (6) inches long - of two cores, B-2 and B-7, at the same depth as the proposed adit were selected for analysis. Core B-2 was drilled approximately 250 feet from the entrance and Core B-7 was drilled approximately 60 feet from the intersection of the adit with the existing mine shaft. The sample from B-2 was of highly weathered diabase and the sample from B-7 was of massive diorite. The adit will pass through both types of rock and Vector believes that the two samples are representative of the mineralogy present in the adit path. A subsurface section along the adit showing these sample locations is enclosed as Plate 2.

The following discussion of the analytical results will be more understandable when preceded by a simplified explanation of the test methods and regulatory requirements. Title

22, California Administrative Code, Section 66699 lists the Total Threshold Limit Concentration (TTLC) and Soluble Threshold Limit Concentration (STLC) for heavy metals. A sample in which the metal exceeds the TTLC is classified as a hazardous waste, while one in which the metal is present in levels below the STLC is regarded as non-hazardous. For concentrations between the two limits, a Waste Extraction Test (WET) using citric acid is required. The test for total metals is run under very acidic conditions which dissolve nearly all of the rock material. Obviously, total dissolution of soil and rock would not occur under normal climatic conditions. The WET analysis was designed to simulate the type of leaching that would be expected to occur under acid-rain conditions. A modified WET using deionized water was designed to more closely simulate the less acidic leaching conditions, such as those that would occur in the Empire Mine State Historic Park area. Normally, the WET analysis is only run if sample concentrations are greater than ten times the STLC. This is because of the ten to one dilution that occurs during the testing process. When concentrations are less than the TTLC and the WET is below the STLC, the material is considered non-hazardous.

The core sections were placed in plastic bags, boxed, and submitted to a laboratory for grinding, sieving, and analysis. The results are listed in Table 1. Results indicate low levels of total arsenic below the STLC, non-detectable levels of total mercury, and low levels of total lead slightly above the STLC. Because levels of lead were slightly higher than the STLC for this metal, a WET was performed on both samples. The ratio of ANP to AGP is greater than three (3) for both samples.

**TABLE 1**  
**Core Sample Analytical Results**

ANALYSIS	B-2 (mg/kg)	B-7 (mg/kg)	STLC (mg/l)	TTLC (mg/kg)
Arsenic (Total)	3.0	3.2	5.0	500
Mercury (Total)	ND*	ND	0.2	20
Lead (Total)	22	9.6	5.0	1,000
W.E.T. (Soluble, for Lead Only)	ND	ND	5.0	N/A*
Acid Neutralization Potential (ANP)	23	16	N/A	N/A
Acid Generation Potential (AGP)	5.8	0.1	N/A	N/A
(ANP/AGP)	4.0	160	N/A	N/A

- \* ND = Not Detected
- # N/A = Not Applicable



The ratio of the Acid Neutralization Potential (ANP) over the Acid Generation Potential (AGP) gives an indication of the potential of the soil to generate acidic conditions which can lead to leaching of heavy metals from the waste rock. A ratio of greater than three (3) is considered to be non-acid generating by the California State Water Quality Control Board and the United States Bureau of Mines. Ratios of less than 3 require additional, more sophisticated testing.

The analytical results indicate that there are non-hazardous levels of total arsenic and lead in the rock and that waste rock generated by construction of the adit would not generate acidic conditions which could lead to leaching of these, or any other metals from the rock. However, since this is a site which will receive intensive public contact, and the levels of lead were slightly above the STLC (although much less than ten times that level), the WET analysis was run for lead on the two samples.

Because an insufficient quantity of the sample from B-2 remained for the WET analysis to be run, another short section of the core was submitted to the laboratory. This section was immediately adjacent to the one sent previously. Enough of the original sample from B-7 remained to perform the WET analysis.

Results from the WET analysis indicate that non-detectable levels of lead would be leached out of adit material even under acid rain conditions. Thus, while lead is present in the rock to be removed from the adit, it is insoluble at conditions normally found at the surface. In our opinion, lead in rock removed from the adit would present no hazard to public health or ground water.

I have also included a copy of a memorandum from the State of California Department of Health Services (DHS - formerly known as Department of Health) regarding the water quality in Wolf Creek and Little Wolf Creek. DHS had become concerned about the potential for leachate from the Empire Mine tailings pile, which contained elevated levels of heavy metals, impacting these two streams. In 1981, water samples were collected from several points downstream of the mine and analyzed for heavy metals. As the memorandum states, the levels of these metals were all well below drinking water standards in all samples.

Conditions in the tailings pile are likely to be very different than conditions in fill material taken from the adit. Mine tailings are composed of heavily mineralized, fine-grained rock which has been processed to remove gold. This can produce acidic conditions which can lead to leaching of heavy metals from this material. The adit will be constructed through relatively unmineralized rock, will be of much larger grain size, and will not be processed. Analysis indicates that adit rock is not acid generating so the potential for leaching is very low.

This report was prepared in accordance with generally accepted engineering practices applicable at the time of preparation. The findings and conclusions presented in this report are based upon our field observations, limited sampling and analysis, and a review of appropriate literature. They are specific for this site and for this client, and may not be

expanded to include the greater area beyond the sampling area. Vector Engineering, Inc. makes no other warranties, expressed or implied, as to the professional advice provided in this report.

I hope that this report will answer your concerns regarding the potential for hazards to the public health from generation and use of adit material. If you have any questions or comments regarding this report, please contact me at (916) 272-2448.

Sincerely,

**VECTOR ENGINEERING, INC.**

*Gail Bakker*

Gail Bakker  
Project Hydrogeologist

enclosures

## APPENDIX D



May 26, 1989  
File No. 23-3531-01

State of California  
Department of General Services  
Office of Project Development and Management  
400 "P" Street, Suite 3460  
Sacramento, California 95814

**PRELIMINARY**

Attention: Mr. Kevin Kaestner

Subject: **SUBSURFACE INVESTIGATION REPORT  
PROPOSED MINE ADIT, PHASE I  
EMPIRE MINE STATE HISTORIC PARK  
GRASS VALLEY, CALIFORNIA**

Gentlemen:

Kleinfelder is pleased to present the following summary of our preliminary exploration program for the proposed mine adit to be constructed within the Empire Mine State Historic Park in Grass Valley, California. The site location relative to existing roads and topographic features is shown on the Site Location Map, Plate 1. The purpose of our investigation was to explore and evaluate the subsurface conditions at various locations along the adit alignment to provide data for cost estimating purposes for preliminary tunnel design. This report includes a discussion of the proposed construction, our field exploration program and the site and subsurface conditions encountered at the locations of our explorations.

### PROPOSED CONSTRUCTION

We understand the proposed project will involve construction of a mine adit which will intersect an existing Empire Mine Shaft at a depth of approximately 90 feet below existing site grade (approximate Elevation 2,583 feet). The proposed adit will be approximately 750 feet long, 7 feet high, and 7 feet wide and will have a near horizontal grade.

The adit entrance will be located southeast of the existing cyanide plant area. The proposed adit will trend northward from the planned entrance for approximately 220 feet, veer to the northeast beneath the existing stamp mill ruins, and terminate near the southeast corner of the machine shop at the existing inclined Empire Mine Shaft.

Visitors will tour the proposed adit on an electric-powered train. The adit will be enlarged in three locations where scenes depicting miners and mining conditions during various era will be displayed. At the intersection with the existing mine shaft, the adit will be enlarged for public viewing. Proposed surface support facilities will include a visitors mini-center including a small office for ticket sales and public restrooms and a shop building. A new roadway will be constructed from the existing park area to the adit entrance.

### PURPOSE AND SCOPE OF SERVICES

The purpose of our investigation was to explore subsurface conditions at various locations along the proposed adit alignment for cost estimate purposes and for preliminary tunneling design.

Our scope of services was outlined in our proposal dated March 8, 1989 and included the following:

1. A review of available published information pertinent to the project site;
2. Exploration of the subsurface conditions at various locations on the project site; and
3. Preparation of this report which includes:
  - a. A description of the proposed project;
  - b. A site plan showing the approximate locations of exploration points for this study;
  - c. A description of the subsurface conditions encountered; and
  - d. Boring logs which include soil and bedrock descriptions, rock quality designation (RQD), degree of weathering, joint condition, and drilling rates.

### FIELD EXPLORATION

#### GENERAL

The subsurface conditions at selected locations along the adit alignment were explored on March 27 through March 31, 1989 and April 13 through April 19, 1989. Seven of the borings were drilled to depths ranging from 1 to 10 feet below the proposed adit floor; total depths of exploration ranged from 9 to 104 feet below existing site grade. Borings B-4, B-5,

B-5A, and B-6 were drilled with a CME-55 drill rig equipped with 6-inch-diameter solid-stem augers and rotary wash equipment. Borings B-1, B-2, B-3, and B-7 were drilled with a Mobile B-53 drill rig equipped with 6-inch-diameter solid-stem augers and rotary wash equipment.

Our geologist maintained a log of the borings, visually classified soil and rock encountered according to the Unified Soil Classification System (see Plate 3) and the Rock Classification System (see Plate 4). The RQD, degree of weathering, joint condition, and drilling rates were continually recorded once bedrock was encountered.

A key to the Logs of Borings is presented on Plate 5. Log of Borings are presented on Plates 6 through 13. A subsurface section depicting the subsurface conditions encountered along the proposed adit alignment is presented on Plate 2.

#### SAMPLING PROCEDURES

Relatively undisturbed soil samples were obtained in the soil materials using either a Modified California Sampler or Standard Penetration Sampler driven 18 inches (unless otherwise noted) using a 30-inch drop of a 140-pound hammer. Blow counts were recorded at 6-inch intervals for each sample attempt and are reported on Plates 6 through 13 in terms of blows-per-foot for the last foot of penetration. Rock coring was performed using either an NW (2-5/8 inch core diameter) or NX (2-1/8 inch core diameter) diamond or carbide core drill bit.

Soil samples obtained were packaged and sealed to reduce moisture loss and disturbance. Rock core was stored in standard core boxes. Soil samples and core boxes are stored at the Department of Parks and Recreation Empire Mine site.

#### SITE CONDITIONS

##### SURFACE

Surface conditions along the proposed mine adit alignment consist predominantly of undeveloped property. Site topography slopes moderately downward to the southwest. Vegetation consists of brush and scattered oaks and pines.

## SUBSURFACE

A generalized subsurface profile of the soil and bedrock materials encountered is presented on Plate 2. The near-surface soil conditions encountered in our borings consisted of medium stiff sandy clay to depths of from 7 to approximately 23 feet below existing site grade. Below these soils, to depths ranging from 35 to about 40 feet, diabase bedrock was encountered. The upper surface of the diabase material was highly weathered and friable to a soil-like consistency. Within the northeastern portion of the alignment (from approximately Station 12+50 to Station 16+25) the diabase bedrock graded slightly weathered-to-fresh and moderately strong-to-strong at a depth of about 38 to 50 feet. In Boring B-7 porphyritic diorite was encountered at a depth of 81 feet to the maximum depths explored. Loss of drilling fluids during coring operations are noted on the Logs of Borings. Fluid loss may be due to voids, fractures, joint sets, or openings related to mining. An approximate 3 foot void was encountered in Boring B-5A at a depth of 36 feet.

The RQD (which is used as an index of rock mass quality) of the diabase material was variable. From Station 8+82 (the proposed portal location) to approximately Station 12+50 the RQD ranged from 0 to 30%. This RQD corresponds to a very poor-to-poor rock mass. From approximate Station 12+50 to 16+25 (the point of intersection with the existing shaft) the RQD of the diabase material ranged from 80 to 100%. This RQD is classified as a good-to-very good rock mass. The RQD of the diorite material ranges from 90 to 100%, and is corresponding to a very good rock mass.

Due to the drilling methods used (rotary wash boring) evaluation of groundwater conditions was not possible.

## ADDITIONAL SERVICES AND LIMITATIONS

We recommend additional subsurface exploration be conducted along the proposed adit alignment to further evaluate anticipated tunneling conditions and tunnel support requirements prior to final design.

Subsurface conditions described in this report are based on the conditions encountered at the locations of our borings. It is possible soil and bedrock conditions could vary substantially between the points explored.

May 26, 1989  
File No. 23-3531-01  
Page 5

Please contact us if you have questions about this information. We look forward to continuing our services to you on this important project.

Very truly yours,

**KLEINFELDER, Inc.**

*Martha A. McDonnell / R. Costa*

Martha A. McDonnell, P.E.  
Project Engineer

MAM:kr  
R027K

Attachments

# APPENDIX E

A Report Prepared for

State of California  
Department of Parks and Recreation  
Gold Mine District  
10556 East Empire Street  
Grass Valley, California 95945

PRELIMINARY ENDANGERMENT ASSESSMENT  
EMPIRE MINE STATE HISTORIC PARK  
GRASS VALLEY, CALIFORNIA

HLA Job No. 20158,002.13

by

---

Gerard J. Abrams, R.G.  
Project Geologist

---

Gregory L. Fasiano  
Senior Geologist

Harding Lawson Associates  
3247 Ramos Circle  
Sacramento, California 95827  
916/364-0793

April 27, 1992

DRAFT PENDING TECHNICAL REVIEW



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DISTRIBUTION

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Plate 4	Site Plan Showing Sample Locations
Plate 5	Site Plan Summarizing Analytical Results (Metals) From Soil Samples
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## EXECUTIVE SUMMARY

Harding Lawson Associates (HLA) has prepared this Preliminary Endangerment Assessment (PEA) on behalf of the California Department of Parks and Recreation for the Empire Mine State Historic Park located at the intersection of East Empire Street and the Colfax Highway, Grass Valley, California. The PEA was requested by the California Environmental Protection Agency, Department of Toxic Substances, Site Mitigation Unit (DTSC). The purpose of the PEA is to assess whether chemical concentrations (primarily arsenic, lead, and mercury) identified at the site pose a potential risk to human health and the environment.

Mining operations within the present boundaries of the park began in 1851 and ceased in 1956. During the operating life of the mine, waste rock and slurry from the milling process was stockpiled south of the former cyanide plant or allowed to runoff in the drainage below the cyanide plant. This "tailings" material contains elevated levels of metals and inorganics (cyanide and sulfide) which were present in either the ore or resulted from the milling process.

Site investigation activities at the Empire Mine have been conducted by various state regulatory or park personnel since February 1977. A sampling and analytical program was initiated at the site by HLA on August 30, 1991. The study involved collection of samples from soils, stream sediments, and ambient (stream) water. An ambient air quality monitoring study using high volume samplers and meteorological monitoring sensors was also conducted. Soils containing levels of lead, arsenic, and mercury which exceeded the total threshold limit concentrations (TTLIC) were reported

from the former mill tailings stockpile area and within the drainage below the former cyanide plant.

Levels of arsenic, lead, mercury, cyanide, and sulfide reported in water samples from Little Wolf Creek were below, or only slightly above the respective laboratory detection limits for these constituents. None of the analytes tested exceeded their respective Maximum Contaminant Level (MCL) in water samples. A MCL is the maximum level of a particular constituent allowed in drinking water which is considered safe for human consumption.

Chemical concentrations at the site were compared to screening values issued by the DTSC as a preliminary appraisal method. Levels of contaminants below DTSC screening values are probably not a health concern; concentrations above screening values may or may not be a health concern. A health risk assessment focusing on site-specific conditions may be completed in cases where contaminant levels exceed screening values.

Findings are summarized as follows:

Air - Of the chemicals detected in air having available screening values, only arsenic exceeded the acceptable ratio of 1.0. The screening ratio for arsenic, however, assumes a lifetime exposure at the detected concentration. Because offsite exposures will be lower than onsite, it is possible that significant exposure to offsite receptors may be within acceptable levels. Similarly, park visitors are likely to spend only a few days at the park per year, therefore, exposure to park visitors via this pathway may be within the acceptable levels. Potential exposure risks to onsite workers via inhalation of arsenic adsorbed to dust particles can be evaluated more specifically by conducting a site-specific (baseline) risk assessment.

Soil - No screening level for any chemical detected in soils (including stream sediments) exceeds 1.0 for adults. Therefore, based on PEA screening levels, existing soil concentrations do not pose a health threat to workers. The screening ratios for arsenic, cadmium, lead, and mercury exceeded 1.0 for children. However, children are only expected to be onsite as visitors and therefore would not be chronically exposed to contaminated soil. Therefore, this exposure pathway may not pose a health threat to occasional onsite child visitors. The threat to onsite child visitors can be evaluated more specifically in a site-specific baseline risk assessment.

Water - Levels of contaminants found in Little Wolf Creek have been found to be lower than screening levels. Exposure to chemicals with available screening values via ingestion or dermal contact with water is not expected to pose a significant health threat.

## 1.0 INTRODUCTION

Harding Lawson Associates (HLA) has prepared this Preliminary Endangerment Assessment (PEA) for a portion of the Empire Mine State Historic Park (site), located in Grass Valley, California (Plates 1 and 2). The area of study is primarily centered around mill tailings material located south of the mine buildings and visitors center (Plate 3). HLA was retained by the California Department of Parks and Recreation to prepare this PEA for submittal to the California Environmental Protection Agency - Department of Toxic Substances Control (DTSC) (formerly the California Department of Health Services). The purpose of this PEA is to fulfill the requirements mandated by the DTSC in a letter to the DPR dated May 18, 1990. HLA completed a Phase I Preliminary Endangerment Assessment in October 1990. During that investigation HLA's scope of service consisted of the following:

- Review available site information and agency records;
- Conduct a site visit and establish site history; and
- Develop a draft PEA for submittal to the DTSC for their initial review.

No field activities nor exposure assessment were conducted as part of the Phase I PEA. HLA's Phase I PEA concluded that the following items needed to be addressed prior to completion of the final PEA:

- Evaluate total and soluble heavy metals in representative locations onsite;
- Evaluate related chemical concerns;
- Estimate current impact of surface drainage on Little Wolf Creek;
- Evaluate potential airborne containment pathways.



Results of that investigation were presented in HLA's report titled *Phase I Preliminary Endangerment Assessment, Empire Mine State Historic Park, Grass Valley, California* dated, October 22, 1990.

### 1.1 Purpose of Study

The PEA process was initiated to determine whether concentrations of hazardous substances (primarily lead, arsenic, and mercury) or other inorganic substances (cyanide and sulfide) identified at the site, pose a threat to human health and environmental resources. In accordance with these objectives, the purpose of this study was to:

- Provide a complete summary of past onsite activities.
- Summarize previous site characterizations and site history investigations.
- Evaluate hydrogeologic, geologic, and climatologic conditions for the site.
- Evaluate demographics of the area, nearby sensitive receptors, and surrounding land use.
- Evaluate the type and extent of hazardous substances at the site.
- Evaluate toxicological properties of constituents of concern and conduct an exposure assessment.
- Provide recommendations and conclusions regarding site status.

This work was performed in accordance with HLA's draft work plan submitted to and approved by the DTSC in July 1991.

## 2.0 SITE IDENTIFICATION INFORMATION

Empire Mine State Historic Park is located in Nevada County on the western slope of the north-central Sierra Nevada. It is approximately 50 miles northeast of Sacramento adjacent to the south edge of the town of Grass Valley (Plates 1 and 2). The Empire Mine property consists of two large, nearly contiguous, irregularly shaped parcels. The larger, 507-acre parcel, south of Highway 174 is comprised of the primary historic area. North of the highway lies the smaller, 270-acre portion of the park. The southern portion of the park is bounded on the north by East Empire Street, the eastern 500 yards of which traverses park property to join Highway 174. The main park entrance is off East Empire Street where it crosses park property. The Park is operated by the California Department of Parks and Recreation (DPR), Gold Mine District. DPR offices for the park are located at 10556 East Empire Street, Grass Valley, California, 95945. DPR personnel can be reached at (916)-273-3884.

The site is listed with the Nevada County Assessor's Office as Assessor's Parcel Nos. (APNs) 9-61-17, 9-61-8, 9-62-9, and 9-62-11. The site and surrounding park area was purchased by the DPR in 1975, and was previously owned by the Newmont Mining Company which operated a gold mine on the property.

An estimated 46,000 tons of tailings piles were removed from the park during 1986 (Ray Patton, DPR, personal communication). The removal took place under the auspices of the Empire Mine Association. Environmental Protection Agency (EPA) identification number CAX000050419 was assigned to the removal operation. Tailings were taken to Homestake Mine in Lake County for reprocessing. DPR administrators are not aware of any other activities that have resulted in prior application for an EPA

identification number. DTSC records similarly confirm that there is no EPA Identification Number assigned to the site (January 16, 1990).

### 3.0 PAST AND CURRENT SITE ACTIVITIES

Gold was found in October 1850 in a surface outcropping that now lies within park boundaries. By 1851, a series of 20- to 40-foot-deep vertical holes were sunk by small claims miners. Consolidation of the mining operations began shortly thereafter with the formation of the Ophir Hill Mine. The property was then purchased by John Rush, who in 1852, changed the name to the Empire Quartz Hill Company.

Ownership changed hands several times until 1879, when William Bourn took over the management of the mine and made it profitable by sinking shafts below the 1,200 foot level. George Starr, Bourn's successor, served as superintendent until 1929.

The mine was sold in 1929 to the Newmont Mining Company, which also acquired a controlling interest in the North Star Mine, an offsite property located 1-1/4 mile west of the park boundary. The combined operation of these mines was known as Empire-Star Mines Company. The mines were closed for a short period during World War II, but reopened in 1945. From 1945 through 1956, the mines operated at marginal profitability, and a decision to shut down the mine was finally reached. The underground mining equipment, including dewatering pumps, were removed in 1957. The equipment was sold at auction in 1959 (DPR, 1988; 1990). However, the Newmont Mining Company retained the property through 1975 (Wagner, 1970; Ray Patton, personal communication).

The DPR purchased the site in 1975. Currently, the site is included within the larger Empire Mine Historic Park and open to the public.