GAGE MINE SAFEGUARD PROJECT
Deming, New Mexico

This project is located approximately three miles south of the Gage exit from U.S. Interstate Highway 10, about 20 miles west of Deming, New Mexico. Access is available to the site at all times, except for vehicular access to a portion of the site where there is a locked gate. Contact the New Mexico Abandoned Mine Land Bureau for access there.

This project successfully eliminated and safeguarded 164 abandoned underground mine entries, shafts, and voids while preserving bat and owl habitat in the mine workings and maintaining authorized access for the mineral claimants and owners to selected portions of the mines. Construction was begun on June 14 and completed by October 2, 1994, at a final construction cost of $307,327.85. The following persons and organizations worked on completing the project:

New Mexico Abandoned Mine Land Bureau
Mining and Minerals Division
2040 South Pacheco Street
Santa Fe, New Mexico 87505 505/827-5970
Program Manager: Robert M. Evetts
Project Engineer/
Submitter of Nomination: John A. Kretzmann
Environmental Coordinator: Homer E. Milford
Reclamation Specialists/
Project Managers: Randall Armijo
Raymond Rodarte

Department of Biology
University of New Mexico
Albuquerque, New Mexico 87131 505/277-3449
Professor/Bat Biologist: J. Scott Altenbach

Office of Archaeological Studies
Museum of New Mexico
P.O. Box 2087
Santa Fe, New Mexico 87504 505/827-6343
Principal Investigator: Yvonne R. Oakes
Project Director: Joan K. Gaunt

Michael C. Donegan, Inc.
P.O. Box 546
Clayton, New Mexico 88415 505/374-2271
Construction Contractor: Michael C. Donegan

NARRATIVE DESCRIPTION

Prospectors discovered lead ores in the Victorio Mountains of southern New Mexico in the 1870's, when the area was still inhabited by the Apaches under Chief Victorio. The famous western mining trio of George Hearst (the father of William Randolph Hearst), James Ben Ali Haggin, and Lloyd Tevis acquired the major Gage mines in the early 1880's. These men were also active on the Comstock lode in Nevada, owned the Ontario Mine in Utah, and created the Anaconda Copper and Homestake Gold Mining Companies. Most of the silver-lead ore was extracted from the Gage deposits between 1882 and 1886. The ore was first shipped to the Benson smelter in Arizona and later to El Paso, Texas. After 1886, mining was sporadic but continued on a small scale until 1930. The last known date of production is 1940.

The Victorio Mountains are a group of ridges of volcanic and sedimentary rock trending north and northwesterly, rising above the surrounding plain in the typical basin and range geography of south-central and southwestern New Mexico. Mine Hill, the southernmost of the Victorio Mountain outcrops and where most of the mining activity occurred, is composed of dolomite and limestone. In the project area, measuring only 1500 feet by 3000 feet, mining activity left over one hundred fifty dangerous shafts, adits, prospects, and stope openings.

The New Mexico Abandoned Mine Land Bureau became interested in safeguarding these mine features when it discovered a report by the New Mexico Inspector of Mines regarding the death of a boy in 1968 caused by falling into a winze, or interior shaft. As is standard practice for all of the Bureau's mine closure projects, Bureau staff and J. Scott Altenbach, bat biologist from the University of New Mexico, explored the mine workings, using proper safety equipment and procedures, for assessment of internal bat habitat. In some of the mine features, they found hibernating small-footed and California myotis bats and significant numbers of hibernating Townsend's big-eared bats, and in another, a maternity colony of Townsend's big-eared bats. Pallid bats used several of the features as day and night roosts and several of the deeper shafts were used by barn owls. In 1992, the Museum of New Mexico surveyed the mine sites and the nearby abandoned mining town called Chance City and recommended that many of the surface features be preserved, including remnants of stone houses, mill and hoist foundations, a blacksmith shop, timber loadouts and headframes, and extensive hand-laid rock retaining walls.

The Bureau made the decision to safeguard 164 of the mine openings, including 120 shafts and prospect pits, 18 adits, and 26 stope openings. Because of the steep and rocky terrain, equipment access to many of the mine openings was difficult or impossible. As a result the construction contractor closed many features by backfilling by hand or by blasting. While the Parole Shaft/Stope was being backfilled, an extensive void on one end of the mine opening became apparent. Rather than requiring only the estimated 500 cubic yards to backfill this feature using material from the adjacent mine waste pile, an additional 3,000 cubic yards was necessary to complete fill using material that was hauled from other mine waste piles in the general area. In order to relieve loading on the long fill slope that resulted below the end of the stope opening, a polyurethane foam plug placed on top of the partially completed fill was designed and constructed. By completion of the project, the contractor's bulldozer, front end loader, explosives, and men had moved more than fourteen thousand cubic yards of material, primarily mine waste, to backfill over one hundred thirty mine openings.

The Bureau designed and the contractor constructed seventeen heavy steel bat grates, which allow bats to continue using the mine workings, keep out humans, and resist vandalism. In places, the contractor had to carry all of the equipment and materials needed to build these grates across the steep rocky hillsides. Some of these bat closures have removable, locking crossbars to allow for access by the mineral owners and the Bureau. One bat closure, measuring twenty feet long, ten feet wide, and three feet high, was built over the three-hundred foot deep Chance Shaft and integrally tied to the existing concrete shaft collar. Although most of the bat grates were built vertically inside adit openings, where the footing is secure, six of the grates were constructed horizontally in competent rock at shaft collars. This work required the contractor to built temporary working platforms and use harnesses and life lines to construct the closures. Another grated closure was built over a shaft to preserve it for use by barn owls. This closure, about nine feet square by three feet tall, is similar to a bat closure with the addition of several perches near the openings. All bat and owl closures were constructed of weathering steel to eliminate the need for on-site painting while providing long-lasting, corrosion resistant structures.

To maintain ventilation for bats and to allow some ingress and egress for bats, or merely to safeguard large stope openings on hillsides inaccessible by equipment, steel cable netting was installed at six openings. Bat windows were incorporated into two of these nets.

At two shafts where the mineral claimant wished to maintain access to the mine workings, but where there was no usage by bats, the Bureau designed grated shaft closures with locking access doors. Because the Museum of New Mexico had designated that the timber headframes at these shafts were to be preserved, the steel grating had to be cut to fit around the numerous timber posts. To maintain ventilation in these workings, 24-inch diameter corrugated steel pipe risers with steel grates were installed at two other connecting shafts. One riser pipe is supported in a polyurethane foam plug in the shaft and the other, at the Rambler Shaft, by a cast-in-place concrete slab over the shaft. Conditions at the Rambler Shaft were unknown prior to construction because the timber lining near the surface had partially collapsed leaving a dangerous debris plug. When the debris plug was removed, timber lining was revealed to over fifty feet below the bottom of the mine waste pile (by now largely removed for fill at nearby shafts and stopes). Although technically the originally specified polyurethane foam plug could have been placed below the timber lining where secure anchorage to bedrock could be achieved, there were notable safety concerns in constructing a foam plug at this depth and there would have been construction difficulties in placing the required ventilation pipe to the surface from that depth. Exploratory excavation around the shaft revealed that there was competent bedrock within a couple feet of the new ground surface. This situation lent itself to design and construction of a cast-in-place reinforced concrete cap over the approximately six-foot square shaft opening.

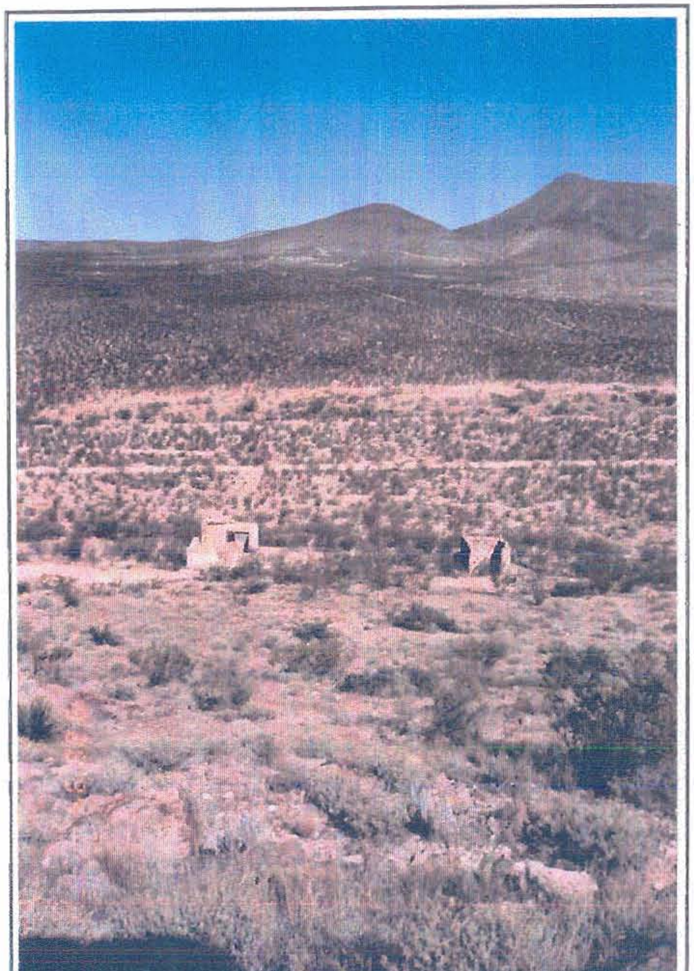
To date all closure methods have been successful in eliminating dangerous mine openings. There has been no significant settlement of fills and no failure or breaching of the steel, concrete, and polyurethane foam structures. The weathering steel on the exposed bat and owl closures is beginning to rust to a soft brown color that blends into the landscape. Items of archaeological and historical interest have been preserved. People who visit the site to explore the ghost town can do so without fear of their children falling into a mine void. The land and mineral owners have a much reduced potential liability for injury or death on their properties. The impact of the project on the bat populations will be more difficult to assess since the number of features and the size and complexity of some of those occupied by bats prevented exact counts. The Bureau plans to continue to monitor the bat populations in all of the features protected for bat habitat. Based on experience at other mine sites, the Bureau expects that the protection offered by the bat closures and the reduction in disturbance caused by explorers will lead to a somewhat increased population.

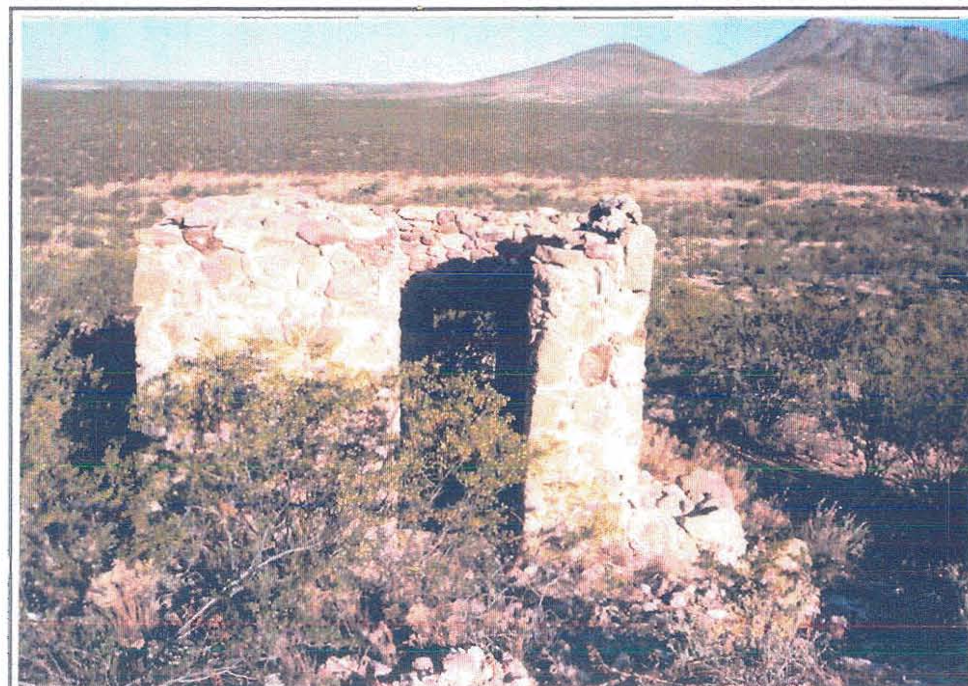
CHANCE CITY GHOST TOWN

Below: Overview of town site (Structures C & D visible)

Upper Right: Closeup of masonry house ruins (Structure C)

Lower Right: Closeup of masonry house ruins (Structure D)



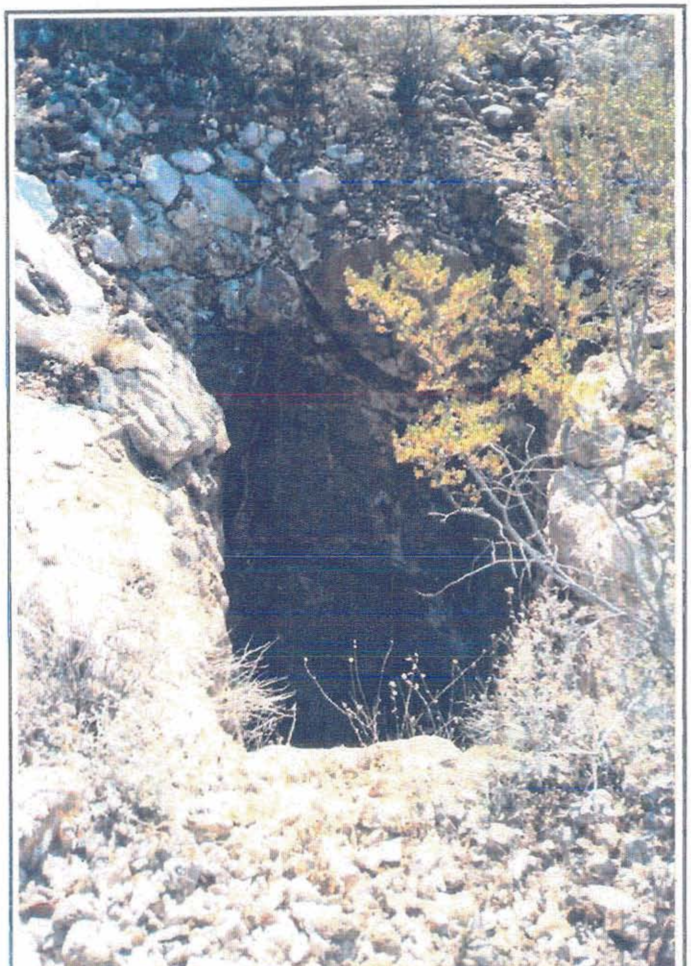


OPEN MINE VOIDS BEFORE CONSTRUCTION

Below: Open shaft, later backfilled (Feature 47)

Upper Right: Open glory hole, later backfilled (Feature 42)

Lower Right: Open shaft, 31 feet deep, later backfilled (Feature 44)

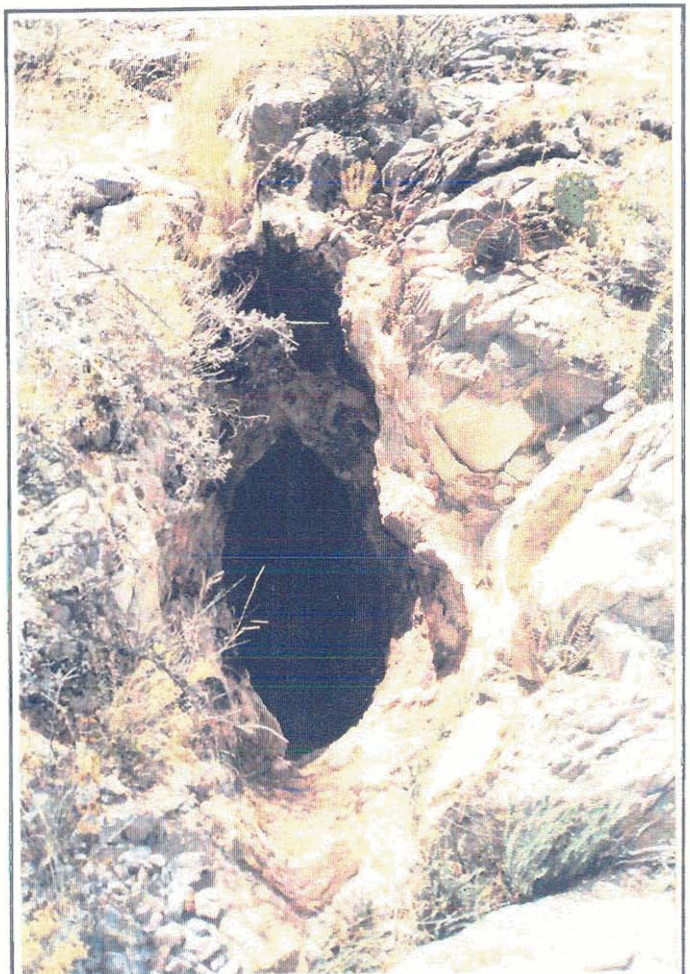


OPEN MINE VOIDS BEFORE CONSTRUCTION

Below: Open shaft, later safeguarded with horizonal bat grate (Feature 160)

Upper Right: Open shaft, 70 feet deep, later backfilled (Feature 57)

Lower Right: Open shaft, 56 feet deep, later backfilled (Feature 132)

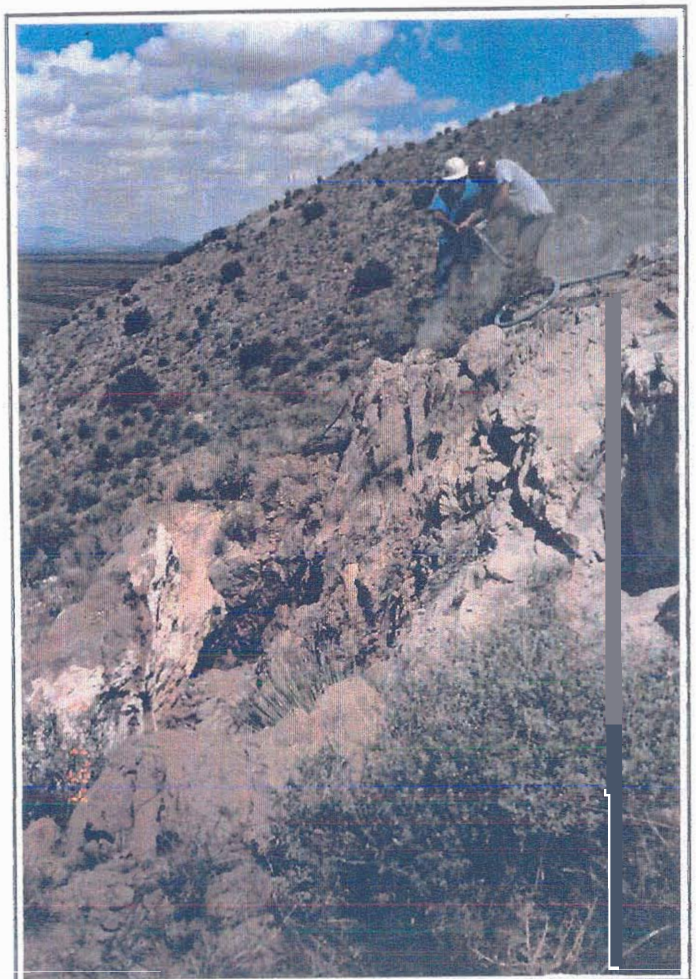


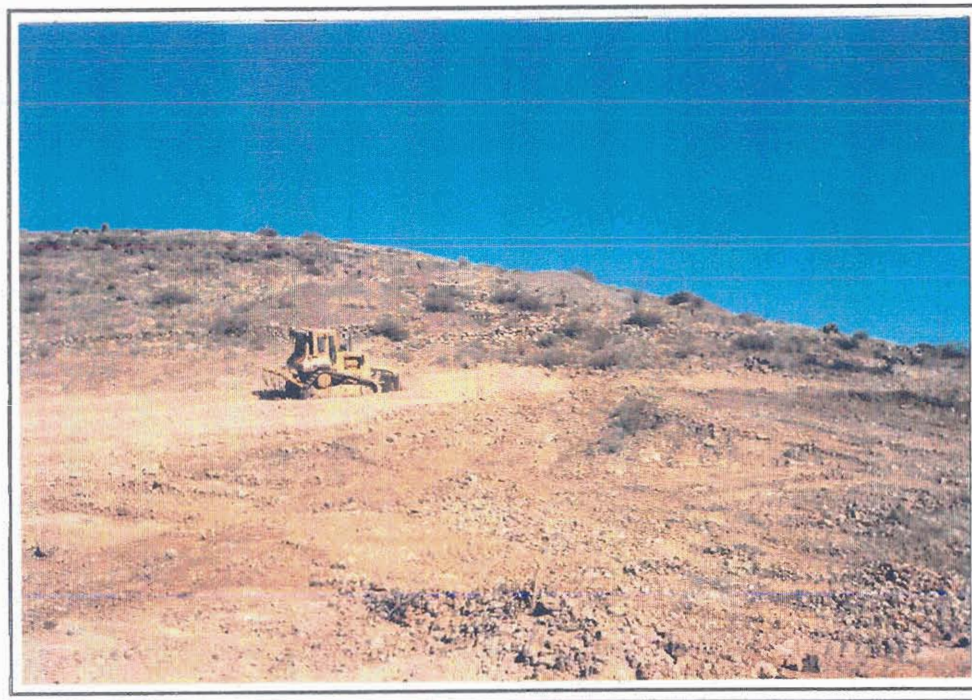
BACKFILLING BY BLASTING AND BULLDOZING

Below: Drilling for blasting at open stope (Feature 116)

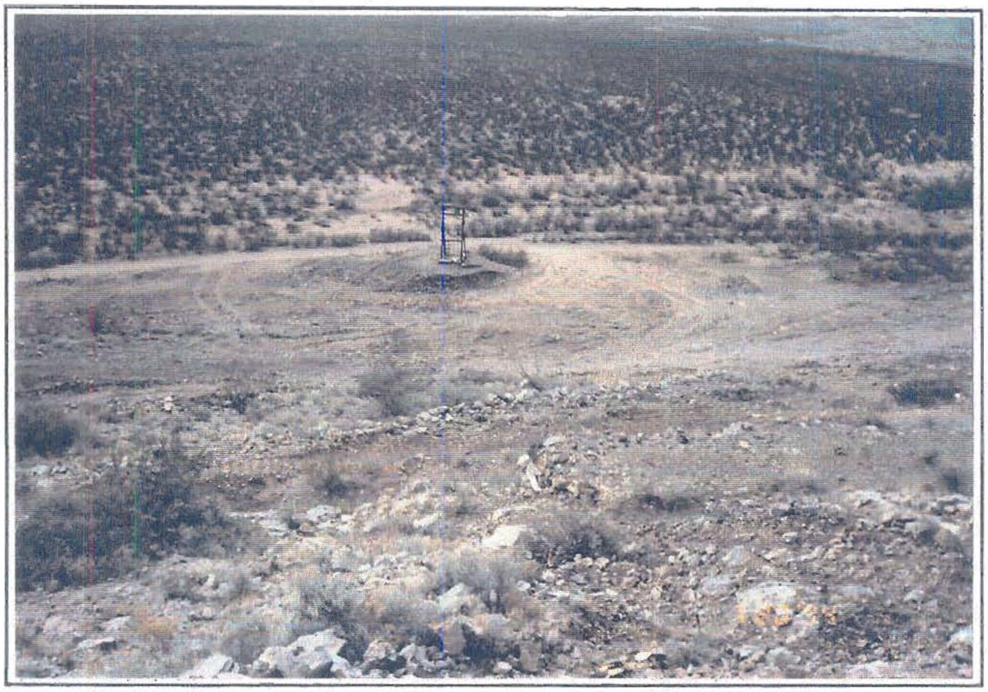
Upper Right: Dozing mine waste to fill open stopes (Features 49 to 56)

Lower Right: Dozing mine waste to fill glory hole (Feature 42)





BACKFILLING OPERATIONS



Backfilled and graded area where there were many open shafts and stopes (headframe at Rambler Shaft, Feature 69, at center)

Backfilling open shaft (Feature 80B)

GRATED SHAFT CLOSURE AT THE HELEN SHAFT (FEATURE 1)

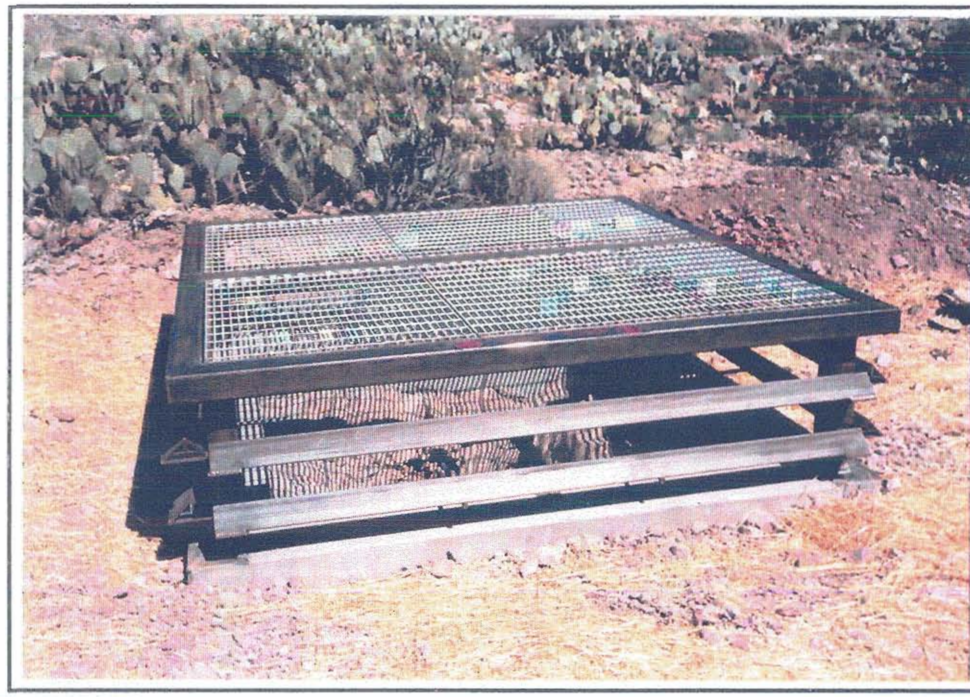
Below: Prior to construction; access to shaft is available down a ladder on right side

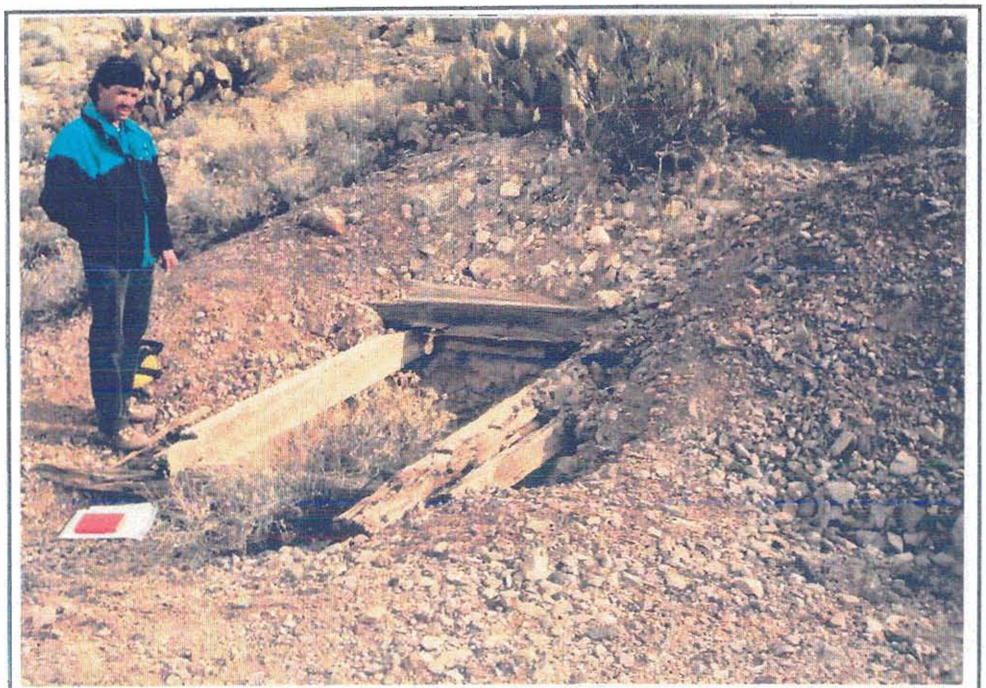
Right: Nearly complete grated closure; note cutting required to fit grating around posts

OWL CLOSURE AT THE FEATURE 34 SHAFT

Below: Open shaft, 101 feet deep, prior to construction

Right: Completed owl closure with grated top; note interior bars for owl perches

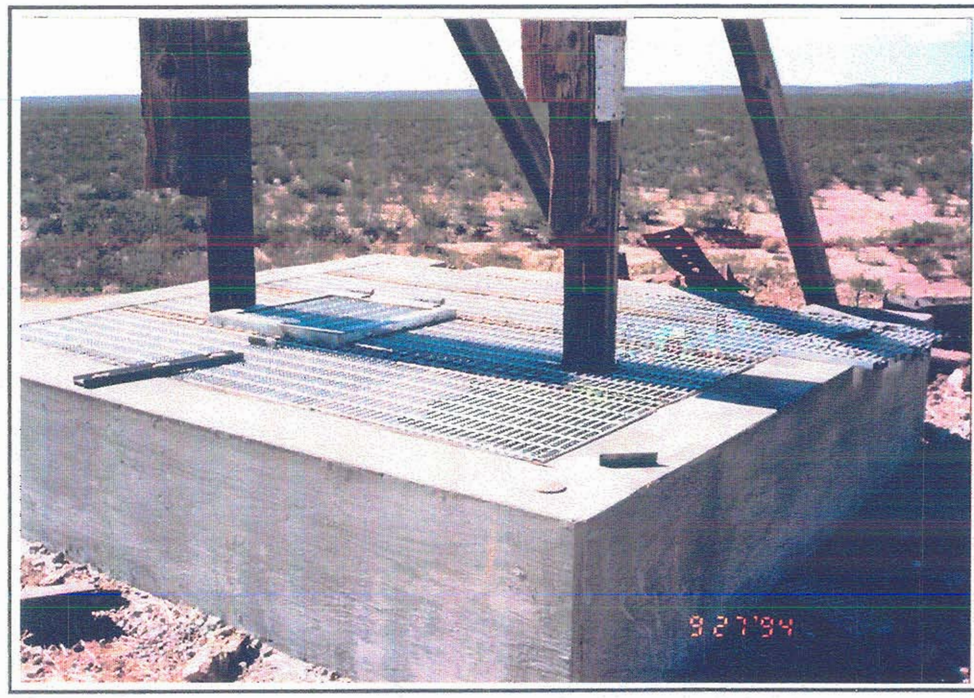




GRATED SHAFT CLOSURE AT THE RAMBLER SHAFT

Below: Open shaft with access down wooden ladder

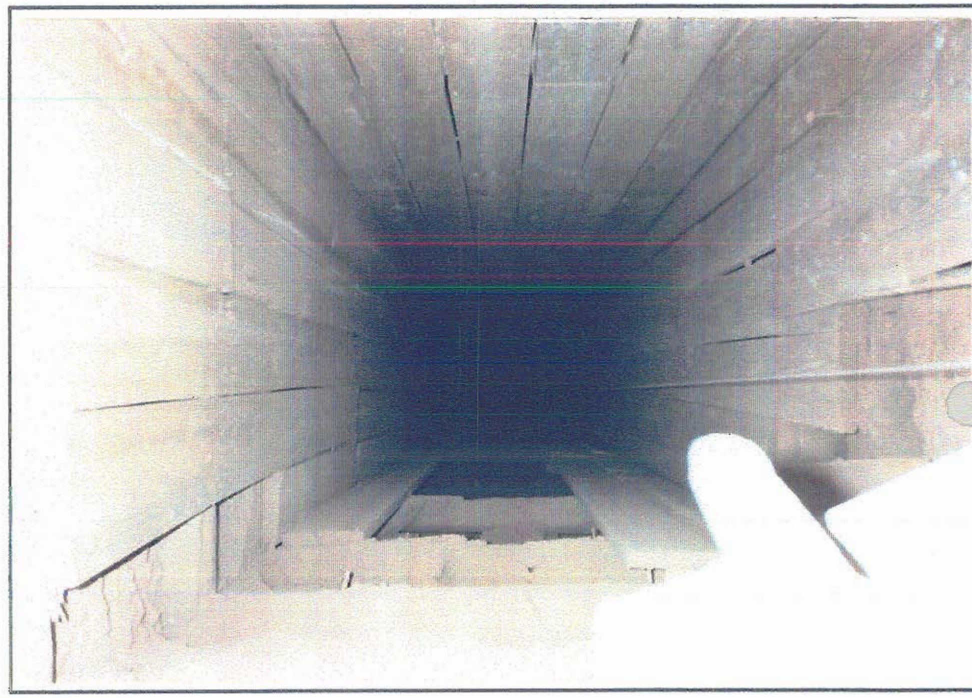
Right: Nearly complete grated closure; note locking access door at ladder location



UNEXPECTED CONDITIONS AT THE RAMBLER SHAFT (FEATURE 69)

Below: The shaft opening, after removing the collapsed debris plug and much of the surrounding mine waste pile

Right: View down shaft showing the timber lining

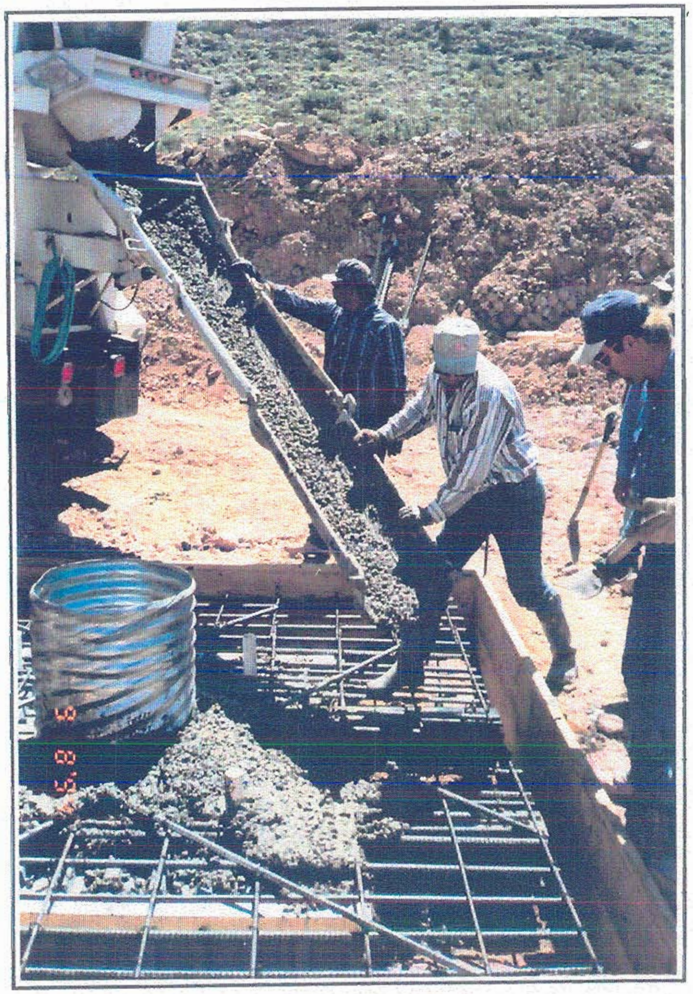


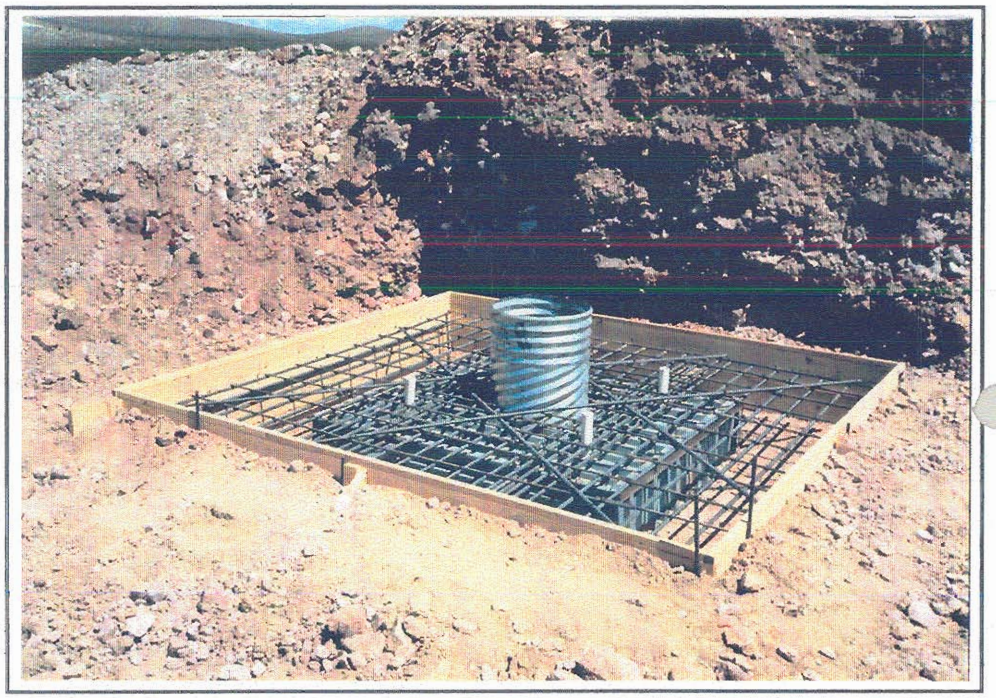
CAST-IN-PLACE CONCRETE CAP AND GRATED VENT AT THE RAMBLER SHAFT (FEATURE 69)

Below: Placing concrete into the forms

Upper Right: Formwork, reinforcing steel, lower portion of vent pipe prior to concrete placement

Lower Right: Completed grate at top of vent pipe

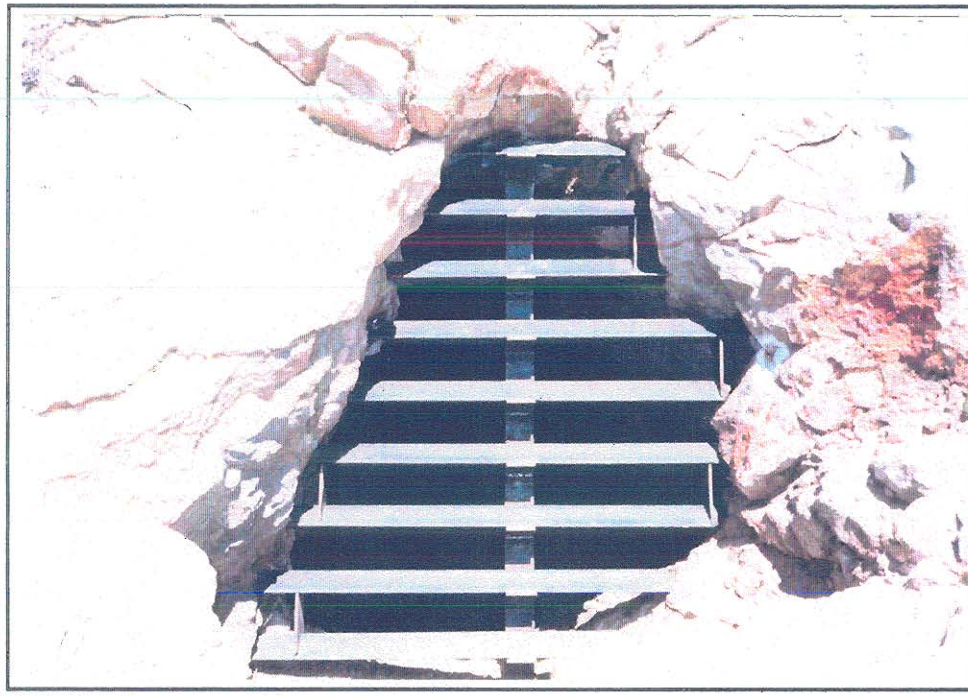




BAT GRATE AT THE FEATURE 82 ADIT

Below: Adit opening prior to construction

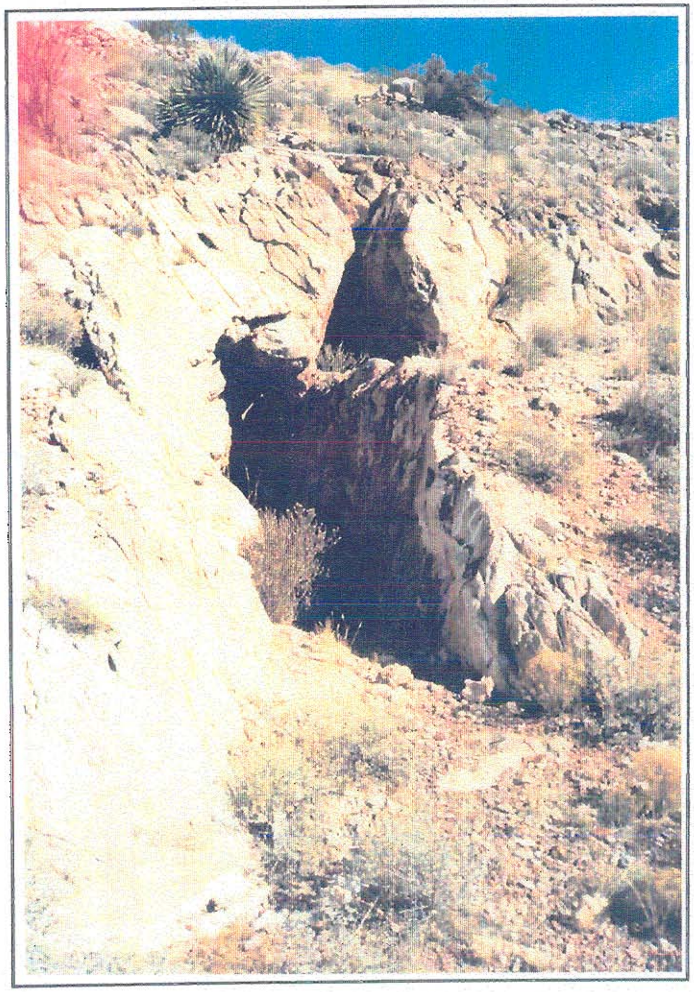
Right: Completed bat grate; it is sloped back about 30° from horizontal

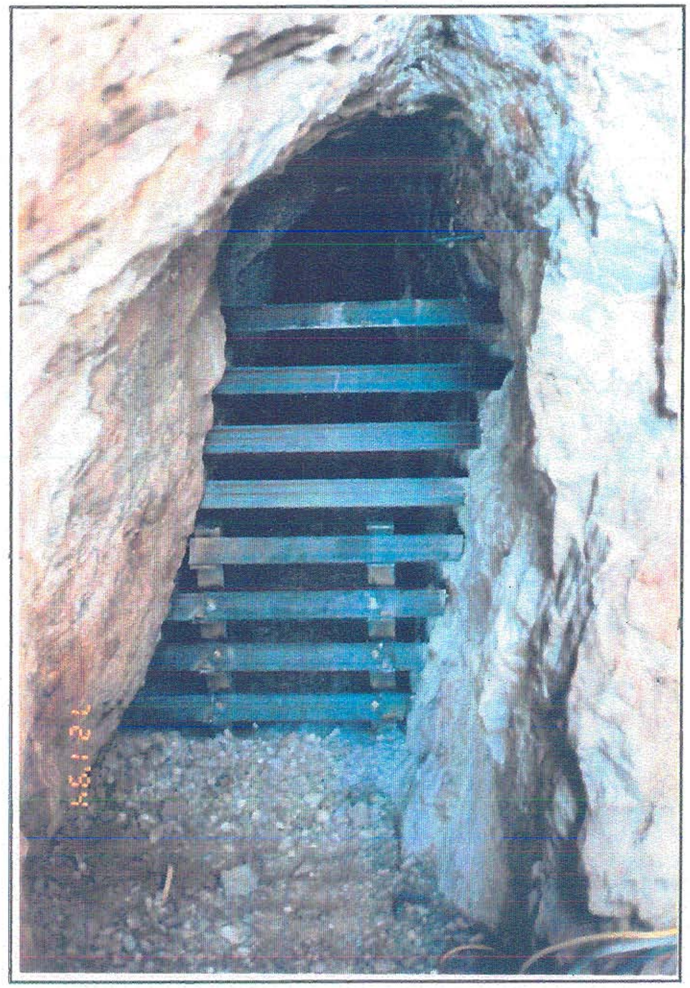


BAT GRATE AT THE BURKE ADIT (FEATURE 84)

Below Left: Adit entry before construction

Below Right: Bat grate under construction inside adit



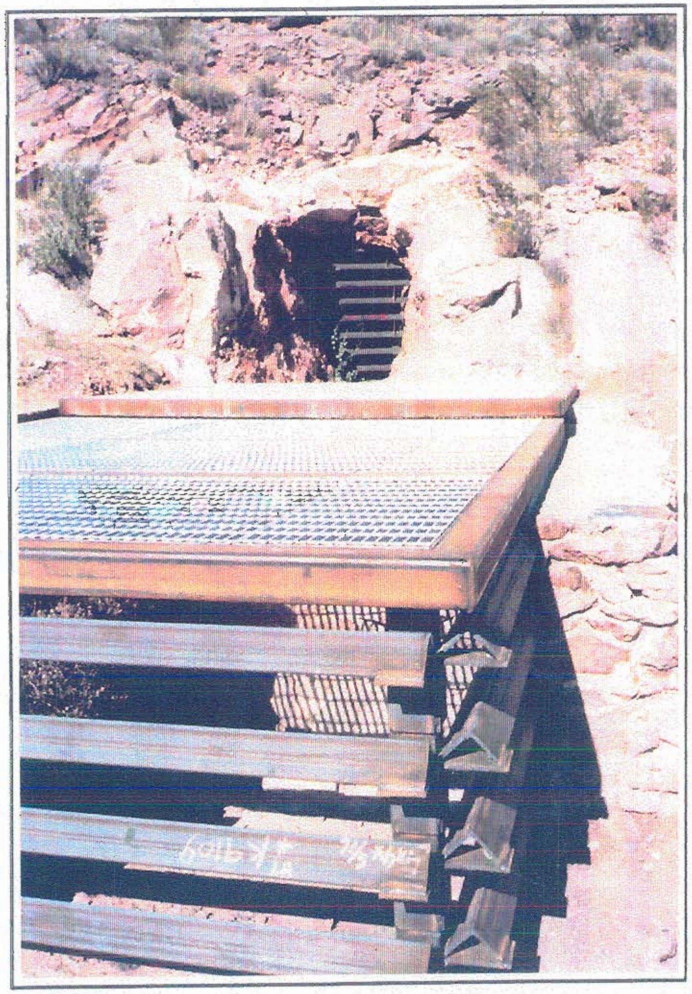


BAT CLOSURES AT THE CHANCE SHAFT AND ADIT
(FEATURES 92 & 93)

Below: Nearly complete bat closures

Upper Right: Open shaft and adit before construction

Lower Right: Another view of completed bat closure at Chance Shaft

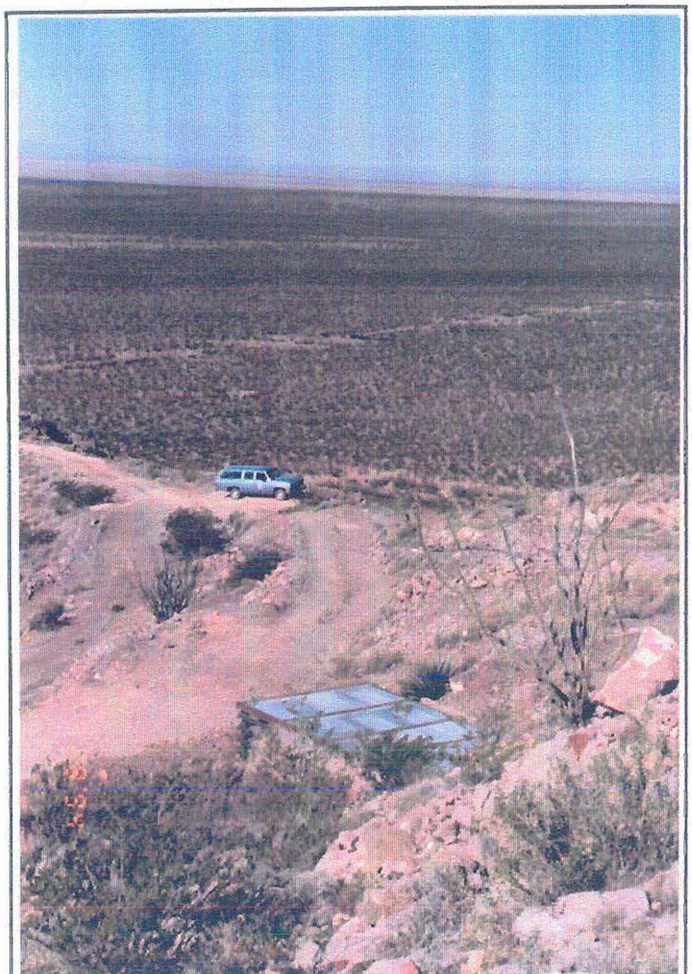


BAT CLOSURE AT THE CHANCE SHAFT (FEATURE 92)

Below: Completed bat closure

Upper Right: Open shaft and concrete collar before construction

Lower Right: Another view of completed bat closure



HORIZONTAL BAT GRATE IN THE FEATURE 95 SHAFT

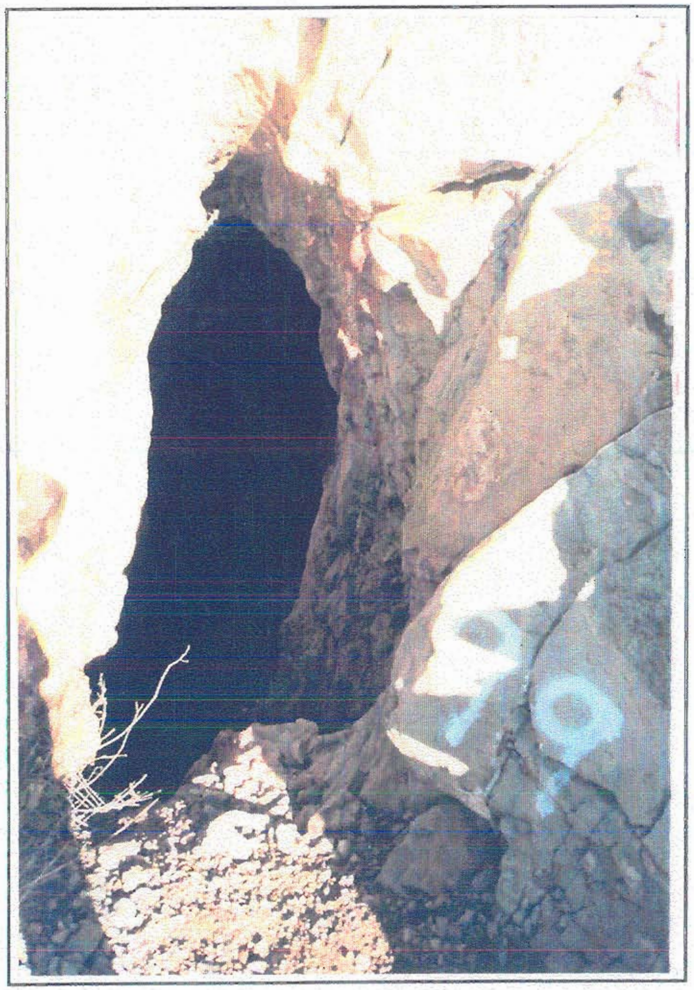
Below: Open shaft before construction

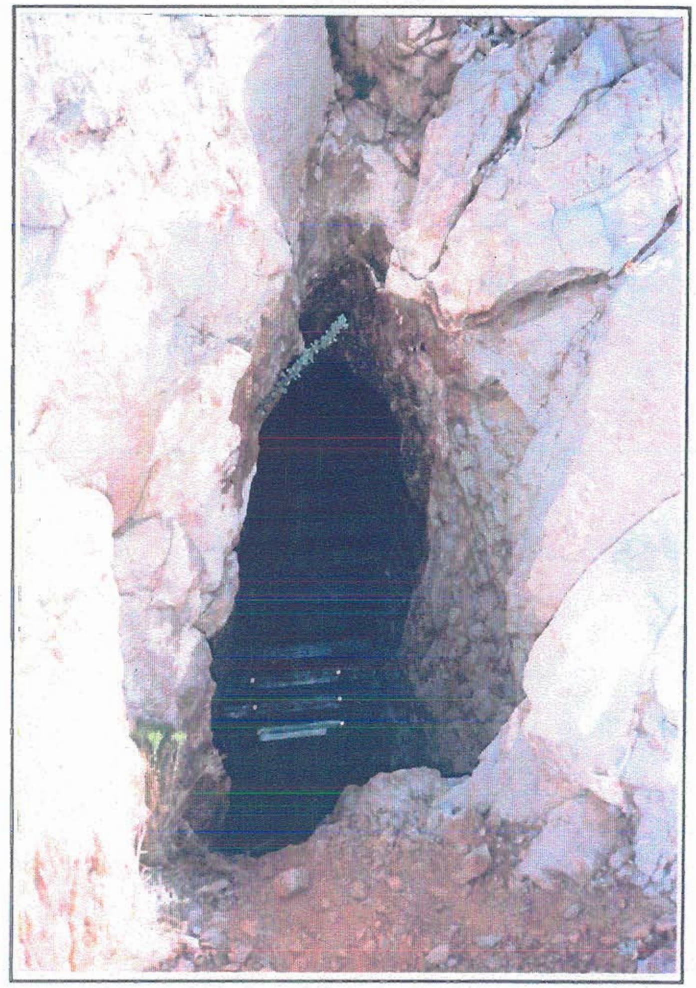
Right: Placing central beam for bat grate; note safety belts and lines on workers

BAT GRATE AT THE FEATURE 99 ADIT

Below Left: Open adit before construction

Below Right: Nearly completed bat grate

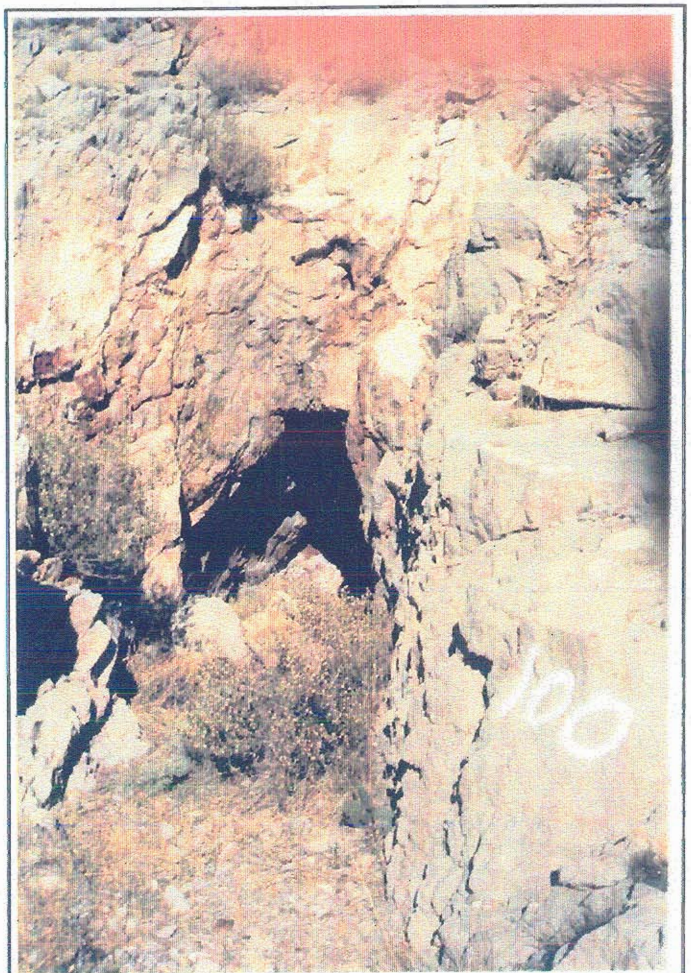


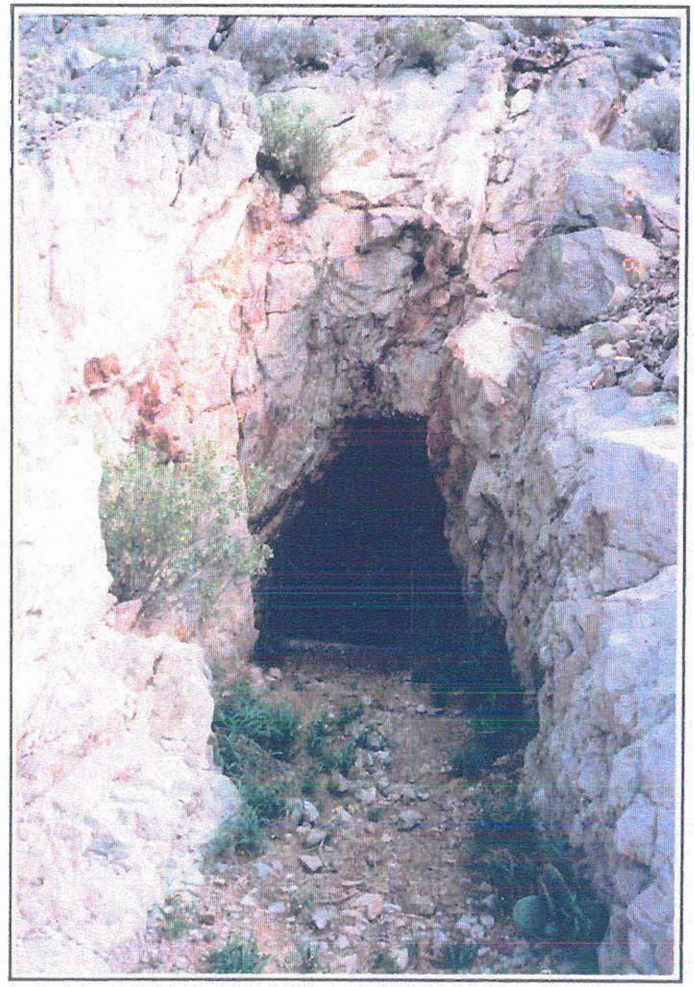


BAT GRATE AT THE FEATURE 100 ADIT

Below Left: Open adit before construction

Below Right: Nearly completed bat grate

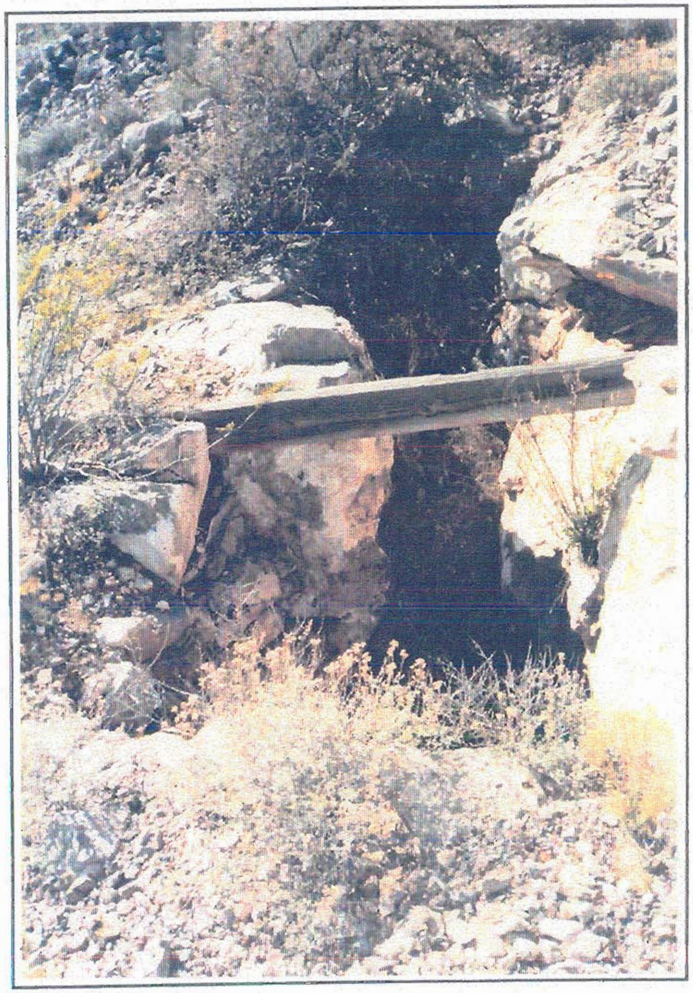




HORIZONTAL BAT GRATE AT THE FEATURE 161 SHAFT

Below: Open shaft before construction

Right: Bat grate under construction

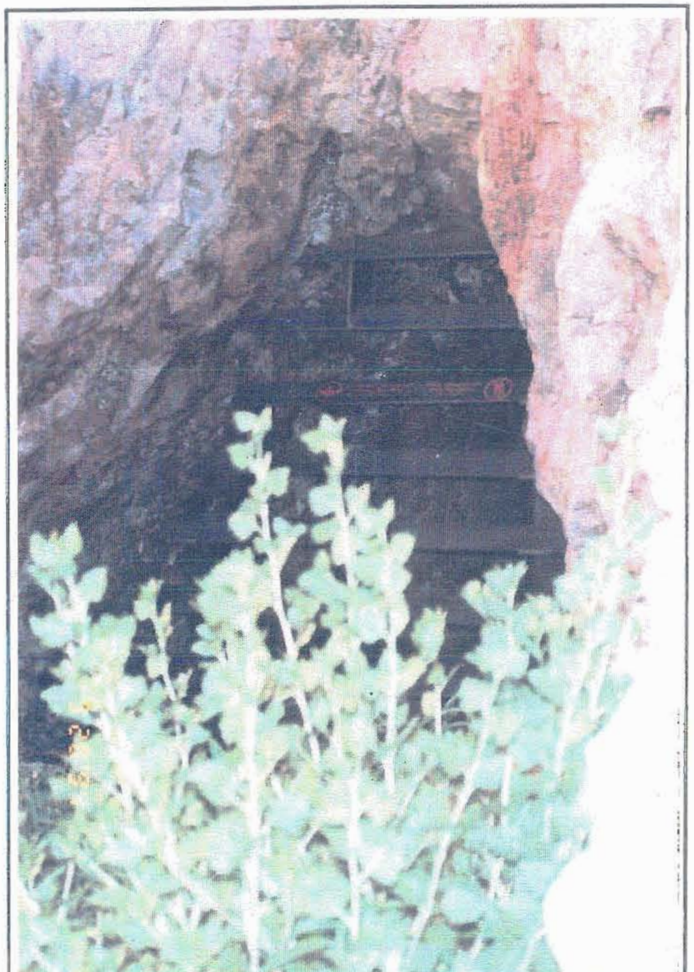


OTHER BAT GRATES

Below: Completed bat grate in Feature 100 Adit, note warning sign on crossbar

Upper Right: Horizontal bat grate under construction in Feature 97 Shaft

Lower Right: Nearly complete bat grate in Feature 149 Adit



CABLE NET CLOSURES

Below Left: Cable net at Feature 117 stope

Below Right: Cable net at Feature 118 stope, note framed bat windows