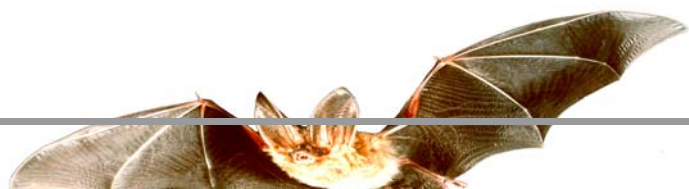


Socorro West



~New Mexico~
Mine Safeguard Project



SOCORRO WEST MINE SAFEGUARD PROJECT

Socorro, New Mexico

Date Submitted: January 21, 1999

This Project successfully eliminated and safeguarded twenty four (24) abandoned underground mine shafts, adits, and stope openings while preserving highly significant bat habitat in the mine workings. Construction was begun on March 14, 1996 and completed by July 11, 1996 at a final construction cost of \$109,163.54.

The following persons and organizations worked on completing the project:

❖ Abandoned Mine Land Bureau
Mining & Minerals Division
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Santa Fe, New Mexico 87505
(505) 827-5970

2 Program Manager/
Submitter of Nomination: Robert M. Evetts
(505) 827-5981

2 Project Engineer: John A. Kretzmann
2 Environmental Coordinator: Homer E. Milford
2 Reclamation Specialist/
Project Manager: Randall Armijo

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Albuquerque, New Mexico 87131
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2 Professor/Bat Biologist: J. Scott Altenbach

❖ Triple L. Constructors
P.O. Box 1079
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2 Construction Contractor: Leon Risenhoover

NARRATIVE DESCRIPTION

With the development of the atomic and hydrogen bombs and the subsequent Soviet acquisition of this top-secret technology, the 1950s and 60s were a time of uncertainty and fear. As part of its efforts to assure the survival of the United States in case of war, the federal government initiated the Strategic Stockpile Program in 1951. This program and its successor, the Carload-lot Program, were designed to secure stockpiles of strategic ores in various parts of the country. They were ended in late 1959 by presidential decree.

Manganese is a metal of high value in weapons production, used for hardening steel alloys. Shortly after the strategic stockpile program started, manganese mining began at several locations in New Mexico, including the Nancy and Black Canyon Mines southwest of Socorro. Although some manganese mining occurred in the district during World War I, production ceased until the early 1950s. Mining began at the Nancy and Black Canyon Mines in 1954 and continued into the 1960s. Little did the miners and government planners realize that in trying to assure the survival of their country that they were also creating significant bat habitat near Socorro. This habitat may help, in turn, to secure the survival of at least one bat species.

In 1992, the New Mexico Abandoned Mine Land Bureau began to inventory the mine sites and noticed signs of significant bat use of the mine workings, including guano at many location on several drift levels. Dr. J. Scott Altenbach, biologist from the University of New Mexico, found the largest recorded hibernating population of Townsend's big-eared bats (*Corynorhinus townsendii*), a species in decline, in the Black Canyon mine. Another portion of that mine contained a summer maternity for the species. During the winter of 1992-93, vandals set the mine on fire. Carbon monoxide, carbon dioxide, and fire killed many hibernating bats. The one drift level accessible shortly after the fire contained the corpses of forty big-eared bats. Carbon monoxide levels remained elevated in the mine for several years after the fire, as collapsed timbers continued to smolder.

The Nancy Mine is also an important big-eared bat hibernaculum. In the winter of 1993-94, in a particularly suitable section where three drifts interconnected, the Bureau counted 68 individuals in a hundred feet of drift. The Bureau has not estimated the total number of individuals using the two mines, but it had to be in the hundreds. In the winter 1994-95 vandals unsuccessfully attempted to set the Nancy Mine on fire.

NARRATIVE DESCRIPTION

The project is within the north-to south trending Chupadera Mountains, which form part of the west edge of the Rio Grande valley. Elevations at the site range from 5,500 feet to 6,050 feet. The Bureau of Land Management and the State Land Office manage lands at the mine sites. With public ownership and good rock climbing opportunities in the area, the lands are used for both cattle grazing and recreation.

The AML Bureau decided to safeguard all discovered openings at these mines, consisting of eight shafts, five adits, nine stope openings, one borehole and one partially collapsed adit entry. Because of the important bat habitat, the Bureau designed bat compatible closures at six of the shaft, adit and stope openings, three cable net closures and three grated closures (all of which allow for ventilation of the mine workings). The other openings were not important for maintaining bat habitat and are safeguarded by backfilling and constructing polyurethane foam plugs and reinforced concrete caps.

To reduce the impact on the remaining bat populations, the Bureau limited construction activities at most openings to periods between winter hibernation and summer maternity. In a few places, the equipment, materials, and power to build the closures had to be carried in by hand across the rocky hillsides. Some bat closures have removable, locking crossbars to allow for access by authorized personnel, including Dr. Altenbach, for monitoring the recovery of the bat populations.

At the pre-bid conference, we discovered that vandals had partially filled the Feature 14-stope opening with rock. The Bureau issued an addendum to backfill the remaining opening with rock, rather than to construct the designed polyurethane foam plug. Other minor vandalism occurred during construction, including removal of survey markers from wet concrete and exploding a small piece of concrete out of the concrete cap at Feature 4.

When Triple L Constructors mucked open the Feature 14-stope opening, the original design calling for a polyurethane foam plug closure clearly could not be built. They discovered a previously unknown drift just below the opening in the bedrock surface. The opening however was well suited for a cast-in-place concrete shaft closure, which was constructed on competent bedrock and covered with about five feet of soil.

NARRATIVE DESCRIPTION

During construction while welding the forms for the Feature 4 concrete cap, collapsed timbers in the shaft accidentally caught on fire. Fire fighters from the New Mexico Fire Training Academy in Socorro unsuccessfully tried to extinguish the smoldering timbers. The timbers continued to smolder for another six or more months, but fortunately did not seem to affect the bats.

Because of the high level of vandalism experienced at the site and the high value of the natural resource being protected, the Bureau took special care in its designs to make vandalism more difficult. The bat closures were designed using heavy steel members. Columns were filled with concrete and crossbars reinforced against cutting with internal stiffeners. Access roads to the openings were closed by ripping, constructing earth berms and PVC-coated chain link fencing, and placing large boulders across the access roads. At one location, a bramble barrier consisting of live cactus cuttings was placed at the chain link fence. Cuttings have successfully rooted and are growing to a size to act as a barrier.

The closure methods have weathered attempts at vandalism well. During inspections, AML staff often finds rocks thrown or rolled on the cable net at Feature 17. A few have been too large to remove by hand and remain on the net, but the net remains intact. The masonry wall at the polyurethane foam plug with corrugated steel pipe riser at Feature 18 was torn apart and the pieces thrown into the closure, blocking the opening in the rock. AML staff has since placed rock around the riser piper and no further vandalism has occurred. Fortunately this opening was not an important bat entrance nor was it important for ventilation.

To date all closures, but one, have been successful in safeguarding the dangerous mine openings. Using a torch, vandals cut a removable crossbar at the steel bat closure at Feature 4A, the most accessible of the bat closures. The AML Bureau arranged to shop-fabricate a replacement bar shortly after they detected the breach. No significant settlement of fills has occurred. Concrete and polyurethane foam structures remain intact. The weathering steel on the exposed bat closures and grated closures has rusted to a soft brown color that blends into the landscape. People who visit the site 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. Although not a major objective of the project, native grass and shrub revegetation of the areas disturbed by construction has been highly successful.

NARRATIVE DESCRIPTION

Dr. Altenbach monitors the bat populations in all the features protected for bad habitat. His assessment is that the protection offered by the bat closures and the subsequent reduction in disturbance has lead to dramatically increased populations. See his attached report.



Photo taken by J. Scott Altenbach, Ph. D.



Townsend's Big-eared Bat
Corynorhinus townsendii

A report on the post-gating use of
THE NANCY AND BLACK CANYON MINE COMPLEXES,
SOCORRO WEST

MINE SAFEGUARD PROJECT

These features were visited in November 1997, January 1998, June 1998 and January 1999. A record was made of the hibernating bats present and evidence of any warm season use after the mines were safeguarded with bat-compatible closures.

The hibernating populations of Townsend's big-eared bat, *Corynorhinus townsendii*, have increased steadily since the mine features were protected with bat-compatible closures. In the Nancy Mine, the hibernating population of this species is now in excess of 100 individuals. The pre-gating population had dwindled to fewer than 25. The hibernating population of this species in the Black Canyon Adit and associated underhand stopes is roughly 200 individuals compared to about 75 before the installation of the closures. In addition, both mines are used again by a few hibernating Big brown bats, *Eptesicus fuscus*. Unfortunately the fire that destroyed a large number of hibernating Townsend's big eared bats in the Black Canyon Mine also blocked human access to areas of the mine where this species very likely hibernates as well. Thus the numbers of hibernating individuals could be somewhat higher in this mine feature.

The maternity population of the Fringed myotis, *Myotis thysanodes*, which uses a stope at the end of the North drift system of the Nancy Adit seems stable. This maternity colony cannot be seen without disturbance but the guano pile beneath the roost continues to increase in size and young of the year were seen flying in the Summer of 1998.

The upper adit of the Black Canyon Mine at one time had a significant maternity colony of Townsend's big eared bats. However, the adit was heavily coated with soot from the fire and the human disturbance of the area increased steadily until the time the bat-compatible closures were installed. In the November of 1998, there was a significant accumulation of fresh guano from this species below the old maternity site in this adit. It was also noted that the soot accumulation was apparently falling off of the back and ribs of the adit. Since this species is very sensitive to human disturbance during maternity activity, prudence dictated that no direct observation should be made of the site during the warm season of 1998. However, in January of 1998, I noted a marked increase in the size of this guano pile indicating that the maternity colony has indeed reestablished and is increasing in size.

The recovery of the highly significant bat populations at this abandoned mine site is directly a result of the competent and well designed bat compatible closures applied to the mine openings. Not only were the main adit entrances protected in this way, but the airflow patterns, so vital in determining the suitability of the internal environment for bat use, were maintained by effective closures of other entries into the mine complexes. The New Mexico Abandoned Mine Lands Bureau is to be commended for a superb job in protecting a highly significant bat habitat and ensuring that this species will be safe from catastrophic human disturbance for decades to come.



**PROJECT SUMMARY, INCLUDING APPROXIMATE MINE OPENING
DIMENSIONS AND MINE FILL VOLUME ESTIMATES**

FEATURE NUMBER	MINE OPENING	DIMENSIONS (FT)	VOLUME (CY)	WORK REQUIRED/ COMMENTS
<i>BLACK CANYON MINE</i>				
5	Adit	5'Wx7'H	-	Constructed bat closure with locking removable crossbars (within 45 days of Notice to Proceed); Constructed chain link fence in entry trench
6	Adit	5'Wx6'H	-	Removed timbers in entry trench; Constructed bat closure with locking removable crossbars (CS)*
6A	Shaft	8'x8'	-	Excavated to bedrock around opening; Constructed cable net closure (CS)*
	Borehole		-	Placed polyurethane foam (PUF) a minimum of 3' thick between pipe and borehole (approx. 100' south of F. 6A Shaft); Constructed bramble barrier with chain link fence along access road
7	Stope Opening	±4'x4'	-	Removed timbers and earth; Constructed PUF closure (CS)*
	Adit	5'Wx6'H	-	Constructed bat closure with locking removable crossbars (CS)*
8	Stope Opening	2'Wx3'H	-	Removed timber; Collapsed large overhanging boulder in front of opening to block opening and closed voids around boulder by hand with rocks (CS)*
8A	Stope Opening	5'x7'	-	Removed timbers and rock; Constructed cable net closure (CS)*
9	Stope Opening	6'x7'x17'D	60	Removed fence and timber; Backfilled with riprap to -4' (four feet below surrounding grade) (CS)*
10	Shaft	10'dia.x12'D	60	Backfilled to +2' (two feet above surrounding grade) (CS)*
11	Shaft	7'x9'x23'D	-	Removed timbers and fence; Constructed grated closure with CSP riser in PUF plug (CS)*

*Cold season closure between September 1 and April 30 only.

**Warm season closure between April 1 and October 31 only.

**PROJECT SUMMARY, INCLUDING APPROXIMATE MINE OPENING
DIMENSIONS AND MINE FILL VOLUME ESTIMATES**

FEATURE NUMBER	MINE OPENING	DIMENSIONS (FT)	VOLUME (CY)	WORK REQUIRED/ COMMENTS
<i>Nancy Mine</i>				
4	Shaft	5 'x9'x44'+D	-	Removed steel door and timber embedded in concrete; Constructed concrete cap
4A	Adit	3'Wx7'H	-	Constructed bat closure with locking removable crossbars (within 45 days of Notice to Proceed)
	Collapsed Entry		5	Backfilled
12	Stope Opening	3'x4'x20'+D	-	Mucked open and removed timber lining; Constructed grated closure with CSP riser (WS)**
13	Stope Opening	4'x4'x18'D	-	Mucked open and removed timber lining; construct grated closure with CSP riser (WS)**
14	Stope Opening	2'x3'	-	Backfilled to +2' (WS)**
15	Shaft	8 'x9'x50'D	-	Removed timbers at shaft collar; Constructed closure with CSP) riser in PUF plug (WS)**
16	Shaft	9 'x10'x10'D	40	Backfilled to surface (WS)**
	Shaft	5'x7'x7'D	10	Removed timbers and rock; Backfilled to Surface (WS)**
17	Stope Opening	13'x29'	-	Removed timber cribbing; Constructed cable net closure (WS)**
18	Stope Opening	3'x3 'x7'+D	-	Removed timber cribbing; Constructed bat closure with CSP riser in PUF plug
18A	Vent Shaft	2'x2'	-	Removed timber cribbing; Constructed backfilled concrete cap
19	Adit	3'Wx3'H	4	Backfilled by hand
TOTAL			180	CUBIC YARDS

*Cold season closure between September 1 and April 30 only.

**Warm season closure between April 1 and October 31 only.

Rock outcrops in the Chupadera Mountains with the
Rio Grande Valley in background



BLACK CANYON MINE



Entry trench to the
Feature 5 Adit,
preconstruction;
note that the trench
angles to the right to
the adit entry



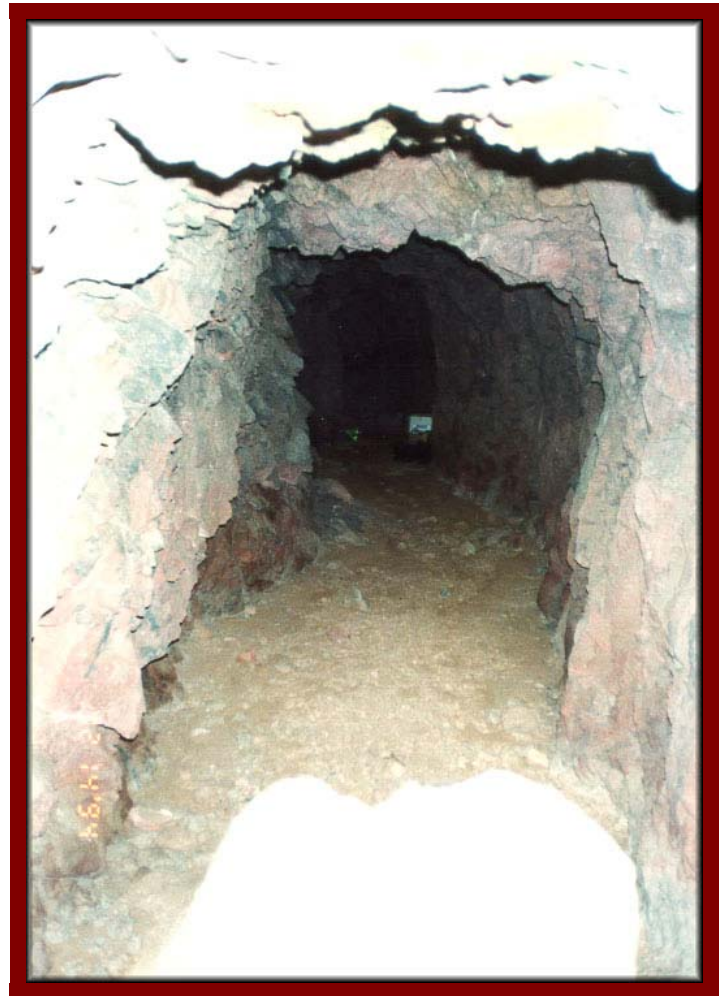
Entry
trench to
the
Feature 5
Adit with
chain link
fence,
completed



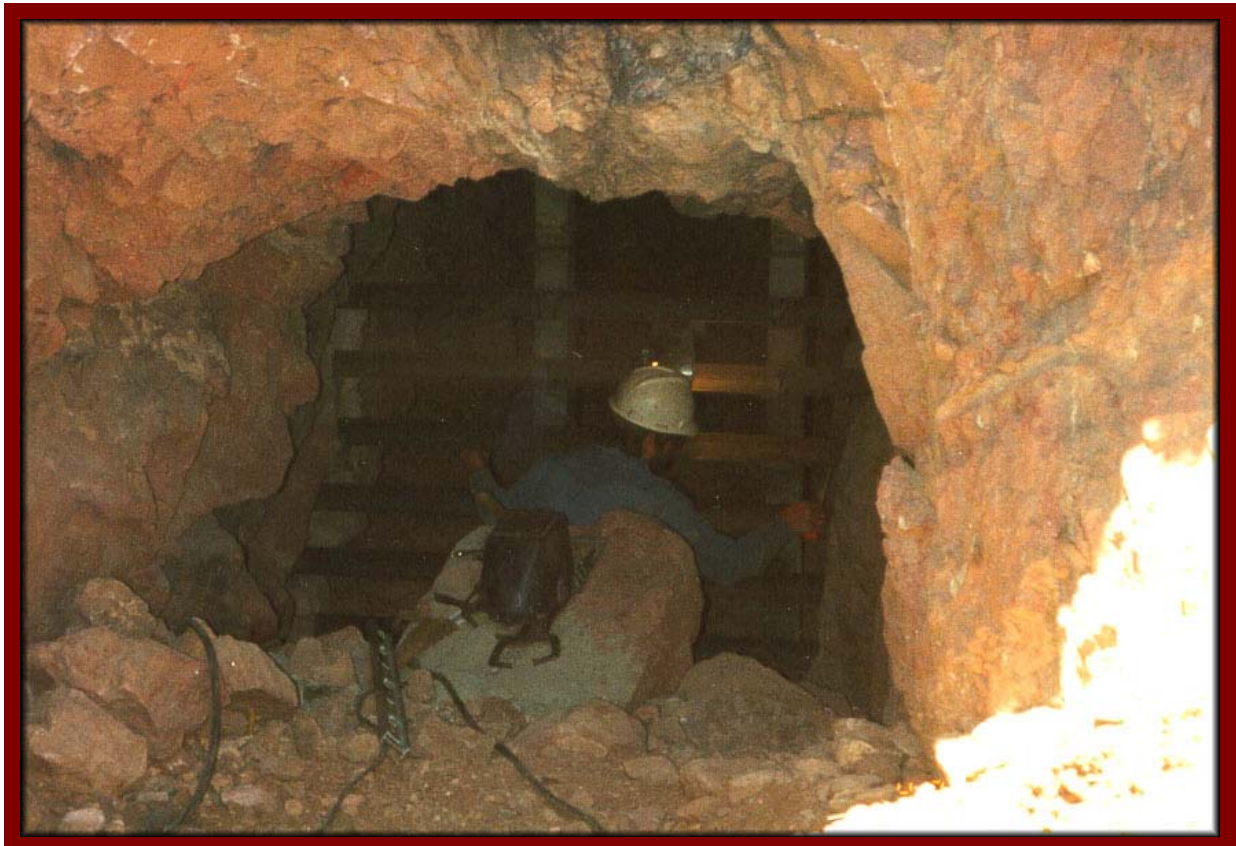


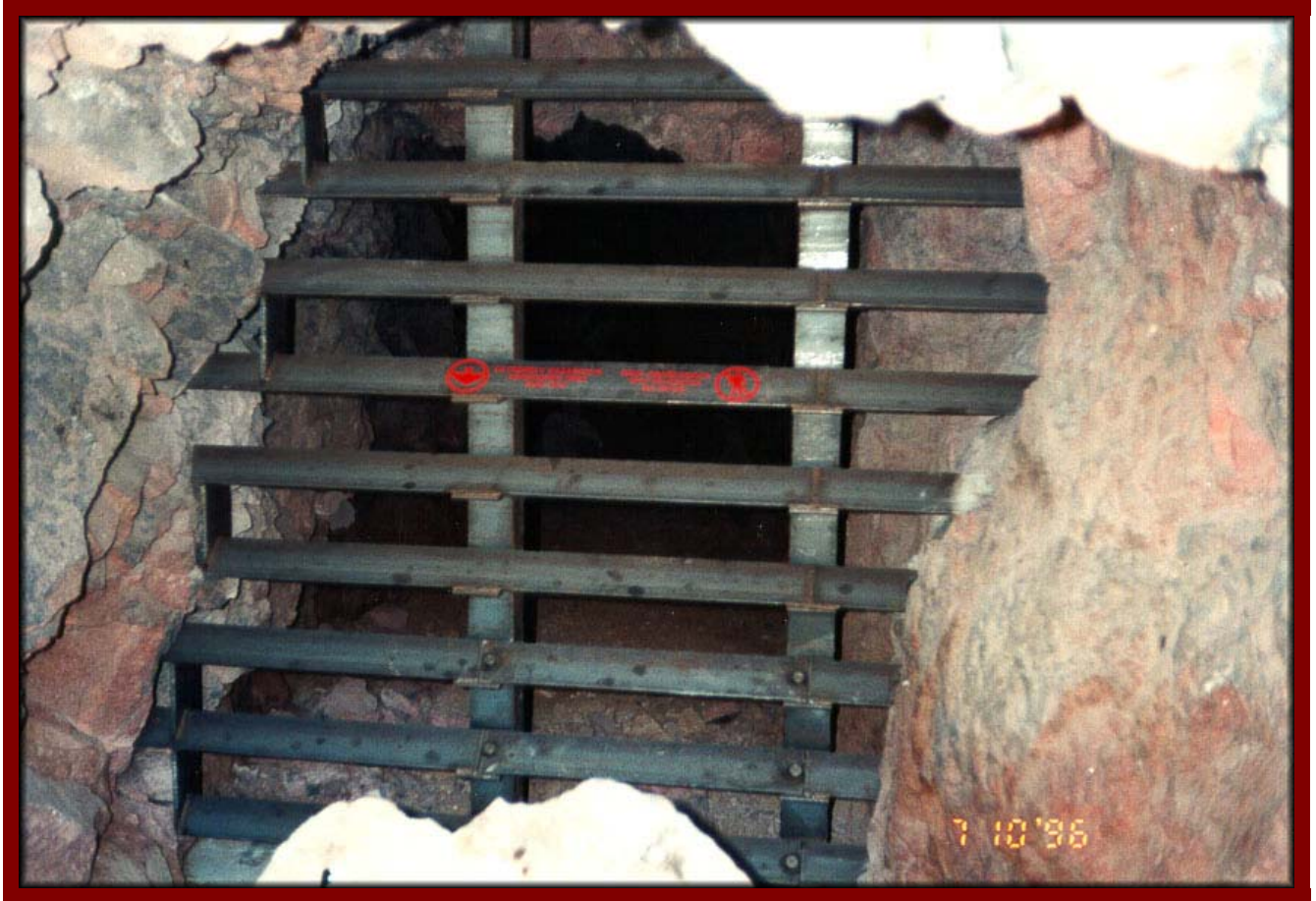
Chain link fence at Feature 1 entry trench, two and a half years after construction

Feature 5 Adit, preconstruction



Bat closure under construction in the
Feature 5 Adit





Completed bat closure in the Feature 5 Adit



Feature 6A Shaft,
preconstruction



Cable net at
Feature 6A Shaft
under construction

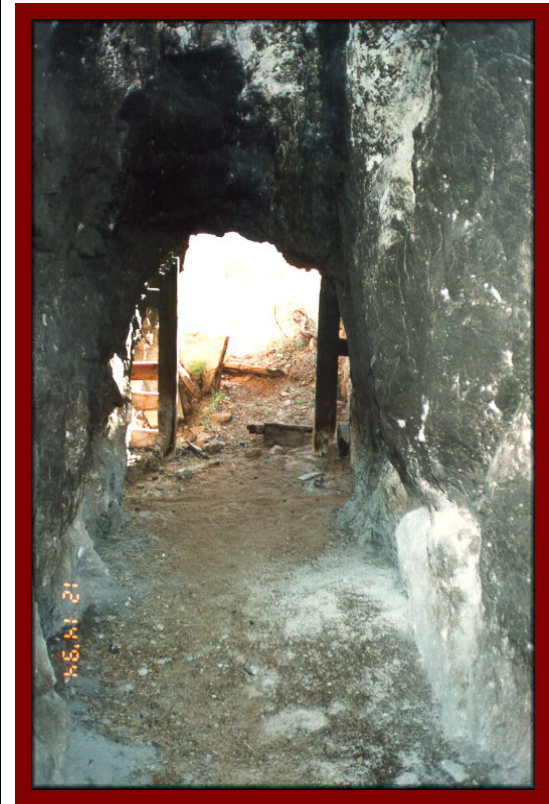


Completed cable net at
Feature 6A Shaft



Completed cable net at
Feature 6A Shaft





Feature 6 Adit, preconstruction



Completed bat closure at the
Feature 6 Adit





Feature 7 Adit,
preconstruction



Feature 7 Adit,
preconstruction



Bat closure under construction
in the Feature 7 Adit



Completed
bat closure
in the
Feature 7
Adit

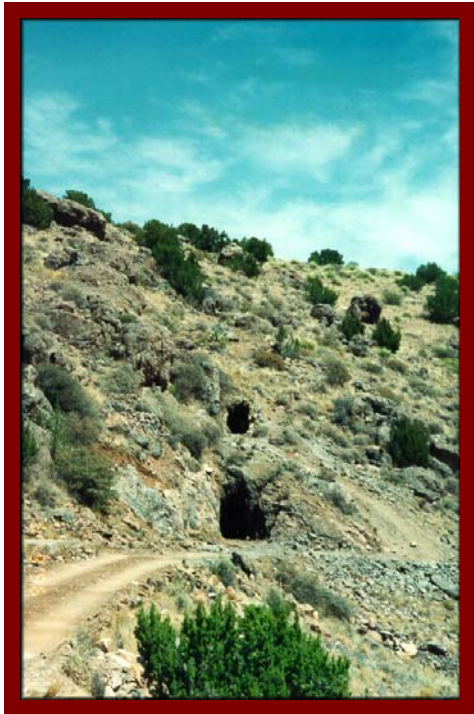




Chain link fence across access road to Features 6A, 6 and 7



Bramble barrier of cactus by chain link two and a half years after construction



Cable net at Feature 6A Shaft (left foreground), Feature 6 Adit (lower of two adit openings), and Feature 7 Adit (upper of two adit openings) during construction



Features 6A, 6 and 7 one year after construction



Construction of cable net at the Feature 8A Open Stope



Completed cable net at the Feature 8A Open Stope



Feature 8 Open
Stope,
preconstruction
(note overhanging
boulder in upper
left)



Moving the
overhanging boulder
with cable and a
come-along to block
the opening at the
Feature 8 Open
Stope





Feature 9 Stope Opening,
preconstruction



Completed rock lined basin
at the Feature 9 Stope
Opening





Feature 11 Shaft, preconstruction

Completed grated closure at the Feature 11 Shaft





Close-up of the grated closure at the Feature 11 Shaft, showing the corrugated steel pipe riser (inside a polyurethane foam plug and masonry collar)

Completed grated closure at the Feature 11 Shaft one year after construction



NANCY MINE



Headframe at the Feature 4 Shaft, preconstruction



Headframe at the Feature 4 Shaft, preconstruction



Headframe and opening at the
Feature 4 Shaft, preconstruction



Opening at the Feature 4
Shaft, preconstruction





Firefighters attempting to put out fire in the Feature 4 Shaft during construction



Collar at the Feature 4 Shaft cleaned and ready for form construction





Constructed form for reinforced concrete slab at the Feature 4 Shaft



Placing concrete at the reinforced concrete slab at the Feature 4 Shaft



Newly
completed
concrete slab
at the
Feature 4
Shaft



Completed concrete slab at the
Feature 4 Shaft





Headframe and closed access road at the Feature 4 Shaft, one year after construction

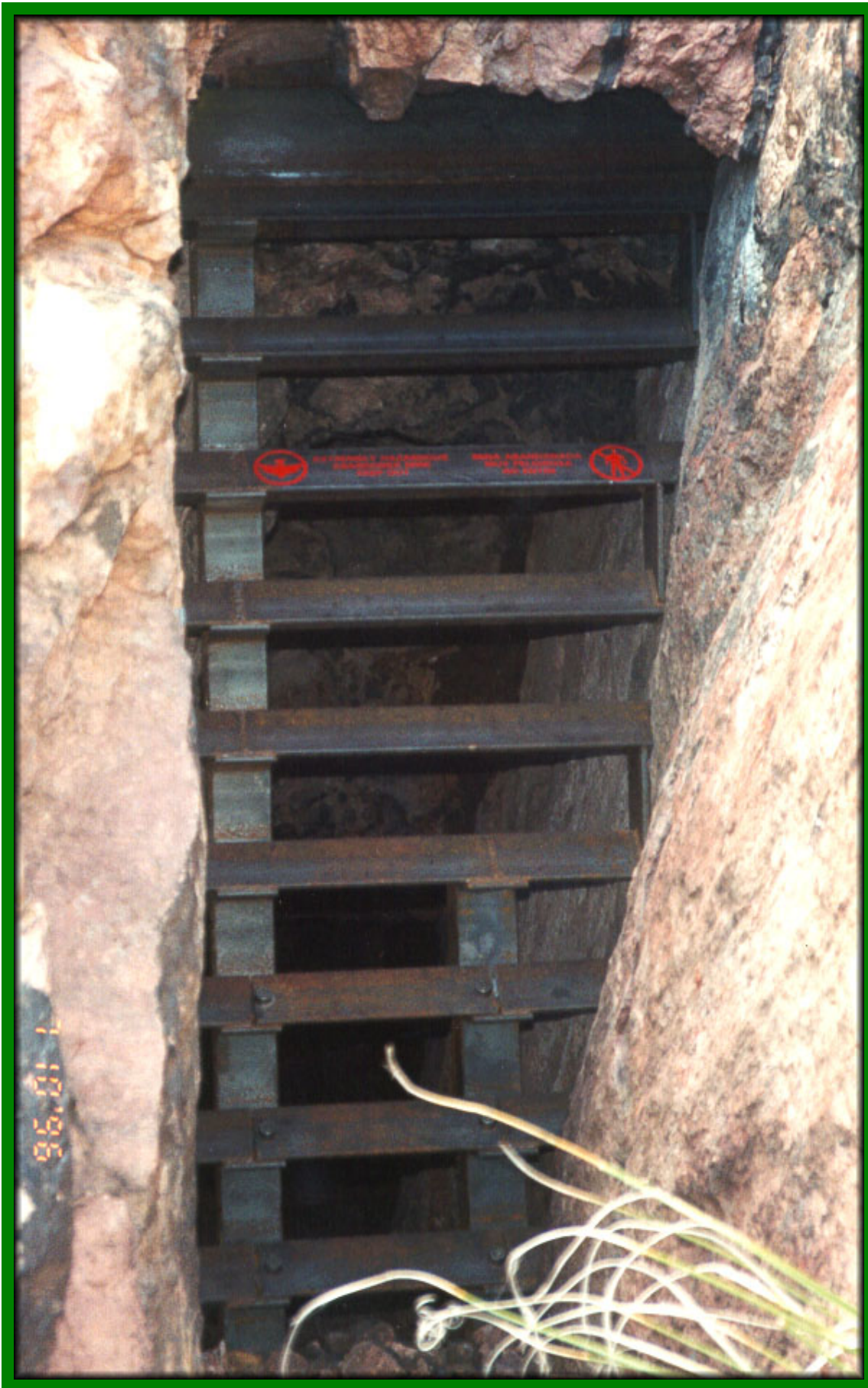


Feature 4A
Adit,
preconstruction



Completed bat
closure at the
Feature 4A Adit





Completed
bat closure
at the
Feature 4A
Adit
(top
removable
crossbar
was
vandalized
and replaced
in 1998)



Feature 19 Adit,
preconstruction



Feature 19 Adit backfilled with rock





Feature 18 Open Stope,
preconstruction



Completed bat
closure with
corrugated
steel pipe riser
in
polyurethane
foam plug (this
feature was
later
vandalized)





Feature 18 bat closure following vandalism, mortarless concrete units replaced with native rock



Feature 18A Vent Shaft, preconstruction



Survey marker at the backfilled concrete cap at the Feature 18A Vent Shaft, one year after construction



The Tower Mine open trench which overlies the Nancy Mine; Features 12 through 17 are located in the base of the trench



Feature 12 Open Stope, preconstruction

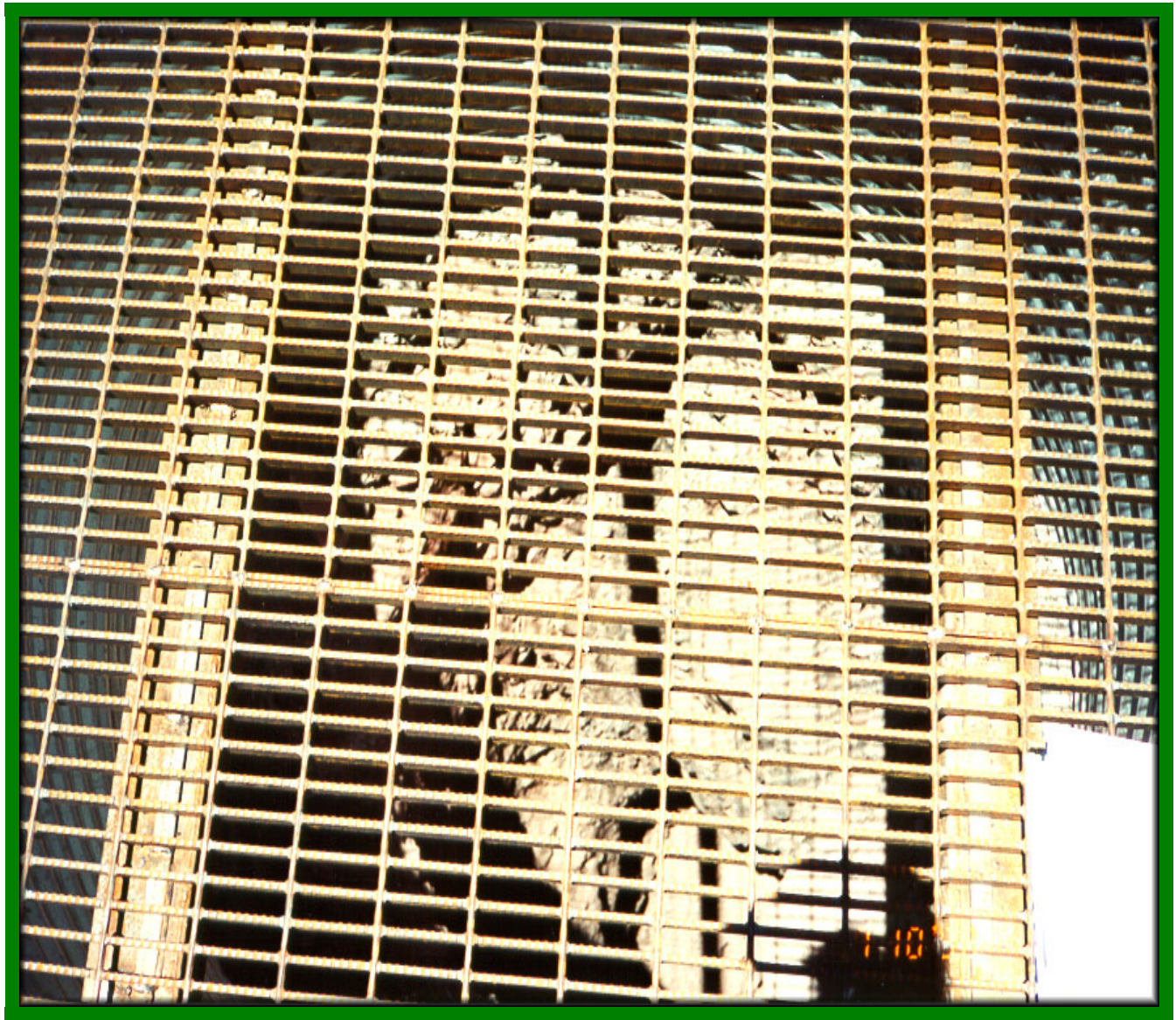


96-inch diameter corrugated steel riser in place and backfilled at the Feature 12 Open Stope



Completed grated closure with corrugated steel pipe riser at the Feature 12 Open Stope





Completed grated closure at the Feature 12 Open Stope; note the corrugated steel pipe riser on rock around the stope opening



Feature 13 Open Stope,
preconstruction



C completed grated closure with corrugated steel pipe riser at the Feature 13 Open Stope

Feature 14 Open
Stope,
preconstruction



Backfilled Feature 14 Open
Stope; note survey cap
grouted into rock face





Feature 15 Shaft, preconstruction

Feature 15 Shaft, preconstruction





Corrugated
steel pipe
riser and
polyurethane
foam plug in
place at the
Feature 15
Shaft



Completed
bat closure
with
corrugated
steel pipe
riser at the
Feature 15
Shaft



Completed bat closure
at the Feature 15
Shaft; note the
cable net at the
Feature 17 Open Stope
in left background





Feature 17 Open Stope,
preconstruction



Completed cable net at the Feature
17 Open Stope





Completed cable net at the Feature 17 Open Stope, in middle of photo



Rocks placed to block access road to the Feature 15 Shaft

