



## **CONTACT INFORMATION**

Mining Records Curator  
Arizona Geological Survey  
1520 West Adams St.  
Phoenix, AZ 85007  
602-771-1601  
<http://www.azgs.az.gov>  
[inquiries@azgs.az.gov](mailto:inquiries@azgs.az.gov)

The following file is part of the

Arizona Department of Mines and Mineral Resources Mining Collection

## **ACCESS STATEMENT**

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

## **CONSTRAINTS STATEMENT**

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

## **QUALITY STATEMENT**

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

PRINTED: 04-15-2010

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: RAY MINE

ALTERNATE NAMES:

RAY CONSOLIDATED COPPER CO.  
PEARL HANDLE PIT  
TILLMAN PROPERTY  
CALUMET MINE  
RAY HERCULES  
WALL TUNGSTEN CLAIMS  
ARIZONA RAY  
ARIZONA HERCULES  
RAY SOUTHERN  
GREAT RAY COPPER CO.  
RAY BROKEN HILL  
COPPER BUTTE  
CANANEA COPPER CO.  
CAMPBELL INTERNATIONAL  
CITADENA GROUP  
SONORA COPPER CORP.  
PALA VERDE GROUP  
ARIZONA BUTTE PROP.  
ALMA GROUP  
KENNECOTT RAY MINE DIVISION  
RAY MILL  
ASARCO RAY MINE

PINAL COUNTY MILS NUMBER: 142A

LOCATION: TOWNSHIP 3 S RANGE 13 E SECTION 10 QUARTER ALL  
LATITUDE: N 33DEG 11MIN 00SEC LONGITUDE: W 110DEG 59MIN 30SEC  
TOPO MAP NAME: HOT TAMALES PEAK - 7.5 MIN

CURRENT STATUS: PRODUCER

COMMODITY:

COPPER SULFIDE  
COPPER OXIDE  
MOLYBDENUM  
GOLD  
SILVER

CONTINUED ON NEXT PAGE

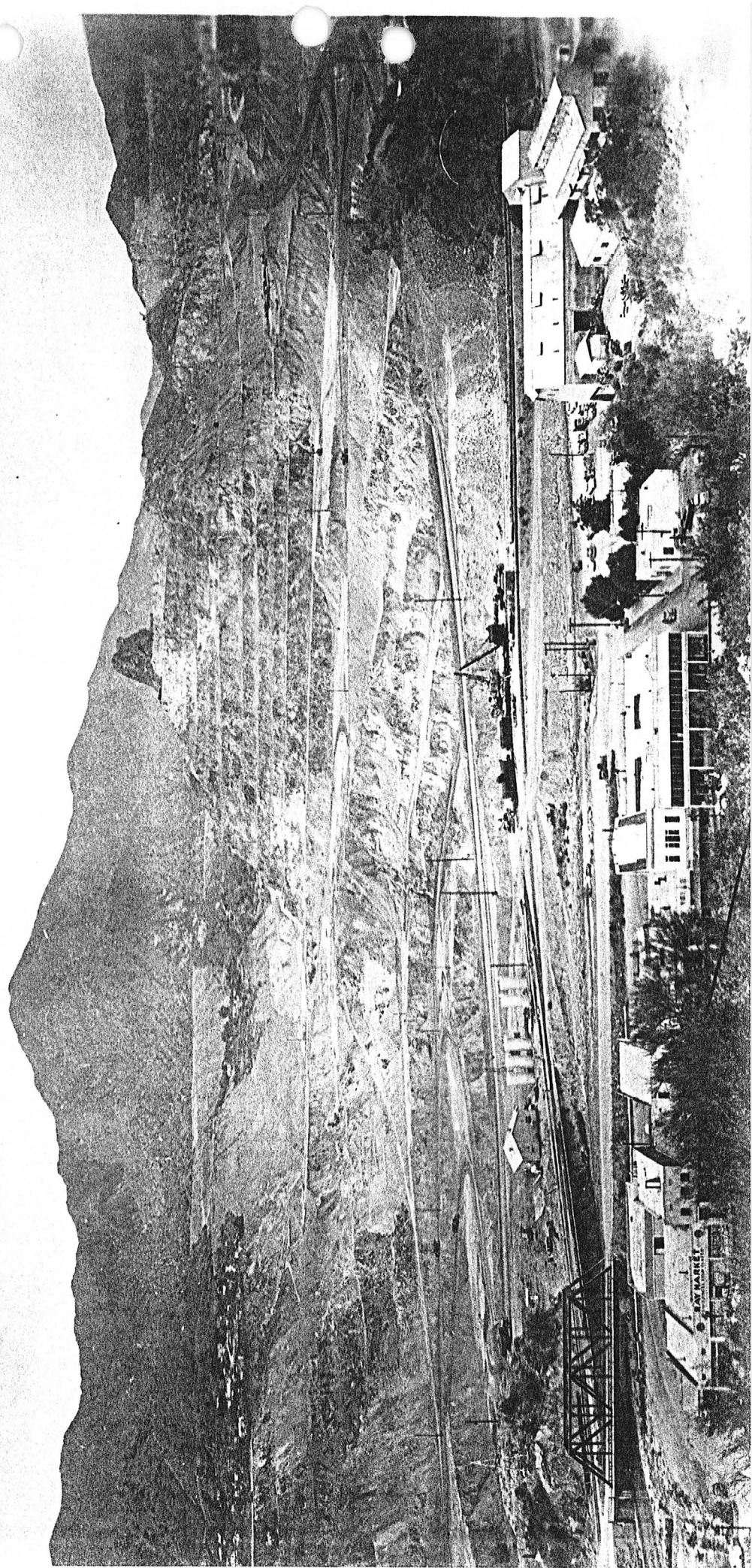


CONTINUATION OF RAY MINE

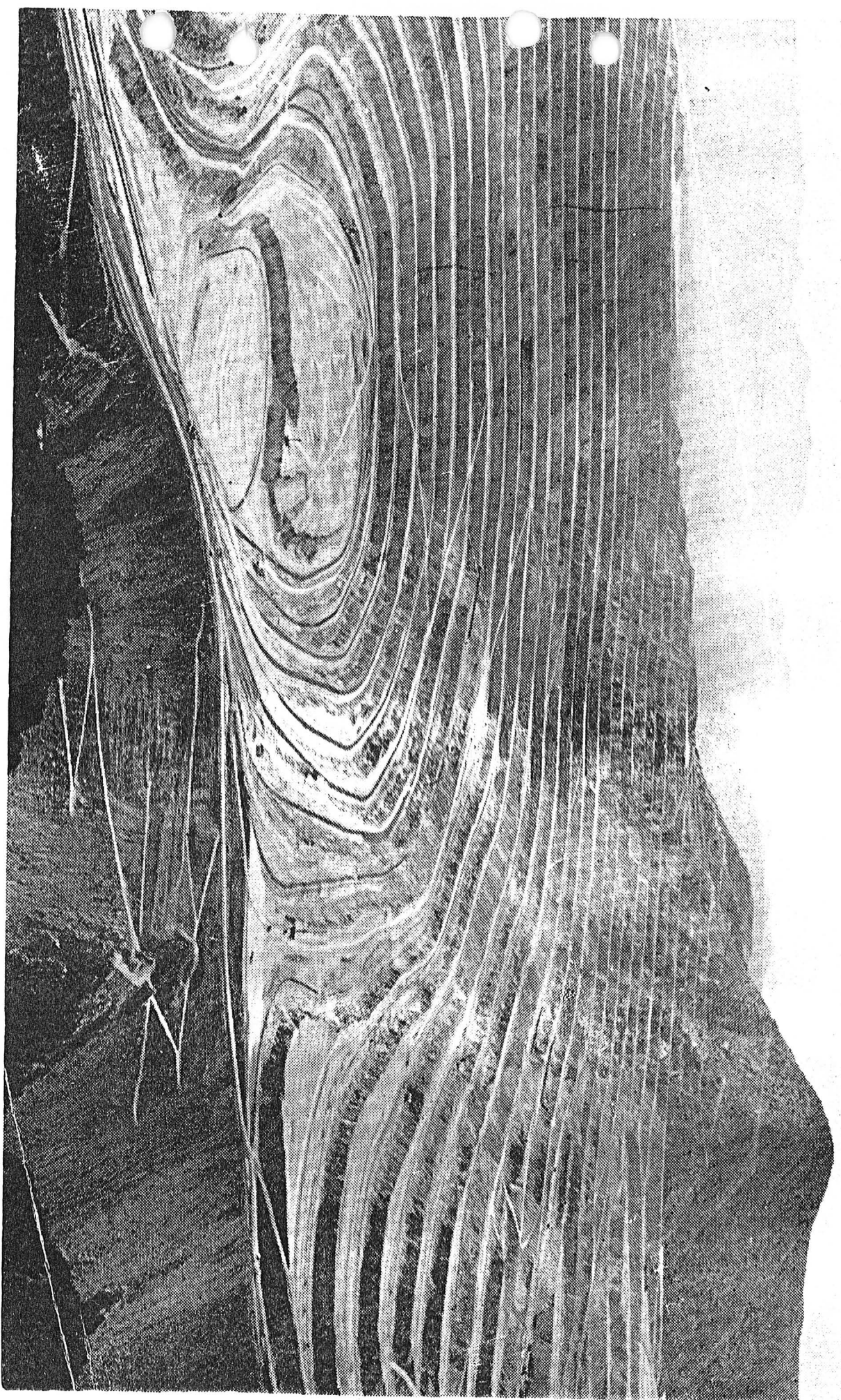
BIBLIOGRAPHY:

ADMMR RAY MINE FILE  
BLM MINING DISTRICT SHEETS 633, 634 & 635  
RANSOME, F.L., THE COPPER DEPOSITS OF RAY  
AND MIAMI AZ, PP 115, 1919  
RANSOME, F.L., RAY FOLIO 1904  
WEED, WALTER MINES HANDBK. 1918, P. 520,  
1924, P. 229  
ADMMR KENNECOTT COMPANY FILE  
AZ GEO. SOCIETY 1994 SPRING FIELD TRIP GUIDE  
AZBM BULL. 180, P. 121  
USGS PROFESSIONAL PAPER #115, P.103

A-174-2

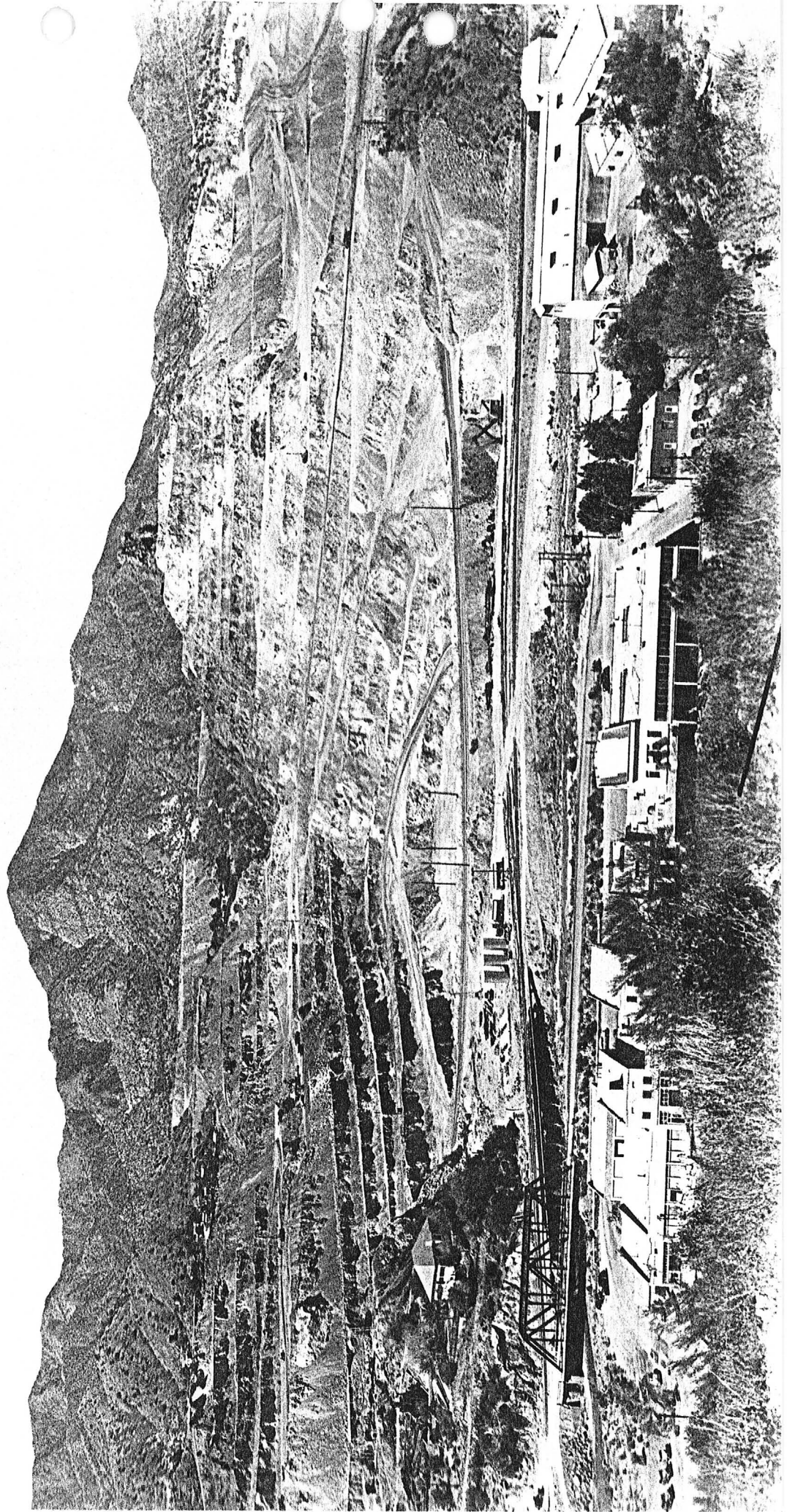




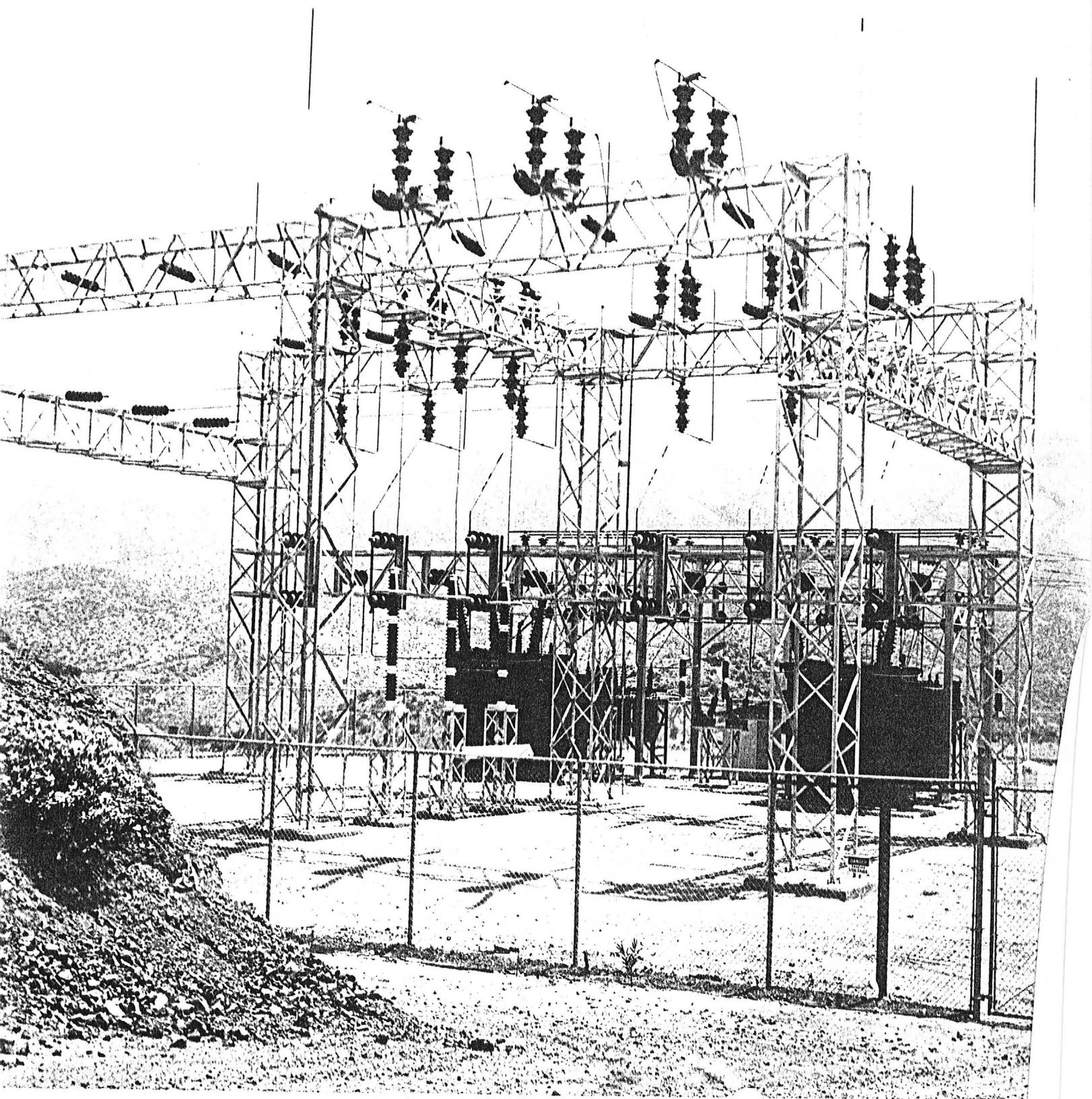


A-174-3



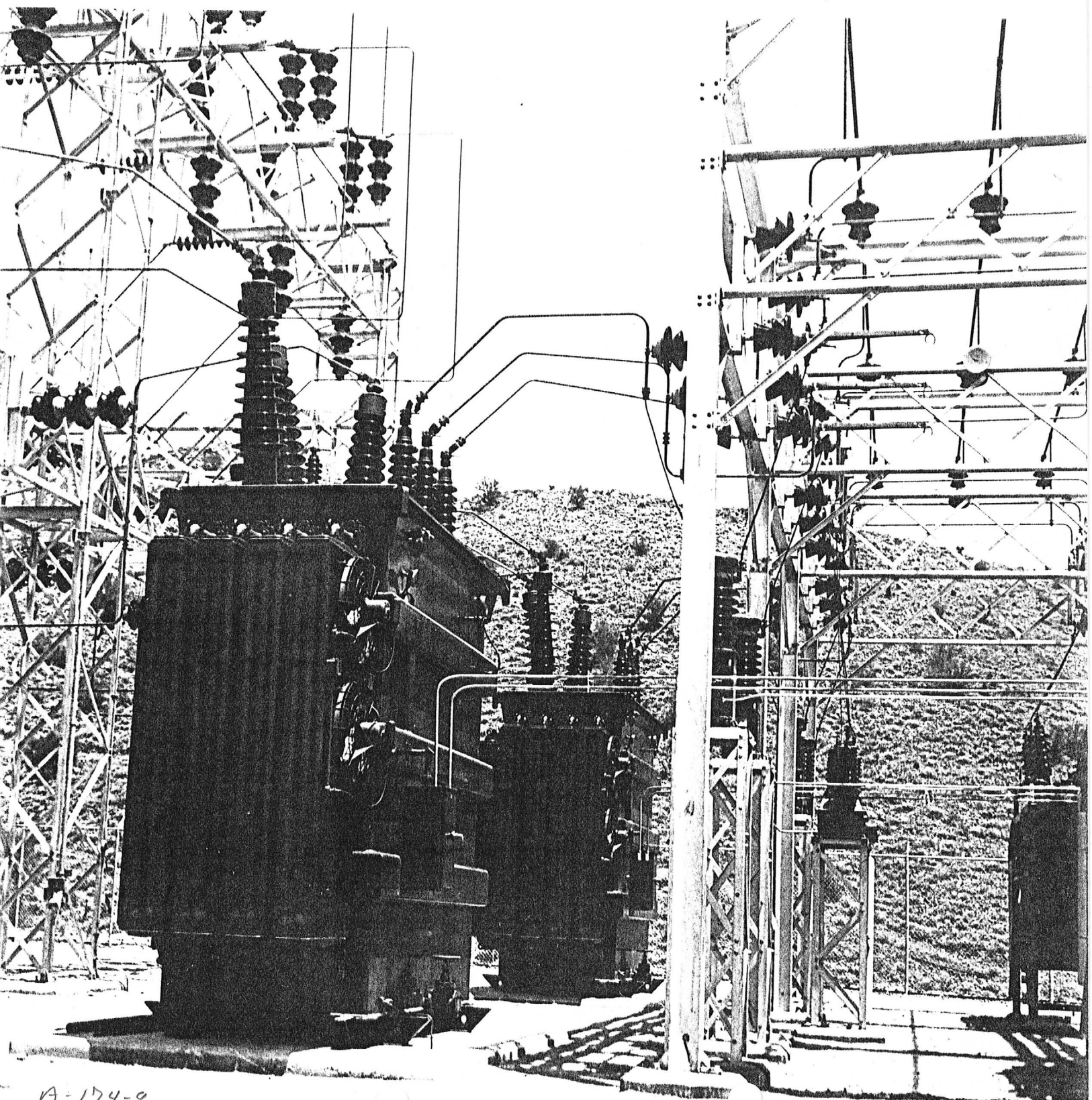


1A-174-1



A-174-10





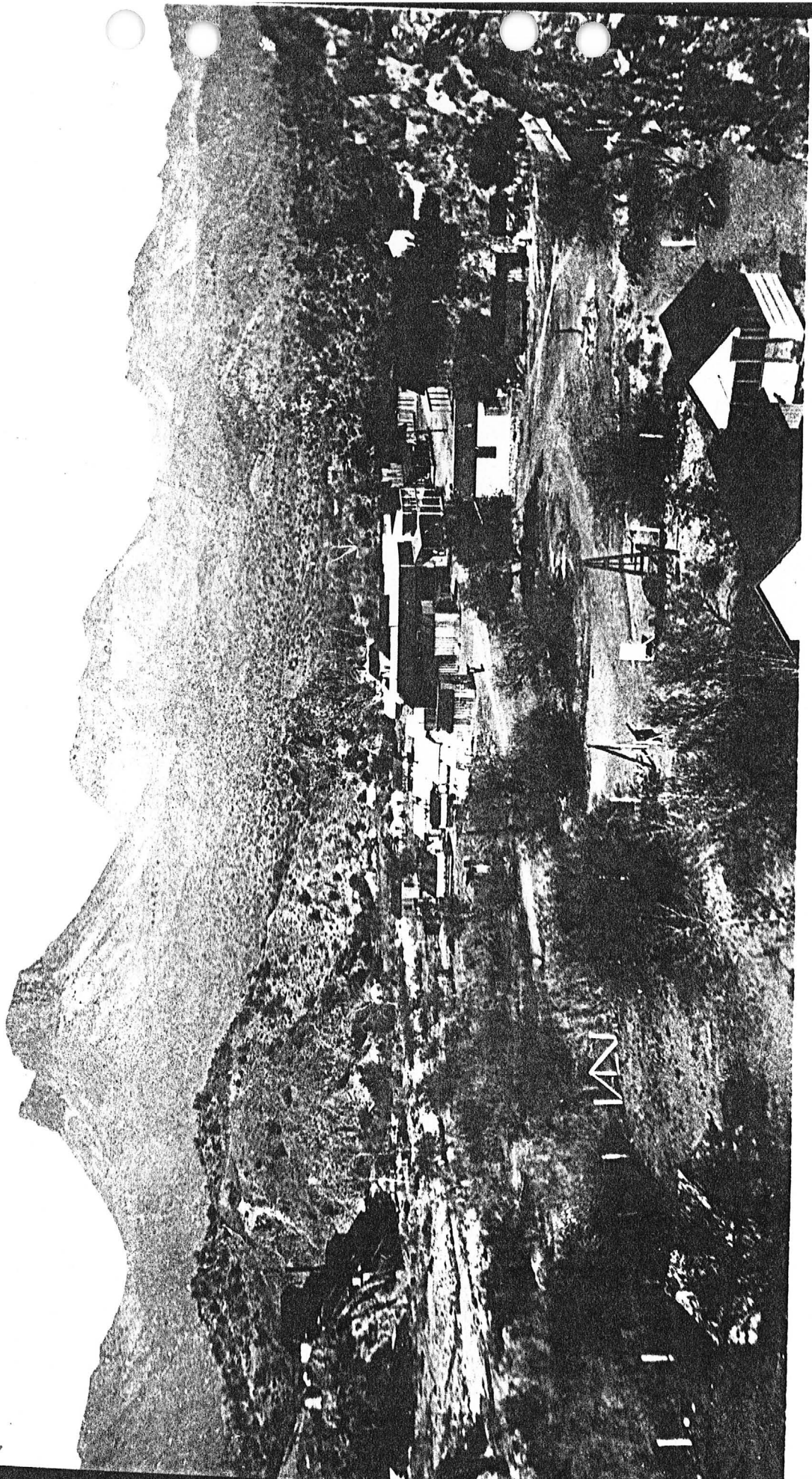
A-174-9

1955

A-174-7

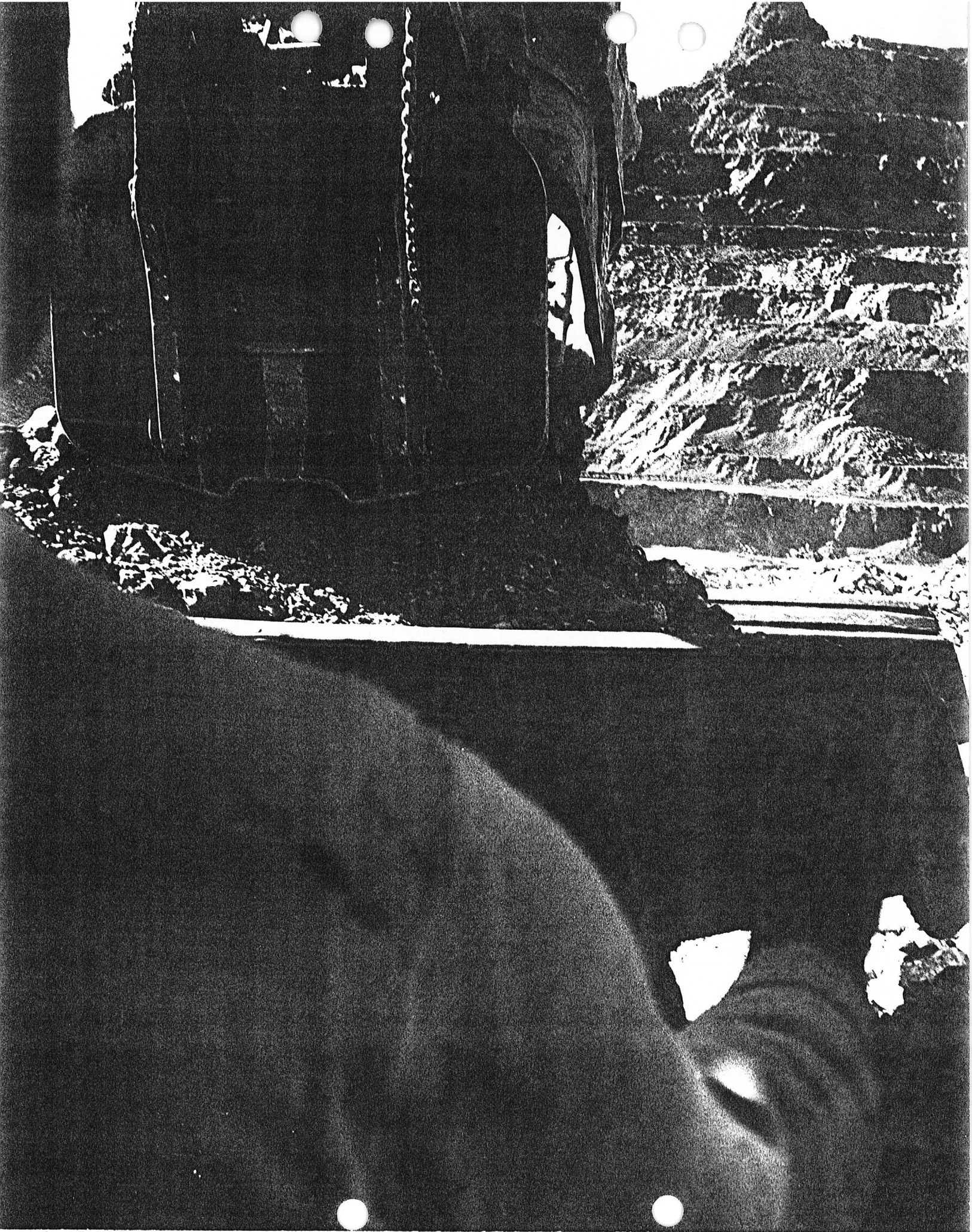






A-174-11





14-174-5





A-174-4





A-174-6 C-1910





1 lb. 1/2 g. 1 1/2 x 2 1/4 x 2 1/4 ✓  
SPECIMEN C-10

M K O 80:  
This specimen now in  
The ADMR Museum

Cabinet

Presented by Nevada Consolidated Copper Co.

Section

Collected by

Shelf

Date received June 25, 1940

Class (principal mineral) Copper

Name of mine or claim Nevada Consolidated Copper Co.

Other minerals

Group

District

Gangue

County Pinal

Depth at which specimen taken

Location (distance and direction by highway  
from what town) at Ray

Approximate mineral content (in terms of  
average per ton)

Quantity

Value \$

Mine active or inactive Active

If inactive, when operated

Owner Nevada Consolidated Copper Co.

Operator Same

Notes: Typical specimens of disseminated copper ore, Ray.

Arizona Department of Mines and Mineral Resources

INFORMATION FROM MINE CARDS IN MUSEUM

USA Az. Pinal Co.  
Hayden

Ray Mine

MM M 207 copper  
M 273 Cuprite  
M 135 Native Copper  
MM N 272 Cuprite  
MM M 091 Cuprite  
M 093 "  
M 975 Chrysocolla

MILS #142 A  
19-AGA  
RAY mine file

ARIZONA

PINAL COUNTY

OPEN-PIT AT RAY MINE

CARD 1

MILS #142 A  
19-AGA  
RAY mine file

MM 1445 Native Copper Precip on Mine  
Timbers  
MM 460 Malachite altering to Chrysocolla  
MM 459 Malachite altering to Chrysocolla  
MM 458 Malachite altering to Chrysocolla  
MM457 Chrysocolla  
MM 456 Chrysocolla  
MM 455 Chrysocolla  
MM 454 Chrysocolla after Cuprite  
MM 5661 Calcite on Chrysocolla  
5662 Mordenite on Chrysocolla  
MM 5663 Calcite Crystals on Chry.  
MM 5664 Calcite with Native Copper Includ.  
MM 5665 Mordenite on Chrysocolla  
5666 Drusy Quartz on Chrysocolla  
MM 5667 Chrysocolla  
MM 5668 Chrysocolla  
MM 5670 Malachite & Chrysocolla  
MM 5671 Malachite & Chrysocolla  
MM 5672 Malachite & Chrysocolla  
MM 5673 Goethite-Turgite  
MM 5674 Malachite on Native Copper  
MM 5675 Pseudomorph of Chry after Selenite

Arizona Department of Mines and Mineral Resources

INFORMATION FROM MINE CARDS IN MUSEUM

ARIZONA

PINAL COUNTY

CARD #2

RAY MINE, NORTH OF HAYDEN, AZ

MILS #142A

MM 544 Cuprite on Native Copper  
& Goethite Massive  
545 Cuprite on Native Copper  
on Matrix  
546 Monzonite: Copper Ore  
547 Diopase  
548 Cuprite on Native Copper  
549 Copper, Native, Lacy  
550 Malachite  
551 Copper, Native  
552 Chrysocolla on Matrix  
553 Cuprite Var. Chalcotrichite  
554 Copper, Native  
555 Copper, Native  
556 Chalcocite  
557 Cuprite  
558 Copper, Native on Matrix

MM-3892 Cuprite on Copper  
MM 3940 Native Copper  
MM 966 Chrysocolla  
Pseudomorph After  
4219 Chrysocolla  
Pseudomorph After  
(Azurite?)  
528 Hematite  
529 Hematite  
530 Hematite  
531 Hematite  
532 Chrysocolla after  
Azurite  
453 Chrysocolla after  
Cuprite  
4856 Mordenite clino-  
ptilolite variety  
with Chrysocolla  
4844 same as above  
462 same as above  
461 same as above  
MM-5351 Mordenite on Chry-  
socolla, Clinoptilolite var  
iet.

ARIZONA

PINAL CO.

Ray Mine, No. of Hayden, Az.

CARD #3

MILS #142A

MM5799 Chrysocolla after Selenite  
MM 5800 Chrysocolla (Stalactitic)  
MM 5809 Malachite after Azurite  
MM6063 Azurite  
MM-6558 Chrysocolla  
6683 Cuprite and native copper  
8516 Copper, native  
8522 Mordenite on chrysocolla  
8523 Selenite on chrysocolla  
8524 Chrysocolla after azurite  
8525 Malachite  
8526 Malachite and chrysocolla  
8527 Quartz on chrysocolla  
8530 Chrysocolla, quartz on  
4165 Pisanite  
5330 Chalcotrichite  
1686 Old style diamond drill bit  
1687 " " " bit blank  
1688 Diamond drill core  
1689 " " "  
1690 " " "  
K080 Copper Ore

Arizona Department of Mines and Mineral Resources

INFORMATION FROM MINE CARDS IN MUSEUM

ARIZONA

PINAL COUNTY

Town of Hayden

Ray Mine

MILLS #142A

CARD #4

MM-5883 Chrysocolla

MM-5903 Druzy Quartz

MM-5904 Chrysocolla

MM-5905 Native Copper

MM-5906 Chrysocolla

MM-5907 Druzy Quartz

MM-6065 Malachite after Azurite (Pseud)

MM-7849 Cuprite

8000 Chrysocolla, pendant

8001 " "

MM 9799 Copper

K377 Chrysocolla replacing Gypsum

MM 9900 Chrysocolla

MM 9987 Cuprite var; chalcotrichite

MM 9988 Libethenite

MM 9989 Cuprite

MM 9990 Diopase

MM K 858 Quartz on chrysocolla

MM K 859 Chrys. on cuprite p/azurite

MM K 946 Native copper

ARIZONA

PINAL COUNTY

TOWN OF HAYDEN

RAY MINE

MILLS #142A

Card # 5

MM K950 Native Copper

MM-L137 Native Copper

MM-L138 Native Copper

MM-L140 Native Copper

MM-L141 Native Copper

MM-L161 Native Copper

MM-L162 Native Copper

MM-L167 Native Copper

MM M 531 Native Copper

M 131 Cuprite

M 464 Copper w/Cuprite



Arizona Department of Mines and Mineral Resources

INFORMATION FROM MINE CARDS IN MUSEUM

USA ARIZONA, PINAL CO

MM M 825 Cuprite

Ray mine

CARD #6

MILS #142A

ARIZONA

MM- 5873 Calcite

PINAL COUNTY

MM M 908 Quattz

Town of Hayden

M

Ray Mine CARD #7

Silica Ore Body

MILS #142A

ARIZONA

MM-5876 Malachite

PINAL COUNTY

Town of Hayden

Ray Mine

Silica Ore Body

1980 Level CARD 8

MILS #142A

ARIZONA

MM-5867 Druzy Quartz

PINAL COUNTY

MM-5868 Chrysocolla

Town of Hayden

MM-5869 Chrysocolla

Ray Mine

MM-5870 Chrysocolla

Silica Ore Body

2220 Level CARD 9

MILS #142A

ARIZONA

MM-5872 Chrysocolla

PINAL COUNTY

MM-5875 Chrysocolla

Town of Hayden

MM-5879 Chrysocolla

Ray Mine

Silica Ore Body

2260 Level CARD 10

MILS #142A

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

INFORMATION FROM MINE CARDS IN MUSEUM

ARIZONA

PINAL COUNTY

Near Ray

Finch mine

Gila county

(London-Arizona)

RAY PIT (see donor card)

MM5778 Microcline Feldspar Xls.

MM5777 Microcline feldspar Xls. in matrix

MM N 141 Mottramite

N 143 "

Group (file)

MILS # 142A

19-AKA's

RAY mine (file)

MILS # 6

12-AKA's



Arizona Department of Mines and Mineral Resources

INFORMATION FROM MINE CARDS IN MUSEUM

Arizona  
Pinal County  
Mineral creek dist.  
Ray Mine CARD 11

MM L 730	Gold, copper
MM M 868	Malachite
M 869	"
MM M 182	Azurite

MILS #142A



## Arizona Department of Mines and Mineral Resources

1502 West Washington, Phoenix, AZ 85007 Phone (602) 255-3795  
1-800-446-4259 in Arizona FAX (602) 255-3777 www.admmr.state.az.us

### Verbal Information Summary

**Mine:** Ray Mine

**County:** Pinal

**Location:** T3S, R13E, Sec. 10 and others

**Date:** June 1, 2002

**Engineer:** Nyal Niemuth

### SME Spring Field Trip Hydrometallurgical Division – Ray Mine

#### Daryl Mathern –Introduction and History (and from Asarco's website)

1846	From Army Records area named Mineral Creek
1880	Mineral Creek Mining Company
1883	Ray Copper Company
1898	Globe Mines Exploration Co., Ltd.
1899	25 TPD mill, Town of Kelvin founded
1899	Ray Copper Mines, Ltd.
1906	Gila & Ray Copper Companies
1910	35 million tons @ 2% Cu blocked out
1910	Ray Consolidated Copper Company
1911	Underground Mine
1927	Nevada Consolidated Copper Company
1929	46.6 million tons @ 1.62% Cu reserves
1933	Kennecott Copper Corporation, Ray Mines Division
1948	Stripping Began
1952	Open-Pit Mine Began
1955	Underground Mine Ceased
1966	Vat leaching begun
1986	Asarco purchased the Ray unit from Kennecott/
1989	Hayden Concentrator modernization
1991	Ray Complex formed
1992	Ray Concentrator commissioned; expansion of Ray mine completed
1996	Hayden Concentrator modernization
1998	Ferric cure leaching commenced
1999	Ray secondary crusher commissioned, Tankhouse renovation completed

#### Neil \_\_\_\_\_? Leaching Operations

Oxide is primarily from the east side of the pit, West side is mostly secondary sulfides. Concentrate is 27% copper. The leaching operation uses all the acid from the smelter. The Ray oxide ore body is 180 million tons.

The mine leached the cave ground in the 1930's thru the launder plant. The caved areas were leached until 1987. The leach precipitation float plant at Hayden was used during 1950-60 to process oxide ore "in the way" of sulfide ore. Vat leach in 1968, agitation leach in 1976-82. Reopened in 1985 with

crushed leach thin layer. The acid cure process is used at present. It is more economic and provides higher capacity.

In 2001 average recovery was 74% from oxide ore with an average grade of 0.3%. The leach operation avoids high acid consuming materials. Typical acid use is 60 lbs. acid/ton with ore at 35% minus 2" plus 1"; at 80 lb acid/ton a 66% recovery achieved. Heaps are 15' thick, but only for 7.5' thick for diabase ore, which is a high acid consumer. The standard leach area is 250' by 500'. Acid is applied with senniger (sp?) wobblers. Ore heaps are ripped before over dumping. It takes 2.5 minutes to load a 240 ton truck, Ray uses a fleet of 40 trucks.

0.007 gpm/cu ft is the application rate. Cure is 2-6 days, 3 day rest, then 23 day rinse. 200 gr/ltr acid solution is used. In 30 days achieves 66% recovery, will get another 6-7% recovery when next lift is added. 1.5-2.0 Ph raffinate is rinse solution. Acid makes lot of gypsum so wobblers rather than drip emiffers are used to avoid plugging.

#### **SX-EW by \_\_\_\_\_**

A 48 gr/ltr solution goes to the EW plant. The SX plant designed in 1981. Two trains each with 4 mixer settlers. 4500 gpm inorganic, 3000 gpm aqueous. The settler flow rate is 2.25 gpm. Use unusual mixers tottry and reduce entrainment. The plant can be run in series or parallel. Swithover at about 1.9 gpl, 14,000 gpm (series 1+2+1) or 17,000 gpm (parallel 1+1+1+1) maximum flows. Switching takes about 45 minutes.

Online analysis is provided by visible light spectrophotometer by Chemsan that takes online samples. Solution goes into barrels for a wet chemical check, occasionally needs calibration.

Mn control issue. There is unusual metallurgy at Ray with high Mn. Didn't have for the first 10 years of operation. Problem relates to the Fe ratio, Mn enters the PLS thru entrainment Fe keeps in low oxidation state, but if not Mn oxidizes and is carried.  $Mn^{+4}$  and  $Mn^{+7}$  corrodes lead anodes so run kerosene as sacrificial organic rather than the 20 times more expensive carrier. The  $Mn^{+7}$  is vivid purple permanganate. Generally monitor Fe: Mn ratio to maintain 10:1 ratio. Acorga M5397 offers lower Co/Fe selectivity. Maintain stockpile of ferrous sulfate, use it as oxidizes Fe to reduce Mn.

#### **EW by Glenn Allen**

Tankhouse was built in 1968. Filters use anthracite and garnet. Rich EEC 48-50, lean 38-40 gr/ltr, acid at 160 gr/ltr; Co at 110. Current density is 20 amp/sq ft. Current efficiency is 90%. Now using cell blankets with the following benefits: the tank house is cooler and almost acid free,! no more mist balls, reduces use of \$90/gallon mist suppression agent by one third. The blankets have been used for almost one year. The do require washing to remove copper growth, etc. from them about once per week.

Starter sheets copper comes from the refinery in Amarillo. Use automatic machine to make sheets. After 1 day pull sheets and press. In 10 days complete cathodes are pulled. Quality is 99.99 9% Cu, S —2 ppm and Pb 0.85 ppm. The cathode is falls into one of three grades: 1 is normal, 2 when Pb embedded, and 3 has plastic embedded. Cathode is shipped by truck or rail.

#### **Miscellaneous comments.**

No pictures allowed of operation.

150 tons of cathode copper produced per day.

The EPA/Dept. of Justice consent decreee deadline was missed. It is expected to be completed in November and the mine will begin dumping in the new areas right away.

Additional acid used comes from Nacozari Smelter of Grupo Mexico in Mexico.

Arizona Copper Reserves and Resources

Compiled by the  
Arizona Department of Mines and Mineral Resources

Property:

RAY

Operator and/or Owner:

Asarco Inc.  
180 Maiden Lane  
New York, NY 10038  
212-510-2000

Location:

Township 3 S Range 13 E Section 10  
County - Pinal AZMILS - 142A  
Description - 26 miles north of Hayden

Mineralization type and reserve/resource:

Sulfide - 951 Million tons at 0.60% Cu (a)  
Acid Soluble - 177 Million tons at 0.45% ASCu (a)

Sources:

(a) Asarco 10-K 1998.

Comments:

Reserve includes native copper and silicate mineralization. Cuttoff grade lowered to .3% when new Ray mill completed in 1992 which greatly expanded reserves.

07/21/92

ARIZONA COPPER RESERVES

COMPILED BY

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

PROPERTY:

RAY

OPERATOR\OWNER:

Asarco Inc.  
180 Maiden Lane  
New York, NY 10038  
212-510-1810

LOCATION INFORMATION:

TOWNSHIP 3 S RANGE 13 E SECTION 10  
COUNTY - Pinal AZMILS - 142A  
DESCRIPTION - 26 miles north of Hayden

ORE TYPE AND RESERVE INFORMATION:

Sulfide - 609 MILLION TONS AT 0.68% Cu

IN 2nd QUARTER ANNOUNCED 1.1 BT OF .63%.

SOURCES:

Asarco Annual Report 1991, page 33.

COMMENTS:

Includes native copper and silicate

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1992

*Pinal County*

**ASARCO INCORPORATED**

**Tucson Office**

1150 N. 7th Avenue, P.O. Box 5747, Tucson, AZ 85703 - Phone 792-3010.

**Southwestern Mining Department**

General Manager T. E. Scartaccini

Assistant to General Manager D. F. Skidmore

Accounting Manager G. H. Myers

Chief Environmental Engineer P. J. Maley

**Mining Department/Corporate Office**

Assistant to Vice President A. D. Coumides

Chief Geologist S. A. Anzalone

**Mineral Beneficiation Department**

Director D. E. Crowell

Chief Metallurgist T. D. Henderson

**Exploration Department**

Manager, Western U.S.A W. L. Kurtz

Manager, Southwestern US Division J. D. Sell

**Acid Sales Department**

National Sales Manager G. P. Gillen

**Governmental Affairs**

Manager, State Legislative Affairs R. E. Quick

**Safety Department**

Director of Safety - Mining B. G. Brumbaugh

Director of Safety - Smelting R. Maxwell

**Ray Mine & Concentrator** T3S R13E Sec. 10

**Hayden Concentrator & Smelter** T5S R15E Sec. 11

P.O. Box 8, Hayden, AZ 85235 - Phone 356-7811 - Employees: 1403 - Open pit copper mine - Dump leach - Heap leach - Solvent extraction-electrowinning plant - Two concentrators: Ray rated at 30,000 TPD and Hayden rated at 31,000 TPD - Smelter capacity 720,000 TPY and 1600 TPD acid plant.

General Manager B. K. Malone

General Manager K. R. Morano

Manager, Ray Operation R. L. Gagliano

Manager, Hayden Operation D. C. Himmesoete

Mine Manager R. E. Thompson

Smelter Manager Joe Wilhelm

Personnel Administrator Joyce L. Morris

Accounting Manager J. T. O'Neil

Purchasing Agent Bob Henry

SX-EW Manager L. A. Davis

Technical Services Superintendent N. A. Gambell

Ray Concentrator Manager S. A. McGee

Hayden Concentrator Manager G. L. Lubers

Electrical Manager, Ray J. L. Weller



ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1992

Electrical Manager, Hayden	G. T. Coryell
Maintenance Manager, Ray	Bill Pyle
Maintenance Manager, Hayden	Hugh Alexander
Support Manager J. W. Murphy	
Financial Manager	J. T. O'Neal
Human Resources Director	W. E. Burrell
Purchasing Manager	K. C. Newman
Chief Engineer	S. F. Johnson
Safety Director Warren Traweek	
Division Geologist	Edward John

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1991

**ASARCO INCORPORATED**

**Tucson Office**

1150 N. 7th Avenue, P.O. Box 5747, Tucson, AZ 85703 - Phone 792-3010.

**Southwestern Mining Department**

General Manager ..... T.E. Scartaccini

Assistant to General Manager ..... D.F. Skidmore

Accounting Manager ..... G.H. Myers

Chief Environmental Engineer ..... P.J. Maley

**Mining Department/Corporate Office**

Assistant to Vice President ..... A.D. Coumides

Chief Geologist ..... S.A. Anzalone

**Mineral Beneficiation Department**

Director ..... D.E. Crowell

Chief Metallurgist ..... T.D. Henderson

**Exploration Department**

Manager, Western U.S.A. .... W.L. Kurtz

Manager, Southwestern US Division ..... J.D. Sell

**Acid Sales Department**

National Sales Manager ..... G.P. Gillen

**Ray Open Pit Copper Mine T3S R13E Sec. 10**

**Ray Concentrator, Smelter T5S R15E Sec. 11**

P.O. Box 8, Hayden, AZ 85235 - Phone 356-7811 - Employees: 815 - Open pit copper mine - Dump leach - Heap leach - Solvent extraction-electrowinning plant - Concentrator rated at 41,000 TPD - 400,000 TPY smelter - On standby - 900 TPD acid plant - On standby.

General Manager ..... B. K. Malone

Operations Manager ..... Roger L. Gagliano

Director of Environmental Control ..... Bryon Brumbaugh

Human Resources Director ..... Rulon Ellett

Personnel Administrator ..... Joyce L. Morris

Accounting Manager ..... J. T. O'Neil

Purchasing Agent ..... Bob Henry

Technical Services Superintendent ..... N.A. Gambell

Ray Concentrator Superintendent ..... S.A. McGee

Hayden Concentrator Superintendent ..... Gary L. Lubers

Mining Superintendent ..... R.E. Thompson

Mining Engineer ..... S.F. Johnson

Maintenance Superintendent ..... Bill Pyle

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1991

Division Geologist ..... Edward  
John

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1990

**ASARCO INCORPORATED**

**Tucson Office**

1150 N. 7th Avenue, P.O. Box 5747, Tucson, AZ 85703 - Phone 792-3010.  
Southwestern Mining Department

General Manager ..... T.E. Scartaccini  
Assistant to General Manager ..... D.F. Skidmore  
Accounting Manager ..... G.H. Myers  
Chief Environmental Engineer ..... P.J. Maley

**Mining Department/Corporate Office**

Assistant to Vice President ..... A.D. Coumides  
Chief Geologist ..... S.A. Anzalone

**Mineral Beneficiation Department**

Director ..... D.E. Crowell  
Chief Metallurgist ..... T.D. Henderson

**Exploration Department**

Manager, Western U.S.A. .... W.L. Kurtz  
Manager, Southwestern US Division ..... J.D. Sell

**Acid Sales Department**

National Sales Manager ..... G.P. Gillen

**Ray Open Pit Copper Mine** T3S R13E Sec. 10

**Ray Concentrator, Smelter** T5S R15E Sec. 11

P.O. Box 8, Hayden, AZ 85235 - Phone 356-7811 - Employees: 815 - Open  
pit copper mine - Dump leach - Heap leach - Solvent extraction-electrowinning  
plant - Concentrator rated at 41,000 TPD - 400,000 TPY smelter - On  
standby - 900 TPD acid plant - On standby.

General Manager ..... B. K. Malone  
Operations Manager ..... Roger L. Gagliano  
Director of Environmental Control ..... Bryon Brumbaugh  
Human Resources Director ..... Rulon Ellett  
Personnel Administrator ..... Joyce L. Morris  
Accounting Manager ..... J. T. O'Neil  
Purchasing Agent ..... Bob Henry  
Technical Services Superintendent ..... N.A. Gambell  
Ray Concentrator Superintendent ..... S.A. McGee  
Hayden Concentrator Superintendent ..... Gary L. Lubers  
Mining Superintendent ..... R.E. Thompson  
Mining Engineer ..... S.F. Johnson  
Maintenance Superintendent ..... Bill Pyle  
Division Geologist ..... Edward John

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1989

## ASARCO INCORPORATED

### Tucson Office

1150 N. 7th Avenue, P.O. Box 5747, Tucson 85703 - Phone 792-3010.

#### Southwestern Mining Department

General Manager ..... T.E. Scartaccini  
Assistant to General Manager ..... D.F. Skidmore  
Accounting Manager ..... G.H. Myers  
Chief Environmental Engineer ..... P.J. Maley

#### Mining Department/Corporate Office

Assistant to Vice President ..... A.D. Coumides  
Chief Geologist ..... S.A. Anzalone

#### Mineral Beneficiation Department

Director ..... D.E. Crowell  
Chief Metallurgist ..... T.D. Henderson

#### Exploration Department

Manager, Western U.S.A. .... W.L. Kurtz  
Manager, Southwestern US Division ..... J.D. Sell

#### Acid Sales Department

National Sales Manager ..... G.P. Gillen

### Ray Open Pit Copper Mine

T3S R13E Sec. 10

### Ray Concentrator, Smelter, Acid Plant

T5S R15E Sec. 11

P.O. Box 9, Hayden 85235 - Phone 356-7811 - Employees 757 - Open pit copper mine - Dump leach - Heap leach - Solvent extraction-electrowinning plant - Concentrator rated at 41,000 TPD - 400,000 TPY smelter (On Standby) - 900 TPD acid plant (On Standby).

General Manager ..... B. K. Malone  
Operations Manager ..... Roger L. Gagliano  
Director of Safety and Environmental Control ..... Bryon Brumbaugh  
Industrial Relations Director ..... Rulon Ellett  
Personnel Administrator ..... Joyce L. Morris  
Purchasing Agent ..... Bob Henry  
Technical Services Superintendent ..... N.A. Gambell  
Concentrator Superintendent ..... S.A. McGee  
Mining Superintendent ..... R.E. Thompson  
Mining Engineer ..... S.F. Johnson  
Maintenance Superintendent ..... Bill Pyle  
Division Geologist ..... Edward John

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1988

**ASARCO INCORPORATED**

**Tucson Office**

1150 N. 7th Avenue, P.O. Box 5747, Tucson 85703 - Phone 792-3010.

**Southwestern Mining Department**

General Manager ..... T.E. Scartaccini  
Assistant to General Manager ..... D.F. Skidmore  
Accounting Manager ..... G.H. Myers  
Chief Environmental Engineer ..... V.C. Martz

**Mining Department/Corporate Office**

Assistant to Vice President ..... A.D. Coumides  
Chief Geologist ..... S.A. Anzalone

**Mineral Beneficiation Department**

Director ..... D.E. Crowell  
Chief Metallurgist ..... T.D. Henderson

**Exploration Department**

Manager, Western U.S.A. .... W.L. Kurtz  
Manager, Southwestern US Division ..... J.D. Sell

**Acid Sales Department**

National Sales Manager ..... G.P. Gillen

**Ray Unit**

**Open Pit Copper Mine**

T3S R13E Secs.10,11,14 & 15

**Concentrator, Smelter, Acid Plant**

T5S R15E Sec. 11

P.O. Box 9, Hayden 85235 - Phone 356-7811 - Employees 757 - Open pit copper mine - Dump leach-precipitation plant - Heap leach-solvent extraction-electrowinning plant - Concentrator rated at 41,000 TPD - 400,000 TPY smelter (On Standby) - 900 TPD acid plant (On Standby).

General Manager ..... R.W. Banghart  
Operations Manager ..... Roger L. Gagliano  
Director of Safety and Environmental Control ..... Bryon Brumbaugh  
Industrial Relations Director ..... Rulon Ellett  
Personnel Administrator ..... Joyce L. Morris  
Purchasing Agent ..... Bob Henry  
Technical Services Superintendent ..... N.A. Gambell  
Concentrator Superintendent ..... S.A. McGee  
Mining Superintendent ..... R.E. Thompson  
Mining Engineer ..... S.F. Johnson  
Maintenance Superintendent ..... Bill Pyle  
Division Geologist ..... Edward John





# **RAY & GILA VALLEY RAILROAD**

---

# **TIME 14 TABLE**

**Effective Tuesday, February 1, 1921**

**At 12:01 A. M., Mountain Time**

**For the Government and Information of Employees only and not intended for the use of the public.**

**The Company reserves the right to vary from this Time Table.**

**W. S. BOYD,  
Superintendent**



KENNECOTT COPPER CORP.  
(Ray Mines Division)

~~DO NOT REPRODUCE~~ GILA CO.

MG/WR 10/25/79 - Neal Gambell of Kennecott said their expansion of the solvent extraction electrowinning plant is on schedule and should be completed by January 1980. It appears that this may be the largest plant of its kind in the State when it goes into operation. Gambell told me it will use 6,600 gallons of water per minute; in comparison the Twin Buttes plant uses 6,000 gpm.

---

KAP WR 12/27/85: The Ray Mine (file) AKA: Pearl Handle Pit), Pinal County is listed as the 19th largest lead producer in 1984 in Table 6, of the 1984 chapter entitled "Lead" in the U.S. Bureau of Mines Minerals Yearbook for that year. The operator is listed as Kennecott. The source of the lead is listed as copper ore.

---

CJH WR 1/10/86: Canuto Sena, deputy State Mine Inspector (c) reports that Kennecott's Ray Mine has reactivated its SX-EW circuit.

---

KAP WR 10/31/86: The 1985 preprint of the Lead chapter from the US Bureau of Mines' Mineral Yearbook report that the Eisenhower (file) Pima County was the 19th largest producer of lead in the United States in 1985. - ? wlf7

---

~~DO NOT REPRODUCE~~

KENNECOTT COPPER CORPORATION - RAY PIT

PINAL COUNTY

Directory of Mining - August 1971 - 2,100 employees.

---

ABM Bull. 180, p. 236

---

Kennecott, Ray Mines Division, continued driving the 19,000 foot long tunnel in their flood control program along Mineral Creek by diverting water around the open pit mine area. FTJ QR 71-72

---

Ray Mines Division diversion project on Mineral Creek continued. The dam was completed in January. Also their storage tank for controlling their runoff from mining and leaching operation was completed. The water is released after purification or is reused. FTJ QR 3rd  $\frac{1}{4}$  '72

---

Telephone call. Mr. B. H. Gerwin regarding the death of Robert Thomas the former manager of the Ray mine. GWI WR 8/11/72

---

Telephone call. Mr. Jim Maize of Kennecott at Ray regarding Mr. Thomas. GWI WR 8/11/72

---

Ray Mines Division of Kennecott had completed the Mineral Creek Dam and were still driving the diversion tunnel. FTJ 4  $\frac{1}{4}$  '72

---

Active Mine List - October 1972 - Empl. 2100 (1971 figures, 10,277,976 T Ore, 23,242,701 T Waste).

---

KP/WR 11/14/79 - Bob Lilliebridge, Rockwool Industries, reported his firm started shipping slag from the Kennecott Ray Mines Division Smelter at Hayden. The slag is used in the manufacture of mineral wool insulation. Mr. Lilliebridge reported that his firm will be investigating in detail some of the basalt properties sampled in the Spring of 1979 by the Department of Mineral Resources.

---

DO NOT REPRODUCE

Active Mine List Nov. 1967 - 664 men  
- 833 mill

Continued progress on several construction projects has been announced by Kennecott Copper Corp., at Ray Mines Division the construction of facilities to treat material from the recently developed copper silicate orebody is proceeding on schedule. This project, which is expected to be completed late next year will increase annual copper output there by 24,000 tons a year. Taken from Mining Journal Dec. 1967 p. 11

---

The Ray Mines copper precipitation plant under construction in Arizona will use stainless steel precipitation cones, each 24 feet high with a diameter of 10 feet. Skillings Mining Review Feb. 24, 1968 p. 24

---

From: C.L. Hoyt, Field Engineer  
Subject: Visits - April 14 & 15, 1968, Ray, Superior & Florence Jct.

Interview with Harold Bishop, Mine Engineer - Ray

Outside prospecting seems to be at a standstill. Occidental Minerals has completed its drilling program at the old Sultana properties at Kelvin.

Ore production from the pit is back to the scheduled 25,400 tons per day, but stripping is suffering from the manpower shortage following the strike.

Construction at the Silicate plant is now 44% complete. The smelter acid plant is 22% complete.

Interview with Robert Winkle, Pit Superintendent - Ray

About 88% of the former employees returned to work after the strike. The greatest shortage is in mechanics, as many obtained other employment during the shutdown. At the mine there are 255 men working on production and 263 men on maintenance and services.

---

Active Mine List April 1968 - 518 men  
Active Mine List Oct. 1968 - 849 men  
- 807 men

Interview with Mr. Lemmons, Assistant to Mr. Knouse, Comptroller, he said acid plant (sulphuric) expected to be on stream in November. FTJ WR 9-27-68

---

Interview with Ed Schultz in Comptroller's office of Kennecott. Acid plant is completed and will produce about 750 tpd of acid. No exact date given for finishing the leaching facility at Ray, but thought it would be in the near future. FTJ WR 1-31-69

---

Active Mine List April 1969 - 897 men

Visited Kennecott office and Mr. Knouse. No particular information. FTJ WR 9-26-69

---

Active Mine List Oct. 1969 - 1100 men - I.G. Pickering, Gen. Mgr.  
Active Mine List May 1970 - 1152 men      Active Mine List Oct. 1970 - 950 men

RAY PIT

PINAL COUNTY  
MINERAL CREEK DISTRICT

~~DO NOT REPRODUCE~~

A brief visit revealed that operations are now normal and all effects of the wet weather in the early part of the year are gone.

LAS 6-22-66

---

Visit and conference with Kennecott officials.

The present daily rate of mining is 24,000 tons of ore and nearly 50,000 tons of waste (stripping ratio is slightly over 2:1; due to the development of the East Side area). The ore generally assays about 0.85 percent copper. The stripping on the East Side has about 800 feet to go horizontally to the east in order to reach the pit limit, as now projected. Eight benches (40 feet high) have been established of the probable 10 benches. The area will be stripped to an average depth of 400 feet, or from 2000 to 2400 feet in elevation. An active development drill program is going on around the pit, along with some prospect drilling, 2 diamond drills. (Boyles Bros. are doing the work.) According to Joe Roberts of Boyles Bros., the holes range from 1500 feet deep to as much as 3000 feet, but 1500 is average.

The geology department now believes it has a large thrust fault involving the pit area. This as now constituted has pushed over the pit area and has had movement of post-enrichment age. This, even though not surely known, has probably been offset by the main Ray Fault that has had movement of post Gila Conglomerate Age. However, what was originally believed to be highly altered schist in the pit area has now been determined as being, in part, Apache Group (Later Precambrian) with the exception of the Mescal Limestone which is missing. Diabase is also present, intruding apparent Apache (Dripping Spring Quartzite, Scanlan & Baines Conglomerate at least seems to be present. Pioneer Shale was not mentioned.) This may complicate ore control procedures.

LAS 10-19-66

---

Visit 6/21/67

The east area benches are progressing well and production is on an even keel. The equipment has been moved in for construction of the new leaching plant. The new molybdenum recovery plant is operating.

LAS MEMO 6/21/67

---

Mr. Dale E. Collier, Kearny, Arizona, has been promoted to smelter field repair general foreman of Kennecott Copper Corp.'s Ray Mines Division replacing J. B. Holmes who is taking a position with U.S. Bureau of Mines. Harwell E. Cooper, Winkelman has been assigned as planner-estimator to succeed Mr. Collier.

Taken from Skillings Mining Review Sept. 9, 1967 p23

---

Earle V. Dempsey, Hayden, Arizona has been appointed Smelter Operations Superintendent replacing C. K. Vance. (Skillings Min. Review 9/16/67).

---

Edward M. Laczynski, metallurgical engineer, has been named to head the Industrial Engineering Dept at Kennecott's Ray mines Div. effective 9/16/67.

Skillings Min. Rev. 9/23/67 p27



RAY PIT

DO NOT REPRODUCE

PINAL COUNTY  
MINERAL CREEK DIST.

Pit Visit 10/21/64

The Pit is now working a swing shift and has 608 people working. Emphasis appears to be around the old town of Ray and eastward. A waste dump, over a mile long, is now evident, and this extends northward from old Ray along the east side of Mineral Creek. Three or four new benches on the east side of the Pit are taking form. The Pit now has 9 shovels, 4-5 are operating at one time. Production of ore is about 8000-9000 tons per shift.

E. J. Longyear Co., is operating two diamond drill rigs in the Pit area, as exploration units. They start holes with NX bits and change, with depth or rock changes to BX bits.

MEMO LAS 10/21/64

---

Visited engineering and mill office, learned that new additions for MoS recovery will not start until about April.

FTJ WR 1/28/66

---

Conferences with J.P. Winkle, Pit Superintendent

Mr. Winkle stated that very excessive rain and snow had somewhat impaired operations since December, and even ~~the~~now considerable trouble is still being caused by Mineral Creek which is running water. Flooding along its channel ate into the road from the main highway to the new general offices and shops. The old residence area north of the main shaft has largely been razed, the last house being moved out 2-16-66. This area will be completely cleared in a large triangle and will be mainly used for waste disposal. A little ground immediately north of the present pit will be stripped.

Currently equipment consists of 8 electric shovels (3-Marian and 5-P&H) with 6 yard dippers, and 33 haulage trucks, 20 of which normally operate per shift. Due to bad haulage roads at times more trucks per shift were used. Mr. Winkle said that they seldom made bank blasts of over 8 rotary holes. These are drilled by large rotary machines of the Joy Mfg. Company type.

West of the old business section of Ray (now razed) 5 - 40 foot benches have been established to date. These looked to be about 1/2 mile long. Above these several shots indicated that parts of three other benches are underway. Some waste was hauled from this area, as much as 1-1 $\frac{1}{2}$  miles to the north up an unfavorable grade. Other smaller disposal areas had an even greater adverse grade. Waste disposal is an acute problem at present.

LAS MEMO 2-16-66

---

Visited Geo. Sewell, Kennecott Eng. Office. The Moly plant has not been started as yet. Work to be contracted.

FTJ WR 5/27/66

---

DO NOT REPRODUCE

---

Because of a change in the characteristics of the ore now being mined at the Ray open pit, operations of Kennecott Copper Corporation's sponge iron and acid plant at Hayden, Arizona, has been reduced to a five-day work week. It has been estimated that between 30 and 35 percent of the ore to be mined during the balance of the year will not contain sufficient non-sulphide copper to justify operation of the LPF circuit on a full-time basis.

MINING WORLD, August, 1962, p 35

---

Ray Pit  
Mineral Creek District

Pinal County

Interview with Geological Staff, at Ray.

The old business section of the town of Ray is now being torn down to clear the way for the eastward extension of the Ray Pit, Ray Mines Division, Kennecott Copper Corp. This area is now being checked by diamond drills to verify previous drilling results, which in a few cases are questioned. Further drilling continues on the ridge south of the old general office. Recent drilling has shown no new enrichment zoning of consequence below the main enriched area, the values, although deep in some places, is considered to be mainly primary. Some indicated enrichment in the deeper areas was considered to be downward tongues along fractures.

MEMO    LEWIS A. SMITH    5/27/63

---

Ray Pit    Mineral Creek Dist.    Pinal County

The Town of Ray is now razed and stripping has been initiated east of the old town. 3 benches are now started with two shovels. The main pit is now at Mineral Creek near the old General Office. The ridge south of the point is also being cut down with two benches. Test drilling and check-drilling in the vicinity of Ray is progressing.

MEMO - LAS Visit 9/26/63

---

**Overview of Ray Operations**

Summary of presentation by Richard Rhoades, General Manager, Asarco's Ray/Hayden operations to the November Maricopa SME meeting by Nyal Niemuth, Chief Mining Engineer

**History:**

1880	Early Mining
1910	Ray Consolidated Copper Co. – Underground mining
1926	Nevada cConsolidated Copper
1933	Kennecott Copper Corp. – Ray Mine Division
1948	Stripping for Ray Open Pit starts
1952	Ray Open Pit Production
1955	Ray Underground Operations ceased
1986	Asarco purchased Ray Mine Division from Kennecott
1991	Ray Complex formed
	Ray Open Pit Mine
	Hayden Operations Concentrator and Smelter
1992	Ray concentrator built
1998	Consent Decree signed; Mineral Creek Project started
1999	Dam built
1999	Grupo Mexico purchased ASARCO
2005	Asarco LLC filed for Chapter 11 bankruptcy

Review of the EPA consent decree of 1998. Constructed an extension of the diversion tunnel (13,000') that resulted in the clean up of Mineral Creek and allowed for a future leach pile area to be constructed north of pit and below diversion dam.

Re Bankruptcy - Originally there was only one Board member and he was reporting to Grupo Mexico.

Now there are 3 Board members, reporting to the Judge, with 2 from Asarco In July 2005 Joe Lapinsky was appointed as CEO.

A large part of Asarco's bankruptcy proceedings is dealing with the environmental liabilities. To date they have worked through 18 of the 27 sites/issues.

**Reserves as of 01 January 2007**

Type	Tons	TCu	ASCu
Mill Ore	534,840,000	0.586%	0.038%
Leach	227,362,000	0.337 %	0.172%
Dump leach	224,825,000	0.242%	0.019%
Waste	804,000,000		
Total	1.79 billion tons		

Strip ratio 0.82

Employees: Current – 685 total; 137 salaried, 548 hourly,

Forecast – 720 total; 153 salary, 567 hourly

Operations are short technical people – electricians, shovel mechanics. Asarco operates a 4-year apprentice program

**Mine Flow Sheet**

247, 778 TPD total - Ray mill 27K TPD, Hayden mill 25K TPD, Acid Cure leach 62,844 TPD dump leach 32,411 TPD, waste dump 101,285 (<0.05% Cu) TPD. Smelter slag 1,000 TPD 3.0% TCu.

Will move to North side of current pit being mined in 2009.

### **Mining Equipment**

5 Liebherr T282B 400-ton trucks - These have AC drive and 63-inch tires. They have had some rotor and crankshaft problems with the new trucks. Plans are to purchase 20 of these new 400-ton trucks over a 5-year period. Total cost will be \$81 million, so about \$4 million for each truck each. Price is without tires, they cost about \$35,000 each now.

25 Komatsu 830s 240-ton trucks

3 Caterpillar 793B 240-ton trucks

Use chains on tires to reduce wear.

Shovels/Loaders - 2 - 56 yd P&H 410, 3 - 42 yd P&H 2800s, and new 1 - LeTourneau L2350 loader, the world's largest wheel loader. They have put chains on the back tires to protect them and will be installing chains on the front tires also. This is the only loader that can properly fill a 400-ton truck. Shovel operators use computer map in cab to see grade and ore type, no more manual grade staking.

Ray has recently purchased one much larger Caterpillar 24H motor grader to supplement fleet of older 16Hs.

**Pit Slope Management** - There are few stable slopes, but failures are typically creep, not catastrophic. The pit walls are wet, so the current drought is a plus. Water is collected with both horizontal drains and vertical wells. An automated laser monitors slope movement and reports to the dispatch office. If movement of 0.5 ft/day is measured personnel and equipment are evacuated.

**Ray Mill** - The Ray mill was commissioned in 1992. Key components are 34' x 17' SAG 14K hp and two 18' x 31' ball mills. Main in-pit crusher is 60" x 89" with 1 mile of conveyor. A new \$46 million crusher will be installed near the lip of the pit and should be completed by the end of the first quarter 2009. The use 500-cubic ft cleaners in the Ray mill. Ray may put in a rougher circuit for the 0.01% Mo and ship a 5% concentrate to the Mission mill for further processing. Elder Gulch Tailings Dam was constructed of rock and has 11-12 years of life left then they must build another tailings dam. It is a 20-mile rail haul to the Hayden mill, typically 6-7 trains per day.

**Leach** - Production via leach is 82 million lb/yr cathode, about one third of mine production.

32K TPD sulfide dump leach and the acid cure leach produce 14K GPM of 1.44 g/l PLS. The SX produces 2,200 GPM rich electrolyte 48 g/l to feed the electrowinning tank house. Circuit is 1 strip 3 extract circuits Acid sold is to the mine from the Hayden smelter at the market price of \$74/ton net. The tankhouse was built on Gila conglomerate in 1969. Leakage of acid into the calcium carbonate of the Gila has formed gypsum that has swelled and raised part of the tank house 3.5 feet. Silver Bell mine's newer tank house loses 10% of the "kerosene" that Rays does. Since 1999 they have invested \$13 million into the tank house, heaters, filters, heat exchangers, and distribution system. Amarillo makes 16-lb cu starter sheets cathodes. The plate cycle is 10 days, sheets are pulled at 24 hours, and straightened and then finished in 8-9 more days. Current density is 22 amps per sq ft, current efficiency 91%, and extraction efficiency is 91%.

### **Comments from the question and answer session.**

Operation is still recovering from the lack of investment during the 1999 low price period.

Mine fleet upgrade includes purchasing a new dozer fleet.

The new primary crusher cost is \$46 million; and installation should be completed in 2009.

Current pit is 750 ft deep.

Gold content is 0.015 oz per ton of concentrate, very low.

Moly runs 0.1% to 0.12%; too low for recovery.

Mine is still using a 90 cent Cu price model but a new mine plan/block model is just about complete - the price used for the new model was unreported.

Diabase ore is hard and reduces capacity to about half but contains good grade.

There are no current plans to develop the Buckeye and Copper Butte oxide/chalcocite deposits to the northwest of the pit area.



RAY MINE (A)



# Office of State Mine Inspector

705 West Wing, Capitol Building  
Phoenix, Arizona 85007  
602-255-5971

87209114  
STATE MINE INSPECTOR  
Kelly  
New  
MAY 12 1988

10170400

## NOTICE TO ARIZONA STATE MINE INSPECTOR

In compliance with Arizona Revised Statute Section 27-303\*, we are submitting this written notice to the Arizona State Mine Inspector (705 West Wing, Capitol Building, Phoenix, Arizona 85007) of our intent to start/stop (please circle one) a mining operation.

COMPANY NAME Longyear Company  
CHIEF OFFICER Allen Krause  
COMPANY ADDRESS 7773 W. Seldon Lane, Peoria, Arizona 85345  
COMPANY TELEPHONE NUMBER 486-1881

MINE OR PLANT NAME Ray Unit

MINE OR PLANT LOCATION (including county and nearest town, as well as directions for locating by vehicle)

Ray Mines Plant, Kearny, Arizona

TYPE OF OPERATION Drilling PRINCIPAL PRODUCT Minerals

STARTING DATE 5-9-88 CLOSING DATE Unknown

DURATION OF OPERATION Unknown

PERSON SENDING THIS NOTICE Allen Krause

TITLE OF PERSON SENDING THIS NOTICE Manager, Southwestern Zone  
Contract Drilling Division

DATE NOTICE SENT TO STATE MINE INSPECTOR 5-10-88

\*A.R.S. Section 27-303 NOTIFICATION TO INSPECTOR OF BEGINNING OR SUSPENDING OPERATIONS: When mining operations are commenced in any mine or when operations therein are permanently suspended, the operator shall give written notice to the inspector at his office prior to commencement or suspension of operations.

RAY DIVISION  
KENNECOTT COPPER CORPORATION

PINAL COUNTY

A conference with Mr. Young, Assistant General Manager, revealed that Kennecott is buying some magnetite from Arkota for their LPF plant for making sponge iron. Kennecott is running at full capacity.

LEWIS A. SMITH - Hayden Conference - 1-18-62

---

"RAY MINES DIVISION of the KENNEDOTT COPPER CORPORATION is producing "milk of lime" for Hayden concentrator in an automated plant" See: MINING WORLD March 1962, p 34.

---

The Fisher Contracting Company of Phoenix has started work on a project at the Ray Mines Division of Kennecott Copper Corporation which involves the sponge iron wet grinding circuit and acid plant equipment modification. The project will provide wet grinding of the sponge iron in a new building to be constructed adjacent to the L-P-F area at the concentrator. Modification of the acid plant includes installation of a heat exchanger which will protect the operation from process interruption, and facilitate start-up of the plant following routine or emergency shut-downs.

Taken from MINING WORLD, April 1962, p 41.

---

# **RAY & GILA VALLEY RAILROAD**

---

# **TIME 14 TABLE**

**Effective Tuesday, February 1, 1921**

**At 12:01 A. M., Mountain Time**

**For the Government and Information of Employees only and not intended for the use of the public.**

**The Company reserves the right to vary from this Time Table.**

**W. S. BOYD,  
Superintendent**

## Photograph of Ray, Arizona Territory

1918

(on hall wall in ADMAN R.  
offices May 19, 2004)

The building on the far left is the General Manager's home. Looking south on a clear brisk winter morning one could see a white speck: the top of Mt. Lemon, near Tucson, fifty miles away.

The wagon train is Mose and his mules who carried broken mine timbers cut to firewood free to any Ray resident who had a fireplace or wood stove. Few had; most residents used kerosene "coal oil" stoves.

Down the hill is a cluster of "tin shacks," galvanized iron bed rooms furnished to the single men who worked at the mine – no rent due.

The larger building in front is the garage and workshop for the mine manager's two Packard automobiles: a "twin six" roadster and a "straight eight" touring car.

To the right, the larger building with the smokestacks is the "cook house" serving two substantial meals a day: 6:00-7:00 AM and PM for \$1:00 per day. Diners could help themselves to a cold table and prepare a lunch of cold roast beef, ham, chicken, hard boiled egg and cheese for sandwiches, with coffee available for the Thermos.

The next building, slightly uphill, is the assay office for sampling the grade of ore by the young engineers. Across the dirt road is the Engineers' Dormitory.

Next right are the two public tennis courts and the "Ray Conn Club," a larger room available for parties, dances or the few vaudeville shows, plus a pool table and billiard table and a small standup bar that served "near beer" and soft drinks in the evening hours.

Downhill from it, with a darker roof is the Guest House for company visitors or officers – two bedrooms, a sitting room, and a kitchen.

The small white building right is for an assistant manager and his family. Last on the right is the abandoned mule shed where earlier miners brought their big white mules that used to haul the ore underground. One could still find a mule shoe, a three-quarter circle of iron, with many nail holes, much larger than a horse shoe.



Starting again left across Mineral Creek is the concrete retaining wall built to keep Mineral Creek floods from destroying the railroad yards. The creek carried water year round, fordable by the single road shown. But a rainstorm, common in the summer months, made it a wild torrent filling its wide bed and cutting off all the east half of the mine from the west half for, perhaps, two or three days. One could cross only on the small foot bridge.

Starting left across the railroad track is the material yard full of wood timbers used as "bracing" in the mine and the machine shop. Next are the railroad engine, two larger locomotives, and a smaller locomotive operating on standard gauge track.

The large locomotive blowing smoke is about to pull, in reverse, the long train of ore cars, seventy tons each, down south five miles to Kelvin and Ray Junction. It is in reverse for easier switching to the Arizona Eastern which carries them about fifteen miles to Hayden, where another Ray and Gila Valley locomotive switches the cars to the mill and the concentrator where, by the floatation process, the copper sulfides are separated from the iron sulfides and the AS&R smelter produces copper ingots of "blister" copper.

A copper ingot, about 60 pounds, four feet long and six inches wide, is ideal ballast for the lumber schooners carrying high deck loads from the North West to the East Coast, where it is again smelted for copper wire or sheet copper, so most of the ingots were shipped to Portland, Oregon and Vancouver, Canada – a long but inexpensive trip.

The smaller engine just past the railroad superintendent's office is coupled to freight cars and the Ray and Gila Valley combination passenger coach and express car for a one day trip to Ray Junction and connection with Arizona Eastern's daily train from Winkleman to Maricopa Junction, near Phoenix.

Beyond the railroad cars are two machinery shops for mining equipment. The small dark tank is the old Ray Number One hoist, now used only to transport miners to work underground.

Directly above it is the broken ground where the top of Ray Hill has disappeared by removal of the underlying ore by the "block caving" beneath it. Its ore averaged 2 ½ %

copper and was the richest in the area and many small mines had dug tunnels into it for some twenty years only to “go broke” when they exhausted the few pockets of “secondary sulfide enrichment.”

Above it is the power house and “New” Ray Number One hoist, which lifted the ore in a self loading car and dumped it into a crusher where the broken ore was sent to the larger loading shed where the ore cars were filled by gravity.

The next building, with four smoke stacks, contains the air compressor sending air to the mine and some of its compressed air locomotives used underground. It ran 24 hours a day, except Christmas and the Fourth of July: the mine’s only two holidays. On those two days we all felt uncomfortable because we didn’t hear the constant “thump thump” to which we normally paid no attention.

To the right are more office buildings and beyond them another area of sinking broken ground.

Next right is Hoist Number 2 and its crusher for loading ore into single cars, not generally used.

The town of Ray is north of the picture. Ray had no company store and the merchants owned their own buildings. There were Miller Bros two stores - a larger grocery and a department store across the street – two banks, a bakery, and a butcher shop, The Iris for movies (Tom Mix and Charlie Chaplin) on weekends, a drug store with soda fountain, a small restaurant, the Ray Hotel (about twelve rooms), two dentists, and a small jewelry store where we could spend our 35 cents per week, saved up to buy our parents a Christmas present.

These residents had homes at American Townsite; across the creek from Ray. Company employees could rent homes at “Boyd Heights,” iron buildings again but larger, thirty dollars a month for two bedrooms, twenty for one bedroom, free water and electricity.

Ray, in 1914, was the largest town in Pinal County, perhaps 5000 population in the “boom” years for copper in World War I. It had had a newspaper, the “Copper Camp” and

two banks. One, the Valley Bank, left Ray for Phoenix, the Merchants and Mines went broke in the twenties.

In Ray the Methodists and the "Mormons" each had a church. The Catholic Church was in Sonora. The Episcopalians had a minister visit about once every four weeks, holding service as the Guild Hall in Ray, where it held Sunday School for children.

Mr. Boyd, mine manager, would loan company trucks and drivers for church picnics at Kelvin in the riverside picnic ground only if all the children of all faiths attended. The Methodists had the best potato salad.

---

### **Background**

These notes are written by R. Mitchell S. Boyd, the son of William Sprott Boyd. As an employee of the mining company, Sprott Boyd came to Ray with Louis Cates in 1910 to reopen the mine. Sprott started as the Assistant Manager and was General Manager of the Ray Mine from 1921-1927. Mitch lived at the mine from the time of his birth in 1914 until 1927 when Kennecott bought the Ray Consolidated Copper Company. At that time Sprott was promoted to a new position with Kennecott in San Francisco and moved the family to San Mateo, California.

Mitch Boyd currently resides at 100 Thorndale Dr. #350, San Rafael, CA 94903.



STATE OF ARIZONA  
DEPARTMENT OF MINERAL RESOURCES  
MINERAL BUILDING, FAIRGROUNDS  
PHOENIX, ARIZONA 85007



FPKnight notes - Symposium on Mining and Ecology in the Arid Environment 3-22-70  
(Tucson) to 3-27-70

Kennecott - Ray

Silicate leach at Ray

10Mt/d silicate ore

5-700 tpd acid @ 600# @ 0.7 ore @ 70% recov = 8.6 lbs/lb Cu recovered

100 - 125 lbs/ton of ore

8-10 10 at start

70% recovery

1 T Cu takes 3 tons acid

\$20 Frt to S.F. on acid. Local mkt \$20/T Cost up to \$40. Some at \$12 so far

Ore character important - leach area.

Smelter at Hayden.

Liquid  $\text{SO}_2$ . 17 MT mkt USA 1955

$(\text{NH}_4)_2\text{SO}_4$ . Sms 350 MT/yr?

Potential of using 10% of  $\text{H}_2\text{SO}_4$  & 1/6 could be marketed

$(\text{NH}_4)_2\text{SO}_4$  plant would cost 60 mil.

Cost of product would be 1/3 above market price

Elemental S - capital cost prohibitive. Sm might produce

1.8MT/da Capital cost \$200-250 mil.

Cost/T for S = Operating loss 32 mil/yr

$\text{H}_2\text{SO}_4$  o.k. for local mkt or Co. needs.

Elemental S can be purchased & acid made for remote areas at less cost than using sm gases

140 mil cost to put in acid plants at all smelters

Reverb gases low S

Roaster " dirty

Converter " intermittent

Combine roaster and converter

Smelters differ & prod costs vary much. 6-10 mil?

Present market 450,000 tpyr. Capacity potential 200 mil.

Freight would mean no profit for surplus

Estimates bases on 1968-9 prices. 8-15%/yr inc=fig being used by contractors



DEPARTMENT OF MINERAL RESOURCES  
STATE OF ARIZONA  
FIELD ENGINEERS REPORT

Mine Copper Creek District, Pinal County Date June 2, 1953  
District Bunker Hill (Copper Creek) Mining Dist. Engineer Axel L. Johnson  
Subject: Exploration by Kennecott Copper Co.

Location Approximately Sec. 17 -- T 8 S -- R 18 E.  
Go 8 miles east of Mammoth on the Copper Creek Road.  
Turn right and go 1 1/2 miles on private newly constructed road.

Present Operations ----- ~~Diamond Drilling~~ Churn Drilling  
C. W. Freelove, drilling contractor is doing churn drilling on contract  
for the Kennecott Copper Co.

The first drill hole is now being drilled. The drill operators would not  
give out any information regarding the depth reached so far, the results of the samples  
taken, or how many additional drill holes were planned.

6 men are employed in the drilling operations. In addition, 2 men are  
employed doing discovery work on mining claims staked out in the immediate area.

A 16 " bit is being used in the drilling operations. No casing has been  
used to date.



In reply refer to:

# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Tucson Field Office

12661 East Broadway Blvd.

Tucson, AZ 85748-7208

OnK  
Ray Mine file

January 6, 1998

### Re: Project Update for the Ray Land Exchange/Plan Amendment EIS

Dear Interested Party,

The Bureau of Land Management (BLM) would like to thank you for your interest in the Ray Land Exchange/Plan Amendment Environmental Impact Statement (EIS) and your participation in the scoping process this past summer. As you know, the BLM is currently preparing a draft environmental impact statement (EIS) in response to an exchange proposal—the Ray Land Exchange—from ASARCO Incorporated. The draft EIS is expected to be published in the spring of 1998. The EIS is evaluating the potential environmental impacts of two connected actions—the proposed land exchange and a plan amendment to allow the BLM to implement the exchange. The purpose of this mailer is to update you on the management and planning considerations involved with the plan amendment.

Please review at your convenience the information on the plan amendment on the following pages. Also, please use the form at the end of this material to update our mailing list. If you have any questions about the material or the project in general, please contact Shela McFarlin at the BLM Arizona State Office (602) 417-9568. Thank you for your involvement in the Ray Land Exchange/Plan Amendment EIS.

Sincerely,

Jesse Juen  
Field Manager

Enclosure

## NEPA/EIS PROCESS

- ✓ Scoping - Summer 1997
- Draft Environmental Impact Statement Public Review - Spring 1998
- Final Environmental Impact Statement Release - Winter 1998
- Protest and appeal period

## THE PLANNING PROCESS

### Planning Area Description

The geographic area encompassed in the proposed plan amendment is referred to as the Ray Complex (see Figure 1-1). This area includes all of the BLM parcels that Asarco has selected for exchange with the exception of 637 acres of BLM mineral estate near Casa Grande for which a plan amendment is not required.

### Management Situation

Asarco has proposed a land exchange which is being considered by the BLM under the National Environmental Policy Act (NEPA), the Federal Lands Policy and Management Act (FLPMA) and the Federal Land Exchange Facilitation Act (FLEFA). The exchange requires a plan amendment because the selected lands are situated in areas designated for retention, including the White Canyon Resource Conservation Area (Phoenix RMP) and the Safford Long-Term Management Area (Safford RMP). Asarco holds 96% of the mining claims in the area that can be developed under the General Mining Act and BLM regulations. Asarco has also indicated that it is likely the company will expand its mining operations onto the selected lands, with or without a land exchange, either through Mining Plans of Operations (MPOs) or through patenting its mining claims under the General Mining Act of 1872.

### Planning Issues

The Phoenix Resource Management Plan (RMP) (adopted 1988) established the White Canyon Resource Conservation Area (RCA), which includes most of the selected parcels. The Phoenix RMP called for the retention of all BLM managed lands within the White Canyon RCA to be retained in federal ownership. Further, the plan provided guidance to the BLM to expand public land ownership within the RCA by acquiring private and State Trust Lands (surface and subsurface) through an active exchange program. Similarly, the Safford District RMP (adopted 1991, 1994) designated an approximately 80,000-acre area adjacent to the White Canyon RCA, as a long-term management area, which includes the Chilito/Hayden selected land parcels, another area where BLM lands were to be retained.

These land tenure decisions are being reanalyzed in the Ray Land Exchange/Plan Amendment EIS for the following reasons: 1) Asarco has indicated that the company is seeking to expand its mining operations on BLM lands in the area, and 2) the State has been unable to effect any land exchanges with the BLM, and with the current interpretation of Arizona case law (Deer Valley School District decision), it appears highly unlikely that any exchanges with the State will be forthcoming. Mining activities could occur without the land exchange through patenting under the 1872 General Mining Act or through Mining Plans of Operations (MPOs). Through patenting, some parcels would be conveyed to Asarco; under multiple MPOs, the lands would retain under federal ownership, and BLM would be responsible for overseeing and regulating mining activities.

### Planning Criteria

The planning criteria identified below are those factors which the BLM will use in evaluating whether each individual parcel proposed for exchange should be made available for possible exchange through a plan amendment, while taking into consideration the planning issues identified above.

- ➡ Are high value resources such as cultural sites, riparian zones, or special-interest species and/or their habitat present on the property?
- ➡ Is the parcel accessible? Does public access to other public lands depend on this parcel? Can existing access be maintained or substituted for?
- ➡ Do valid (non-federal) land uses exist on the parcel?
- ➡ Are there any special BLM programs (current or future) on the parcel?
- ➡ Is it appropriate that the parcel be made available for exchange to improve management of public lands?

### MAILING LIST

If you would like to be added to our mailing list, correct your address, or have your name removed, please fill out the bottom portion of this form and mail to the Bureau of Land Management, Arizona State Office (AZ 917), c/o Shela McFarlin, 222 N. Central Ave., Phoenix, Arizona 85004

- \_\_\_\_\_ Please add my name to the Ray Land Exchange/Plan Amendment mail list  
\_\_\_\_\_ Please correct my name/address  
\_\_\_\_\_ Please remove my name from the Ray Land Exchange/Plan Amendment mailing list

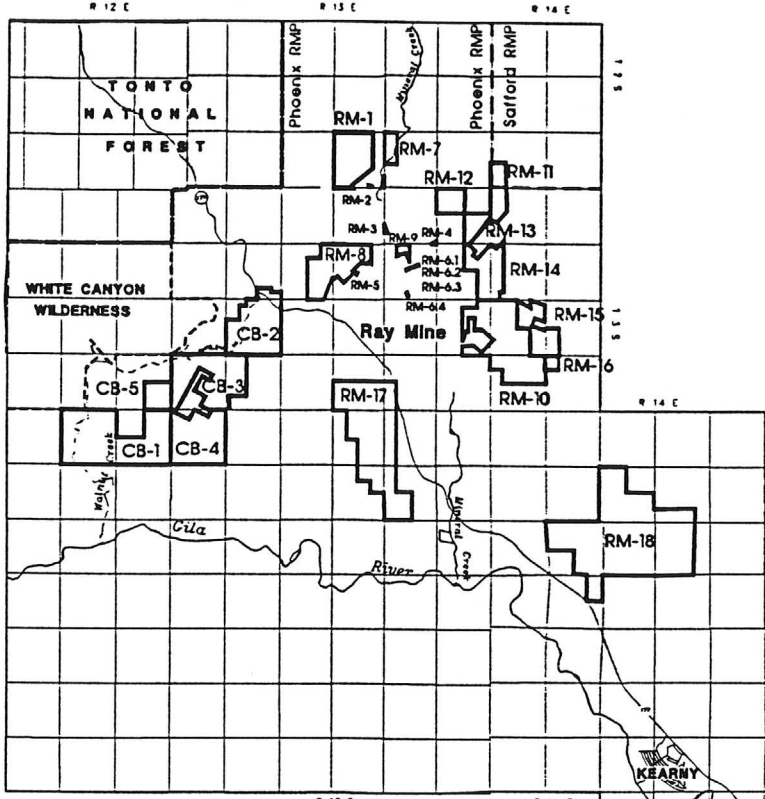
Name \_\_\_\_\_

Address \_\_\_\_\_

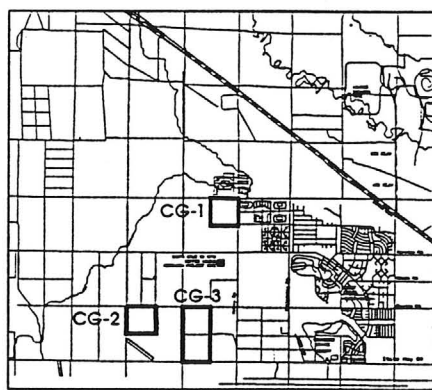
Organization \_\_\_\_\_



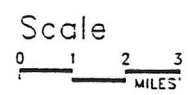
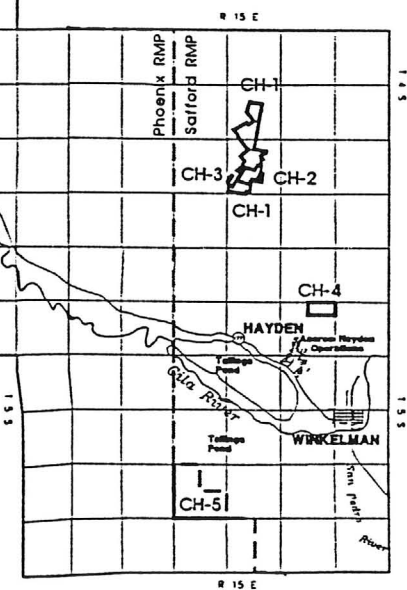
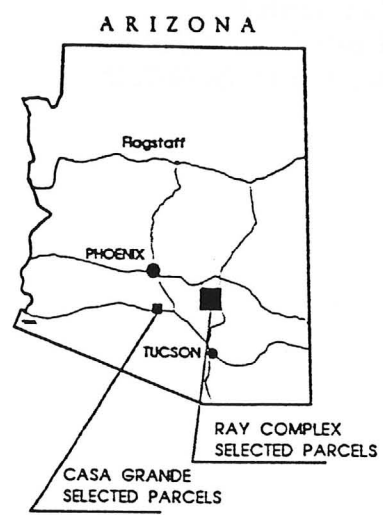
Date: 8-05-97 Rev.  
 Checked by: KAD  
 Drawn by: KAD  
 Drawing: PROJ.DC.DWG  
 File: BACAD\94929  
 Proj #: 86-94929



RAY COMPLEX SELECTED PARCELS



CASA GRANDE SELECTED PARCELS  
(Phoenix RMP)



**KEY**

- RESOURCE MANAGEMENT PLANNING BOUNDARY (RMP)
- RM-2
- SELECTED PARCELS

**RAY LAND EXCHANGE/PLAN AMENDMENT EIS**  
 Gila and Pinal County, Arizona  
 LOCATION MAP OF SELECTED LANDS  
 IN THE RAY COMPLEX  
 AND THE CASA GRANDE AREA  
 FIGURE 1-1

# UPDATE:

## The Ray Land Exchange Environmental Impact Statement

Bureau of Land Management, Phoenix District

August 1995

Earlier this year, the Bureau of Land Management (BLM) initiated scoping for the Ray Land Exchange Environmental Impact Statement (EIS). Public scoping meetings were held in Kearny and in Mesa. Written comments were provided by many individuals, organizations and agencies. An interdisciplinary team and the contractor preparing the EIS (SWCA), analyzed these comments to identify a number of issues of concern to the public. The EIS process consists of a number of steps including scoping, baseline studies, preparation and review of the draft EIS, finalizing the EIS and the record of decision. This EIS is still in the scoping phase. Since the initiation of scoping, the project mailing list has almost doubled. This UPDATE provides background for new additions to the mailing list and gives the latest information to those previously involved.

### *What is the Ray Land Exchange?*

ASARCO Incorporated has proposed a land exchange with the BLM. This exchange has the potential to provide public benefits since selected public lands would be exchanged for private lands offered because of their high resource values. These private parcels, in the process of being acquired by Asarco, are surrounded by Congressionally designated wilderness or contain riparian habitats for important plants and animals. The proposal requires the preparation of an environmental impact statement (EIS) to consider the potential environmental impacts which might result from the land exchange. Under the Federal Land Management Policy Act and the Federal Land Exchange Facilitation Act, such an exchange must be in the public benefit and land values must be equalized.

### *What are the selected lands?*

The public lands proposed for exchange (called the selected lands) total 4,720 acres located near Kearny including the Copper Butte area lying southeast of the White Canyon Wilderness Area, parcels adjacent to the current Asarco Ray mine, and other parcels near the town of Hayden. Included also are 1,188 acres of federal mineral estate in these same areas and 640 acres of federal minerals near Casa Grande. Currently these public lands in Gila and Pinal counties are utilized for grazing and recreation and are open for mineral development. A number of valid mining claims exist on the parcels, most held by Asarco. None of the White Canyon Wilderness acres are proposed for exchange. The selected land includes 160 acres of the White Canyon Area of Critical Environmental Concern.

### *What are the offered lands?*

Asarco will offer private lands for exchange which have high resource values. The offered lands have been identified but not all parcels have yet been secured through contracts to purchase. The realty process has been slower than anticipated when the scoping phase began and in one case negotiations failed to produce a contract. Once these private parcels have been secured, the proposed exchange will be reopened for further public scoping on both selected and offered lands.

### *What is the status of the Environmental Impact Statement (EIS)?*

The EIS will fully analyze the land exchange proposal including feasible alternatives and the no-

action alternative. It will analyze impacts of an exchange of public and private lands including what is known about foreseeable uses such as mining, recreation and other multiple uses. The EIS will identify what is known about values and resources on both the selected lands and the offered lands. Baseline studies such as biological assessments and cultural resources surveys have commenced on the selected lands.

The EIS process was initiated with the Notice of Availability published in the *Federal Register* December 19, 1994. The first scoping period on the selected lands was completed in February, 1995. The analysis of comments has revealed a number of issues important to the public: mineral development, recreational access, and protecting wilderness and other critical resource values.

***When will Scoping for the EIS be continued?***

Once the offered lands have been secured by Asarco, the BLM will reopen scoping on the project including both selected and offered lands. A review and comment period will be established through a *Federal Register* announcement and by notice to those on the project mailing list. Public scoping meetings will be announced as well.

All comments submitted during the original scoping for selected lands will continue to be used in developing issues to be analyzed in the EIS. During the future scoping meetings, new comments may be submitted and will be considered along with those previously received.

***What is the public review process and schedule for the Ray Land Exchange EIS?***

Several phases of public participation are planned during the EIS process including additional scoping, review of the Draft EIS and of the Final EIS. You will be contacted so please ensure that your address label is correct.

***How is the White Canyon Plan Amendment and Environmental Assessment related to the proposed land exchange?***

The current land use plans for the selected lands near Kearny and Hayden are defined in the Phoenix and Safford District Resource Management Plans. These plans provide that the public lands and federal minerals in the White Canyon Resource Conservation Area and additional parcels in Gila County be retained in federal ownership. This includes about 160 non-wilderness acres that are now part of the White Canyon Area of Critical Environmental Concern.

To even consider the proposed land exchange requires an amendment to the resource management plans. The White Canyon Plan Amendment/EA considers whether any or all of the selected parcels could be available for exchange. The Draft offers four alternatives for land use and analyzes the impacts of each. This includes a no-action alternative which would not change the current uses such as mining, grazing, recreation and other multiple uses. The EIS will analyze the specific actions and impacts of the proposed land exchange. Comments on the Draft plan amendment must be sent by September 7 to the Phoenix District.

***How do I obtain more information?***

For more information or to obtain a copy of the White Canyon Draft Plan Amendment, contact the Project Manager, Shela McFarlin, at the Bureau of Land Management, Phoenix District Office, 2015 W. Deer Valley Rd., Phoenix, AZ. 85027, or at 602-780-8090. Mail comments on the Draft Plan Amendment to her attention at the same address.

**Your continuing interest and participation is appreciated.**



United States Department of the Interior  
BUREAU OF LAND MANAGEMENT  
Phoenix District Office  
2015 West Deer Valley Road  
Phoenix, AZ 85027



In reply refer to:

2200

## RAY LAND EXCHANGE ENVIRONMENTAL IMPACT STATEMENT SCOPING INFORMATION

January 1995

### *What is this land exchange all about?*

ASARCO Incorporated, a mining company, has proposed to trade private lands for public lands administered by the Bureau of Land Management (BLM). The public lands Asarco would like to acquire are the "selected lands." The private lands they would trade in return are the "offered lands." These lands would be of approximately equal monetary value. BLM must prepare an Environmental Impact Statement (EIS) for the proposed Ray Land Exchange.

**Selected Lands.** Asarco has selected approximately 4,720 acres of land and 1,118 acres of mineral estate near Kearny Arizona, and 640 acres of mineral estate near Casa Grande for exchange. The mineral estate lands are part of a "split estate," which means that one party owns the subsurface mineral rights (in this case the BLM), and another party owns the rights to the surface.

**Offered Lands.** Asarco is in the process of acquiring lands to be offered in exchange for the selected lands. BLM has provided Asarco with a list of parcels targeted for acquisition because of their significant public values. The targeted parcels will include Sonoran desert broadleaf riparian habitat in Arizona and private parcels within designated BLM Wilderness areas in Arizona. Details about the offered land parcels will be available at the scoping meetings to be held January 30 (Mesa, AZ) and January 31 (Kearny, AZ).

### *Who is involved?*

**Bureau of Land Management.** Gordon Cheniae, at the BLM Phoenix District Office, is responsible for producing the EIS. Shela McFarlin will be the BLM Project Manager. She will work closely with a BLM interdisciplinary (ID) team and the third party contractor to prepare the EIS.

**ASARCO Incorporated.** Asarco, the project proponent, has proposed the Ray Land Exchange. Neil Gambell, Technical Services Manager at the Ray Complex in Hayden, is the project coordinator.

**SWCA, Inc. Environmental Consultants.** SWCA is a third party contractor assisting BLM with preparation of the EIS. SWCA's project manager, Mary Taylor, works out of Tucson.

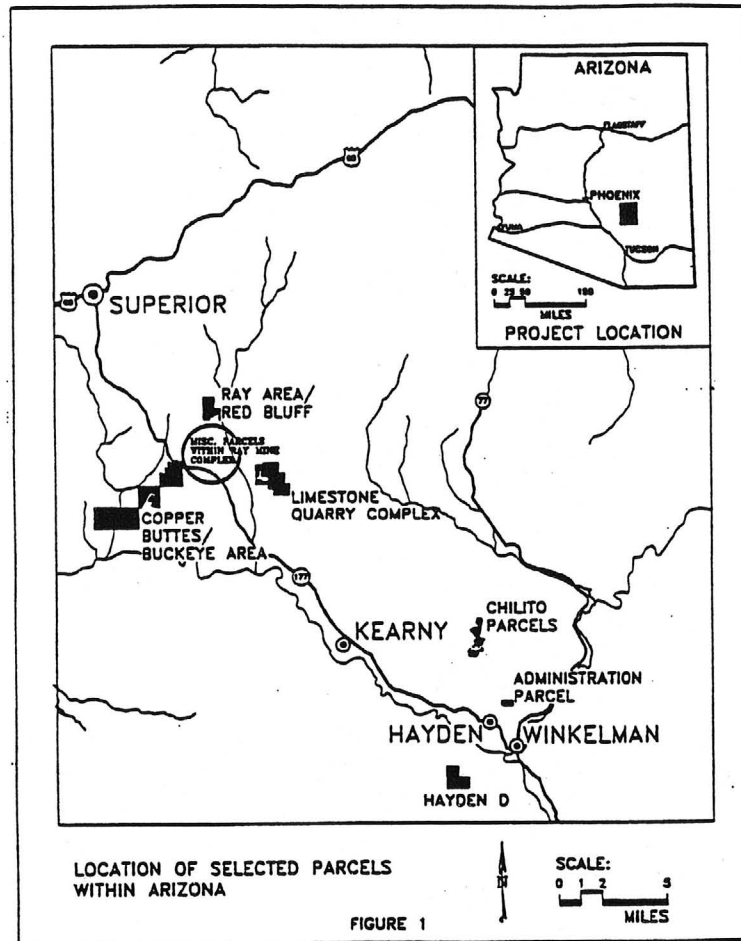
### *When will the EIS process begin, and what are the issues?*

**EIS Process.** The proposed Ray Land Exchange is a federal action requiring preparation of an Environmental Impact Statement (EIS). The National Environmental Policy Act (NEPA) of 1970 requires public review of and involvement in analysis of potential environmental impacts resulting from a federal action. Preparation of the Ray Land Exchange EIS begins now with scoping. The projected completion date for the Final EIS is January 1996. EIS preparation includes identifying issues, concerns, and opportunities, describing the effected environment, and analyzing the potential environmental consequences of the proposed action and reasonable alternatives, including the no action alternative.

**Potential Issues.** Preliminary analysis has identified the following resources for analysis: Vegetation (upland and riparian), wildlife and special status species, socio-economic factors, recreation, Wilderness, cultural resources, and minerals. Public comment and BLM coordination with state and federal agencies and tribes during scoping will be a vital part of understanding potential impacts to these resources. Additional opportunities for public involvement will occur when the draft and final versions of the EIS are published, and (for those who have been involved earlier in the process) during the appeal period following the Record of Decision.



# RAY LAND EXCHANGE EIS: PROPOSED SELECTED LANDS



## Ray Land Exchange Selected Lands

Selected Land Acreage and Location	Surface Rights	Mineral Rights	Current Owner / Manager
4,720 acres near Kearny	YES	YES	Federal Public Land (BLM)
1,188 acres near Kearny	NO	YES	State of Arizona
640 acres near Casa Grande	NO	YES	Asarco Santa Cruz, Inc.

## Selected lands would be used to:

- Consolidate the Asarco land position at the Ray Mine through acquisition of BLM inholdings,
- Be utilized for expansion of the mine overburden/leach rock deposition areas at the Ray Mine and the tailings deposition area at Hayden,
- Provide for future development of the Copper Buttes (near term) and Chilito (long range) copper deposits,
- Provide for future development of the Ray and Hayden limestone quarries,
- Provide a buffer zone around Ray Complex operations.

**DETAILED INFORMATION ABOUT THE OFFERED LAND PARCELS  
WILL BE AVAILABLE AT THE JANUARY 30 & 31, 1995 SCOPING MEETINGS**



United States Department of the Interior  
BUREAU OF LAND MANAGEMENT  
Phoenix District Office  
2015 West Deer Valley Road  
Phoenix, AZ 85027



In reply refer to:

2200

January 5, 1995

Dear Interested Party:

This package of information is important to anyone who is interested in being involved in an Environmental Impact Statement (EIS) addressing a land exchange proposed by ASARCO Incorporated, a mining company. Asarco has proposed to trade private land for public land administered by the Bureau of Land Management (BLM). The parcels Asarco would like to acquire, the "selected lands", are near its Ray Complex facilities based in Hayden, AZ. The private lands Asarco would trade, the "offered lands", have been targeted by BLM for acquisition because of their significant value to the public.

This mailing provides basic information about the proposed land exchange, descriptions of the parcels, and the location and timing of public scoping meetings. Public scoping, the first step of the EIS process, provides an opportunity for interested parties to learn about the proposed land exchange and share ideas and concerns. Your participation during this early phase of the EIS process is crucial.

The scoping period will end February 14, 1995. There are two ways for you to submit your comments. Either mail them in on the enclosed self-addressed form and/or submit them in person at one of the public open houses being held for your convenience in Mesa and Kearny, AZ. At the open houses, you will be able to view displays about the land exchange, the legal process, and the parties involved in the project. Plus, representatives from the BLM, Asarco, and SWCA Inc. Environmental Consultants (the third party contractor assisting BLM with preparation of the EIS), will be available to talk with you in person. The open houses will be held January 30 and 31, 1995, at the following locations:

January 30, 1995, 4-8 pm, Apache Room  
Mesa Community and Conference Center  
263 N. Center St., Mesa, AZ  
602/644-2178

January 31, 1995, 5-9 pm  
Constitution Hall (Senior Citizen Center)  
912 E. Tilbury Dr., Kearny, AZ  
602/363-5071

Please send us your comments by February 14, 1995 - and we urge you to attend one of the open houses. Thank you for your participation. For additional information, please contact Shela McFarlin, (602) 780-8090.

Sincerely,

G. L. Cheniae  
District Manager

Para obtener informacion en español, llame a Hector Abrego, al (602) 780-8090.

Enclosure

John

Kennecott

RAY MINE (F)

OFFICE PHONE 255-5971



STATE MINE INSPECTOR

# State Mine Inspector

MAR 27 1985

JAMES H. McCUTCHAN  
PHOENIX, ARIZONA 85007

## NOTICE TO STATE MINE INSPECTOR

In compliance with Arizona Revised Statute 27-303, we are hereby submitting this written notice to the State Mine Inspector, 705 West Wing, Capitol Bldg., Phoenix AZ 85007, of our intent to start/stop a mining operation.

COMPANY NAME BOYLES BROS. DRILLING COMPANY  
MAILING ADDRESS 10801 N. 21st Avenue; Phoenix, Arizona 85029  
CHIEF OFFICER AT ABOVE ADDRESS Clark Hirschi - District Manager  
PERSON SENDING THIS NOTICE Pam Langhammer - Office Manager  
TYPE OF OPERATION Rotary Drilling  
STARTING DATE 02-28-85 CLOSING DATE 12-31-85  
DURATION OF OPERATION Until project is completed.  
NUMBER OF EMPLOYEES Three (3)

Give exact description of location of this operation (including directions for locating by vehicle).

Kennecott Copper - Ray Mines Division - Kearny, Arizona  
In Ray Pit.

Any operation found operating without sending this notice will be charged with a misdemeanor.

the nature of the issues proposed to be raised in the hearing.

The permit will become effective thirty-three (33) days following the date of mailing by the EPA of the final permit. If no comments request a change in the draft permit, the permit will become effective three (3) days from the date of mailing.

A request for an evidentiary hearing may be submitted to the Permits Record Coordinator, (W-5-1), within thirty-three (33) days following the mailing of the final determination, in accordance with 40 CFR 124.74. If granted, applicable provisions of the permit will be stayed pending the hearing.

Please bring the foregoing notice to the attention of all persons you know would be interested in this matter.



Apr. 12, 1958  
AIM & ME Meeting, Geologic  
Div, at Ray.

## A BRIEF HISTORY OF THE RAY DISTRICT

The Mineral Creek Mining District, which includes the Ray area, was organized by silver prospectors in 1873. In 1880 the Mineral Creek Mining Co. built a five-stamp mill, then in 1883 the Ray Copper Co. took over and built a 30-ton copper furnace. The ore of the area was described as principally native copper. There was little activity until 1898 when the claims were purchased by the Globe Mines Exploration Company, (Ltd.), of London. The following year the ground was acquired by the Ray Copper Mines, (Ltd.), another British Company.

During the first year of its existence the new company founded the town of Kelvin and erected a 250-ton mill there. Ray and Kelvin were connected by a 7 mile narrow gauge railroad, various shops and offices were erected, and a 344 ft. shaft was sunk at Ray. Supplies were transported by steam traction engine 43 miles from Red Rock, the nearest shipping point on the railroad. There was no mining activity between 1901 and 1905.

D. C. Jackling was attracted to the district in 1906. The Ray Copper Co. and Gila Copper Co. were organized to acquire the English Company's holdings; they were merged as the Ray Consolidated Copper Co. in 1910. Other companies to become active in the district in 1906 and 1907 were the Arizona Hercules Copper Mining Co., Kelvin Calumet Mining Co. and Ray Central Mining Co.

The properties of all these Companies were acquired by the Ray Consolidated Copper Co. through the years. A mill was placed in operation at Hayden during 1911 and production started from the mines at Ray. In 1912 a smelter was built by A.S. & R. at Hayden. In 1924 Ray Consolidated Copper acquired the Chino Copper Co. in New Mexico. In 1926 the Nevada Consolidated Copper Co. absorbed the Ray Consolidated holdings and these holdings were later absorbed by Kennecott Copper Corp.

---

Mining methods underground and metallurgical processes at the mill underwent a slow but constant improvement. The Ray Mines were the first underground operation to produce 8000 tons of ore per day by the block caving method.

There was a brief shut-down of mining operations in 1921. Operations were again shut down during the depression between 1933 and 1937.

In 1938 the first unit of a modern precipitating plant was placed in operation. The plant has now expanded to six units which handle 2000 gallons of solution per minute, from underground workings and waste dumps.

During 1948 it was decided to mine the remaining ore by open pit methods. The Isbell Construction Company stripped waste from the Pearl Handle Pit under contract from 1948 to 1952. First ore was mined by open pit methods in 1950. The capacity of the Mill at Hayden was increased to 15,000 tons a day. A new Crushing Plant was built at Ray to handle the pit ore. Ore from the pit was gradually increased and from the underground mine decreased, until February 1, 1955, when underground mining was discontinued.

To increase recovery of non-sulphide copper in the ore, a Leach-Precipitation-Flotation Plant (L-P-F Plant) has been built at Hayden at a cost of over \$5,000.000. This involves a special flotation section for recovery of previously rejected pyrite. This is roasted to produce sponge iron and sulphuric acid. The acid is used to leach the ore in the Mill feed and remove the soluble copper which is then precipitated on the sponge iron and recovered by flotation.

During 1956, work was started on an expansion program to increase production capacity to 22,500 tons of ore a day. A new Smelter is being constructed at Hayden to treat the concentrates which have previously been treated by the American Smelting and Refining Company.

Reference: Ransome - U.S.G.S. Professional Paper #115  
1919, 1923

Notes from Mr. Leroy Hoyt



# ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

EVAN MECHAM, GOVERNOR  
GERALD H. TELETZKE, PH.D., DIRECTOR  
Rose Mofford, Acting Governor

## JOINT NOTICE OF PROPOSED ACTION

by the

U. S. Environmental Protection Agency  
Region 9 (W-5-1)  
215 Fremont Street  
San Francisco, CA 94105

Telephone: (415) 974-8105

On Application for National Pollutant  
Discharge Elimination System (NPDES)  
Permit to Discharge Pollutants to  
Waters of the United States

State of Arizona  
Department of Environmental Quality  
2005 North Central Avenue-Room 202  
Phoenix, AZ 85004

Telephone: (602) 257-2270

On Application for Certification  
for Compliance with Applicable  
Effluent Limitations and  
Appropriate Requirements of the  
State of Arizona

The Environmental Protection Agency (EPA), Region 9, San Francisco, California, and the Arizona Department of Health Services (ADHS) are jointly issuing the following notice of proposed action under the Clean Water Act (CWA).

The Environmental Protection Agency, Region 9, San Francisco, California, has received a complete application for a National Pollutant Discharge Elimination System (NPDES) permit and has prepared tentative determinations regarding the permit.

On the basis of preliminary review of the requirements of the Clean Water Act, as amended, the implementing regulations, the Regional Administrator, Region 9 Environmental Protection Agency, proposes to issue an NPDES permit to discharge to the following applicant, subject to certain effluent limitations and special conditions.

Public Notice No. 7-88-AZ

April 4, 1988

ASARCO - Ray Unit  
P. O. Box 8  
Hayden, Arizona 85235  
NPDES Permit No. AZ00000035



*The Department of Environmental Quality is An Equal Opportunity Affirmative Action Employer*

The applicant is the operator of the wastewater treatment plant which will serve the ASARCO - Ray Unit mine near the town of Kelvin. The discharge consists of treated domestic wastewater and mine drainage. The discharge, at latitude 33° 09' 29" N, longitude 110° 58' 40" W, will be to Mineral Creek, eventual tributary to the Gila River above the Anhurst-Hayden Dam. The Gila River above the Anhurst-Hayden Dam has protected uses of Aquatic and Wildlife, Full Body Contact, Agricultural Irrigation and Agricultural Livestock Watering. The proposed permit contains effluent limits for Suspended Solids, pH, Arsenic, Boron, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Selenium, Silver, Zinc, Phenolics, and Sulfides. The permit will expire five years after it becomes effective.

The State of Arizona is considering a request to certify the discharge described above, pursuant to Section 401 of the Clean Water Act. The certification will set forth any limitations and monitoring requirements necessary to assure compliance with water quality standards under Section 303, areawide waste treatment management plans under Section 208(e), effluent limitations under Sections 301 and 302, standards of performance under Section 306, or prohibitions, effluent standards or pretreatment standards under Section 307 of the CWA, and any other appropriate requirement of State law.

The State may certify a draft permit and specify conditions which are more stringent than those in the original draft permit, where the State finds such conditions necessary to meet the requirements of the CWA. For each more stringent condition, the certifying State agency shall cite the CWA or State law references upon which that condition is based. Review of appeals of limitations and conditions attributable to State certification shall be made through the applicable procedures of the State.

The Administrative Record, which includes the application, draft permit conditions and other relevant documents, is available for public review Monday through Friday from 9:00 a.m. to 4:00 p.m. at the EPA address below. A copy of the draft permit and other pertinent documents may be obtained by calling or writing to the addresses below.

Persons wishing to comment upon or object to the proposed determinations or request a public hearing pursuant to 40 CFR 124.12 should submit their comments or request in writing within thirty (30) days from the date of this notice, either in person or by mail to:

U. S. Environmental Protection Agency  
Region 9 (W-5-1)  
Attn: Andrew Lincoff  
215 Fremont Street  
San Francisco, CA 94105

State of Arizona  
Department of Environmental Quality  
Attn: Wayne H. Palsma - Room 202  
2005 North Central Avenue  
Phoenix, AZ 85004

Telephone: (415) 974-8284

Telephone: (602) 257-2270

All comments or objections submitted within thirty (30) days from the date of this notice will be considered in the formulation of the final determinations regarding the application. If the response to this notice indicates a significant degree of public desire for a public hearing, the Regional Administrator shall hold one in accordance with 40 CFR 124.12. A public notice of such hearing will be issued at least thirty (30) days prior to the hearing. A request for a public hearing shall be in writing and shall state



RAY (+) PINK

AMC

LC



## ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Fife Symington, Governor

Edward Z. Fox, Director

### NOTICE OF THE PRELIMINARY DECISION TO MODIFY AN INDIVIDUAL AQUIFER PROTECTION PERMIT

Pursuant to Arizona Administrative Code, Title 18, Chapter 9, Article 1, the Director of the Arizona Department of Environmental Quality intends to modify an individual Aquifer Protection Permit of the following permittee:

Public Notice No. 127-93 AZAP  
ASARCO Incorporated- Ray Complex,  
Elder Gulch Tailings Impoundment  
ASARCO Incorporated  
P.O. Box 8  
Hayden, Arizona 85235

On or about  
Nov. 24, 1993

Aquifer Protection Permit No. P-102278

The site is located in and north of Kearny, Arizona in Pinal County, over groundwater of the Lower San Pedro Basin in Township 3 S, Range 13 E, Section 36, -Gila and Salt River Base Line and Meridian. Latitude 33° 09' 29" North and Longitude 110° 58' 40" West.

Aquifer Protection Permit No. P-102278 was issued to ASARCO Incorporated on September 25, 1991 for the operation of the Elder Gulch tailings impoundment and related facilities. Included in the permit is a compliance schedule that requires ASARCO to submit an application for an individual Aquifer Protection Permit for the remainder of the operations at the Ray Complex (formerly the Ray Unit and the Hayden Unit) subject to the Aquifer Protection Permit program by December 25, 1993.

Due to the heavy winter rains and flooding of the Gila and San Pedro Rivers in December, 1992 and January and February, 1993 two groundwater monitor wells located in the floodplain of the Gila River were destroyed or covered over with sediments preventing the permittee from collecting three consecutive monthly samples from the two wells. The data collected from these wells is to be included in the Aquifer Protection Permit application to establish groundwater alert levels and aquifer quality limits. The permittee has requested that the compliance schedule to submit the application be extended for three months to allow for the collection of the groundwater samples that were not collected due to the floods.

The Arizona Department of Environmental Quality intends to grant the request and extend the compliance schedule until March 25, 1994.

The permit modifications and related materials are available for public review Monday through Friday 8:00 a.m. to 5:00 p.m. at the Arizona Department of Environmental Quality, Plan Review and Permits Section, 3003 N. Central Avenue, 5th Floor, Phoenix, AZ 85012.

Persons may submit comments or request a public hearing on the proposed action, in writing, to Ed Pond, Plan Review and Permits Section, Arizona Department of Environmental Quality, at P.O. Box 600, Phoenix, AZ 85001-0600 within thirty (30) days from the date of this notice. Requests for a public hearing must include the reason for such request.

KAT (1)  
make & file 50  
10/15

# ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

ROSE MOFFORD, GOVERNOR  
RANDOLPH WOOD, DIRECTOR

NOTICE OF INTENT TO ISSUE AN  
AQUIFER PROTECTION PERMIT(S)

Pursuant to Arizona Administrative Code, Title 18, Chapter 9, Article 1, the Director of the Arizona Department of Environmental Quality intends to issue an Aquifer Protection Permit(s) to the following applicant(s), subject to certain special and general conditions.

Public Notice No. 13-90AZAP  
Elder Gulch Tailings Facility/  
Ray Concentrator

On or about  
July 21, 1990

ASARCO Incorporated  
180 Maiden Lane  
New York, NY 10038

Aquifer Protection Permit No. P-102278

The proposed permitted facility is located in Pinal County, approximately 3 miles southeast of the existing Ray Mine, seven miles northwest of Kearny and is over groundwater of the Middle Gila River (GSK) Basin. The proposed permitted facility consists of temporary containment areas for tailings slurry, tailings thickeners, and a tailings impoundment in the Elder Gulch Drainage. The permittee will deposit processed ore wastes (tailings) at an average rate of 27,000 tons per day (tpd) and a maximum rate of 65,400 tpd in the Elder Gulch Tailings Impoundment. The operational life of the tailings pond is expected to be 25 years, with an approximate total tailings deposition of 250,000,000 tons by dry weight. The temporary containment areas and tailings thickeners shall be constructed and operated as non-discharging. The tailings impoundment is designed to minimize the amount of seepage from the tailings solution into the aquifer.

To verify efficacy of design, Aquifer Water Quality point of compliance wells at the perimeter of the tailings dam will monitor quarterly for the indicator parameters pH, specific conductance, temperature, and total dissolved solids, and sulfate; and annually for chromium, copper, lead, silver, selenium, and the major anions and cations. Two other point of compliance wells approximately 2500 feet downgradient of the dam will monitor quarterly for the indicator parameters and annually for the major cations and anions.

If monitoring alert levels are exceeded at a point of compliance, corrective actions may include: installation of new monitor wells and/or low capacity dewatering wells; operational or design changes to minimize future discharge; an investigative program to ascertain the degree and extent of seepage causing the problem; implementation of a secondary

*The Department of Environmental Quality is an Equal Opportunity Affirmative Action Employer.*

seepage control system consisting of an array of interceptor wells.

Final closure plans will be approved prior to closure. Preliminary closure plans include capping the pond with a eighteen inch layer of fine waste rock; a diversion ditch dug at the intersection of the watershed drainage and the tailings pond to prevent runoff from collecting on the closed pond; draining and monitoring the drainage collection pond until drainage has stopped. The length of post closure groundwater monitoring necessary will be determined after completion of closure.

The permit and related material are available for public review Monday through Friday, 8:00 a.m. to 5:00 p.m. at Arizona Department of Environmental Quality, Water Permits Unit, 2005 North Central Avenue, Phoenix, Arizona 85004.

Persons may submit comments or request a public hearing on the proposed action, in writing, to ADEQ at the above address within thirty (30) days from the date of this notice. Public hearing request must include the reason for such request.



## The Ray Orebody

### Foreword.

The geology of the area was first described by Ransome in 1919, later revised by him in 1923 in U.S.G.S. Professional Paper #115. It is a wonderful piece of work that still remains essentially correct. Valuable contributions to the Ray geology were later made by Spurr and Cox (private report, July 1909), C. L. Hoyt (private report, 1938) and Otis M. Clarke, (Arizona Geological Society Guidebook, 1952).

In the present work, the constant supervision of Mr. Donald D. Smythe, his continued advice and personal study of the deposit have largely increased our knowledge on the major structures with, as a result, a substantial increase in ore reserves.

The progressive policy observed by Mr. A. P. Morris, General Manager, keeps pace with the geological work by a well-planned and systematic drilling program, well worth mentioning.

---

### Location.

Ray is located at the foothills of the Dripping Spring Mountains on Mineral Creek which flows South into the Gila River.

---

Geology. 1. Stratigraphy

The Stratigraphic sequence is first reviewed and the most important rocks are here briefly described. The basement consists of the Pinal Schist, old pre-Cambrian in age and contemporary to the Vishu Schist in the Grand Canyon. The formation generally shows a northeast-southwest schistosity, dipping to the NW from 30 to 60 degrees. Many local folds are observed in this formation which is composed of metamorphosed sedimentary rocks, generally showing an alternation of shaly and quartzose layers, and of intrusive rocks like rhyolite and what is locally called "amphibolite-schist".

The color of the Pinal Schist is generally gray with a bluish hue outside of the mineralized area turning naturally into different shades of brown within it.

The Apache group unconformably overlies the Pinal Schist and is also pre-Cambrian. The lower part of it is mainly composed of the Pioneer formation, generally a shale, the Barnes conglomerate, and the Dripping Spring quartzite. These rocks show in the vicinity of Ray a regional trend slightly east of north with a low dip, 10 to 20 degrees eastward.

The Pioneer formation, the Dripping Spring quartzite, and the Pinal Schist are at times quite difficult to differentiate, be it in the field on the surface geology, or in the examination of drill-core.

The tan-colored Mescal limestone is next in the sequence and is often seen in conjunction with dark brown basaltic flows that covered it.

The Troy quartzite, Cambrian in age, follows.

All these formations are abundantly found East of Ray.

The Martin, Escabrosa and Naco limestones of Paleozoic age occur only on the top of the Dripping Spring Range and do not appear near the orebody.

Long before Laramide time, heavy faulting occurred and incompetent rocks such as the Dripping Spring quartzite, were broken and fractured. Diabase was intruded shortly after, lifting the separate masses of quartzite and filling all existing fissures.

A specific fracture trending NNW and SSE with a dip of 45 degrees to the East has been filled with diabase: it is now conspicuously visible in the pit. To the East of Mineral Creek there is considerable diabase, some existing as sills between members of the Apache group and other portions underlying the whole series as an extensive mass. Another series of irregular fractures exhibit the same trend but they occur more vertically; in this group we have the Ray fault and the Mineral Creek fault.

Porphyry next intruded the area. The Teapot Mountain porphyry came first, exhibiting well formed feldspar and quartz phenocrysts, and it was followed by the Granite Mountain porphyry. It appears that this latter porphyry forced its way through fractures that trend in an opposite direction to those previously noted;

it is found along a NE-SW trend irregularly intruded but it also shows here and there as small stocks.

One interesting observation is the fact that the Teapot Mountain porphyry occurs North of an East-West line passing approximately through the pit, while the Granite Mountain porphyry definitely shows South of that line. Copper mineralization occurred simultaneously or slightly after the intrusion of the Granite Mountain porphyry.

After a presumably long interval of time, during which erosion and also secondary enrichment occurred, the country was covered by tertiary flows, tuffs, and conglomerates: Whitetail conglomerate, dacite flow, Gila conglomerate, then tuffs and volcanic breccias.

These are the main formations that we encounter in and around the Ray orebody.

## 2. Structure.

A major fault zone, particularly complex near Ray, extends along Mineral Creek exhibiting a Northwest-Southeast trend. It seems to show an en-echelon pattern with successive downthrows to the East, almost all steep.

The movement along this major fault area has been estimated by Ransome, Cox and Spurr, to amount to 1500 ft. and even 2000 ft. It started before Laramide time with a relative downthrow of the east block, later alternated with an upthrow and finally with a renewed and important downthrow again of the eastern area.

Recent Tertiary movement is well shown by the conspicuous offset observed in the dacite flow: some remnants occur on the Teapot Mountain to the Northwest at 4400 ft. elevation while a larger mass of dacite occurs near town (best seen at the bridge) at 2050 ft. elevation and more. Another obvious indication of this large offset is obtained from a look at the geologic map. It shows a solid area of Pinal schist west of the fault zone without any of the later sediments. This contrasts with later sediments found to the east, ranging from the Cambrian up to the Tertiary.

It is worth mentioning that while the west block has been disturbed relatively little, the eastern one shows a broken assemblage of formations that Ransome justly calls a mosaic. It is fortunate that stratigraphy can partially assist in deciphering this jumble; the Barnes conglomerate is of particular help here as a faithful and conspicuous marker.

The orebody, and particularly its limits, is largely controlled by structural factors. To the west, the West End fault appears definitely to indicate a structural termination. To the north the situation may be similar. The southern limit seems to be indicated by a rather sharp fade-out. Similarly to the east we are inclined to believe in a gradual fade-out beyond the fault zone.



The orebody can thus be represented roughly on a map by an irregular ellipsoid 8000 ft. long and 1500 ft. wide elongated along a direction east-west. This does not mean that this is a solid ore body: for instance, between the old Pearl Handle pit and the West pit the intervening hill, that is now being gradually stripped away, is almost all waste. The west block contains three major coordinate faults almost at right angle. Whenever they cut through the ore body there is no large offset in the latter.

It will be difficult for a long time to determine for certain which are the faults that pre-date or post-date mineralization; most of them probably antedated mineralization then recurrence of movement during and/or after mineralization blurred the whole picture.

Without any doubt the later fault movements have influenced the supergene orebody: for instance, the oxidation zone in the eastern block is much deeper than in the western zone because the water-table has followed the downward movement of that bloc.

A major structure observable in the pit is an over-thrust fault oriented N20W, dipping 15 degrees East. This truncated the main diabase dike, displacing its upper body toward the west; no remnant of the upper body has been found yet as it is probably all eroded. The lower body has been dragged close to the fault and extends irregularly toward the west as an elongated tongue.

The westward displacement along this thrust fault is indicated in section by an offset (known from drill-hole data) of parts of the porphyry mass existing east of the pit. The amount of displacement might amount to a few hundred feet.

### 3. Mineralization.

The three formations seen in the pit are the diabase, a dark-gray color, the schist ranging from a light pink to a reddish brown and the porphyry often lighter in color.

Hypogene mineralization occurs more conspicuously in the diabase under the form of chalcopyrite and pyrite. The rock is fractured and broken, although fine-grained and dense. It is hard to break, hard to drill and hard to crush; however it crumbles easily by disintegration after a few months of exposure in the air. A hammer blow breaks it along pre-existing fractures and each new blow breaks it along more tiny fractures all of which are mineralized. This mineralization does not extend far away from the fracture, perhaps a tenth or 2 tenths of an inch. It is not truly disseminated therefore, and it could better be called reticulated for example, as E. N. Pennebaker labeled it (verbal communication).

It is difficult to distinguish chalcocite in this dark rock and the amount of supergene enrichment is now well known.

The schist in the pit usually shows chalcocite as copper mineral either as tiny specks or as veinlets. This is understand-

ably secondary because we are still in the supergene zone.

In the schist also, we can detect the same "reticulation" in mineralization as noticed in the diabase.

The porphyry in the pit shows chalcopyrite, pyrite and secondary chalcocite; much of the chalcopyrite and the pyrite have indeed been already replaced.

Gold and silver in minute quantity accompany the copper minerals with some molybdenum.

Native copper has been one of the copper minerals frequently found in the Ray ore zones. Cuprite sometimes under the form of chalcotrichite with its delicate hairlike crystals, is also abundant in places.

#### 4. Alteration.

Little hydrothermal alteration as such seems to have affected the diabase. The schist, on the other hand, exhibits much more alteration although less than at other mines, such as Chino, etc. Sericitization is the main phenomenon and it occurs generally along with mineralization; it is well displayed in the whole western portion of the Pearl Handle Pit. Some silicification mainly along faults also shows at places. It has been repeatedly observed in field specimens from the pit and outside, that a small bleached zone of sericitization occurs on either side of pyrite veins but the phenomenon does not occur along quartz veins.

Another type of alteration connected with thermal metamorphism is seen in the pit west of the diabase: this is the occurrence of larger masses of a siliceous rock quite sericitic, grayish and fine-grained, occasionally still showing remnants of schistosity. It breaks, however, like diabase with a similar occurrence of mineralization, often then having a darker grayish color.

Two such occurrences have been found. One shows in the diabase, near its underface, north of the pit, where it looks more like a stoped mass of schist in the diabase. The other, quite extensive, shows on the west side of the pit below but adjacent to the diabase. The occurrence seems in this case to be more of a transitional type. The color is generally light gray, sometimes whitish gray showing a marked contrast with the dark diabase to the east and the brown reddish schist further west. Thin sections made from this rock showed it to be a sericitized quartzite.

The porphyry, mainly found east of the pit, displays some alteration mainly in the plagioclase feldspars. It has a pinkish appearance and shows well-formed biotite books, shiny and well crystallized. Here too, we see that along pyrite veinlets there is a bleached sericitized band on either side. These bands are wider here than in the schist, often 1 or 2 inches wide in total. The color becomes creamy-tan.

To the south of the pit we also find a transitional zone between schist and porphyry this time where the two rock characteristics have been blended together.


---

5. Origin of the Ore.

There is much speculation about this question. It appears, however, that one of the small stocks of Granite Mountain porphyry is much more broken and shattered than others; it is located east of the present pit and on the Ray fault within the ore body.

A well shattered porphyry stock in the middle of a heavy fault zone, accompanied by a general rustiness of the rocks in the area, seems a valid criteria for good porphyry copper. The presence of diabase, as is seen in other mines of the vicinity, is an additional favorable factor influencing the orebody.

---



J. Wertz

(Paper presented at the Spring Meeting AIME, Geology Division, Ray, Arizona on April 12, 1958).



RAY FILE, FINAL 6  
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Fife Symington, Governor

Edward Z. Fox, Director

**NOTICE OF THE PRELIMINARY DECISION TO MODIFY AN  
INDIVIDUAL AQUIFER PROTECTION PERMIT**

Pursuant to Arizona Administrative Code, Title 18, Chapter 9, Article 1, the Director of the Arizona Department of Environmental Quality intends to modify an individual Aquifer Protection Permit issued to the following permit:

Public Notice No. 16-95AZAP

On or about: May 10, 1995

✓ ASARCO Incorporated - Ray Complex,  
Elder Gulch Tailings Impoundment  
ASARCO Incorporated  
P.O. Box 8  
Hayden, AZ 85235

Aquifer Protection Permit No. P-102278

The site is located in and north of Kearny, Arizona in Pinal County, over groundwater of the Lower San Pedro Basin in Township 3 S, Range 13 E, Section 36, - Gila and Salt River Baseline and Meridian, Latitude 33° 09' 29", North, Longitude 110° 58' 40" West.

Aquifer Protection Permit No. P102278 was issued to ASARCO Incorporated on September 25, 1991 for the operation of the Elder Gulch tailings impoundment and related facilities. The permit was modified on January 4, 1994 to extend the Aquifer Protection Permit application submittal date for the remainder of the Ray Complex operations by 3 months. ASARCO has met this submittal date.

As the Elder Gulch tailings impoundment rises in elevation, a tailings booster pump is required at the 2,200 foot elevation along with an emergency temporary containment pond at the 2,100 foot elevation. The permittee has requested a modification to the Elder Gulch APP to allow the construction of the tailings booster pump station and associated emergency temporary containment pond.

The facility will consist of a pump station, an auxiliary control building, and a lined emergency temporary containment pond. The pump station will consist primarily of an above ground concrete sump, associated tailings slurry pipelines, and slurry booster pumps. The booster pump sump will be constructed above grade of water-tight concrete to collect the tailings slurry from the primary pump station for feed to the booster pumps. The emergency temporary containment pond will be constructed with 60 mil HDPE liner over 12 inches of prepared, compacted, fine-grained soils and will be able to contain 3 pipeline volumes with 1 foot of freeboard. The pond will have a capacity of 260,000 gallons but will only see fluids in

the event of an emergency shut down of the booster pumps and is designed to contain 3 sequential shutdowns. The facility will have the capability of removing free fluid from the pond within 24 hours of discharge to the pond. Provision for manual clean out of solids from the pond has been incorporated into the design by inclusion of a concrete front end loader ramp and pad overlying the HDPE liner. No long term storage of solution is proposed. Only tailings slurry and direct precipitation will access the pond, all stormwater runoff from the proposed facilities will be captured and recycled in previously permitted containment areas.

The technical materials are available for public review Monday through Friday 8:00 a.m. to 5:00 p.m. at the Arizona Department of Environmental Quality, 3033 N. Central Avenue, 4th Floor, Phoenix, AZ 85012

Persons may submit comments or request a public hearing on the proposed action, in writing, to Michael Wood, ADEQ, at 3033 N. Central Avenue, Phoenix, AZ 85012 within thirty (30) days from the date of this notice. Public hearing request must include the reason for such request.

For further information contact Michael Wood, Environmental Program Specialist, Aquifer Protect Permit Program, Arizona Department of Environmental Quality at (602) 207-4585.

MEMBERS NEW YORK STOCK EXCHANGE  
MEMBERS BOSTON STOCK EXCHANGE  
MEMBERS NEW YORK COTTON EXCHANGE  
MEMBERS CHICAGO BOARD OF TRADE  
CABLE ADDRESS "HAYSTONE" NEW YORK

HAYDEN, STONE & Co.  
25 BROAD STREET  
NEW YORK

BOSTON OFFICE, 87 MILK STREET  
PORTLAND, ME. OFFICE, 194 MIDDLE ST.  
NEW HAVEN OFFICE, CENTER ST.  
DETROIT, MICH. OFFICE, 116 GRISWOLD ST

July 9, 1909.

W. R. Defty, Esq.,

Phoenix, Ariz

Dear Sir:

We enclose herewith copy of a circular recently issued by the Ray Consolidated Copper Company to its shareholders, and also a circular which we have issued on the Gila Copper Company. The holdings of these companies are adjoining properties.

We are able to vouch for the accuracy of the statements contained in the Ray Consolidated circular, a perusal of which furnishes the most convincing testimony that this is destined to become one of the world's biggest producers of the red metal.

The shares of Ray Consolidated are today selling at around \$17, and we are strongly of the opinion that about one year hence they will have practically doubled in value, for which reason we strongly advise their purchase.

It is yet too early to discuss with any degree of accuracy along the same lines the Gila Copper, which we believe, however, will render an excellent account of itself. The location of this property would indicate that it will be found to contain an enormous ore tonnage.

We think very well indeed of the shares of the Chino Copper Company and are not hesitating in recommending their purchase around \$8, the present selling price. We believe this stock will rise considerably higher during the current year.

We issue a weekly market letter, and if desired will enter your name on our list that it may reach you regularly. We will be glad to advise you from time to time regarding the above or any other mining stocks, their prospects, outlook, etc, while in the event of your entering the market, we should be pleased to be favored with the execution of your orders.

Yours truly,

SJB-EM

*Hayden, Stone & Co*  
*B*

September 24, 1957

TO: Mr. Frank P. Knight, Director  
FROM: Lewis A. Smith, Field Engineer  
Subject: RAY CONSOLIDATED MINE, Ray, Arizona  
KENNECOTT COPPER CORPORATION

The new Ray pit is progressing nicely and while it maintains a 2.25 to 1 stripping ratio, ore production is being maintained at a rate of 15,000 tons. Waste is being removed at the rate of 35,000 tons. The operation is handled by means of eight 4 to 6 yard shovels which are rotated at the basis of 3-4 shovels per shift. The average waste haul is about 1-1/3 miles, but ranges from 1 to 2 1/2 miles, and the ore haul averages 1.2 miles. Adverse grades up to 8 percent, but usually about 6%, are common within the pit, but they flatten out on the dumps. The shovels are covered at the rate of 5-6 trucks depending upon the length and steepness of the haul. Standby trucks make a shift in the coverage rate when it is required. The trucks are mostly 35-ton Euclids, but a few 50-ton trucks are being used successfully.

The ore is blasted at a rate of 5.9 to 7.0 tons per pound of powder, but Bomar (Assistant Pit Supt.), does not expect this to continue since the pit is approaching broken ground overlying the old block-caving section. Here the secondary blasting will be excessive and primary breakage will be hindered by cracked ground. The solid ground breakage is in excess of that obtained in most established pits. The average in several of these is about 4.5 to 1, given average rock character.

The first shovels purchased were Bucyrus-Erie but the last two new ones are P & H shovels. The last of the P & H shovels is electronically controlled by push button and is very smooth in every way. There appears to be no jerk at any stage of the loading operation, even when the dipper enters a bank or lifts a load. Bomar feels that it will require much more time to tell how this shovel will stand up. Of course the ability of the operators will have much to do with the life of the shovels.

The average ore grade varies 0.85% up to 1.00% Copper. There is much variation in the grade on the different benches. The present cutoff is around 0.40% copper even though lower material is used, provided there is equivalent "sweetener" available for the blending. As yet the pit has not reached its potential.

The operation is on a six day basis with day's pay men working five days. A swing crew permits them to carry the sixth shift.

Mr. Jacques B. Wertz is now the chief geologist.

Considerable leveling and road building, incident to a new township, is being done by Isabel Construction, including the diversion of the main creek

and some lesser ones.

The leaching operations are producing about 5 cars of cement copper per week. This material runs about 86-87% Copper and precipitation is done by means of shredded tin cans.





STATE OF ARIZONA  
DEPARTMENT OF MINERAL RESOURCES  
MINERAL BUILDING, FAIRGROUNDS  
PHOENIX 7, ARIZONA



February 8, 1962

Kennecott 1961

Rhenium metal from Moly concentrate - Important in missile program and in low temperature power generation.

Over 60 million spent at Ray-Hayden development on Abe Morris' say-so. Spending 1.5-2 million this year in Tucson area explor. Total of about 5 million being spent by all Companies in this area this year.

Total of 200 million spent in recent expansion and integration programs by Kennecott.

FPK

SPEECH

delivered by

A. P. MORRIS

before

ARIZONA COUNTY SUPERVISORS AND CLERKS

at

GLOBE, ARIZONA

May 18,, 1961

During the next 20 minutes I hope to accomplish the near-impossible. I am going to try to make you remember something that much of Arizona has spent years forgetting.

That is the importance of the mining industry to Arizona: Its importance in the past; its present importance; and its importance to the future growth of our great state.

The history of mining in early day Arizona is a fascinating study -- at least to me. I have just finished reading a book called "Rock to Riches", written by Charles H. Dunning and Edward Peplow Jr. It added to and refreshed my knowledge of some of those colorful early days, and I shall rely upon it for much of my presentation of facts and figures from those early days. The stories in this book -- and its title -- are symbolic of our state. There was nothing much but rock in Arizona when the first miners visited the territory. But the courage and the fortitude of those mining men literally wrenched riches from this rock. True, not very many of the pioneer miners found riches for themselves, but in their search for silver and gold, they opened the doorway to all of Arizona's riches for those of us who have followed them.

Mining exploration in Arizona began nearly three hundred years ago. Urged on by the tales of the Indians, the Spanish in Mexico searched throughout the southwest for the fabled cities of gold.

In 1582, one Don Antonio De Espejo traveled north along the Rio Grande River, then west into Hopi Indian country. He prospected south of San Francisco Peaks and found a rich copper-silver deposit which he could not work because of lack of equipment.

The exact location of this discovery is not known. But there is little mineralization south of the San Francisco Peaks until near the Verde River. Many years later, a prominent outcrop along the Verde was discovered and developed into the United Verde Mine at Jerome. It is possible that this mine at Jerome -- which later yielded more than a billion dollars worth of copper, silver and gold -- was actually the first mine discovered in Arizona, by Senor Espejo.

For the next 150 years there was little mining activity in Arizona. The mines in Mexico itself were richer and more convenient to operate.

In 1736, prospectors searching the desert near Nogales made a discovery that was to rekindle interest in mining in southern Arizona, but nothing of lasting value.

In 1750, prospectors from Mexico found what they thought to be silver ore some 100 miles west of the missions along the Santa Cruz. They found with it a zesty plant which appealed to their taste. However, they left the area when their "silver ore" turned out to be nothing but copper. They also left a name for the area, the name of the plant they found there. They called it ajo -- we call it garlic.

Between the time of the Gadsden Purchase in 1854 and the Civil War, many of Arizona's present day towns and cities were founded as mining camps.

These included Ajo, Tubac, Patagonia, settlements along the Hassayampa River, Wickenburg, Prescott -- and incidently, the Prescott claims directly influenced the future growth of Phoenix. Two of the men most active in Prescott were George and David Lount. The Lount brothers also dabbled in real estate and much of the present downtown Phoenix area was once owned by the Lounts.

Other camps sprung up at Kingman, Humboldt, Ehrenburg, La Paz -- some of the camps along the Colorado became shipping points for ore from the interior of the state.

The miners were followed by many people -- and not just the type known as camp followers, although of course, they were there too.

I'm speaking of a much more substantial and respected group, particularly the merchants who stayed on to help build the communities in which they settled. The Steinfelds and the Jacomes, and the Haydens and the Goldwaters. Charles Trumbull Hayden came to Arizona from Santa Fe. He stated to serve the southern part of the state -- and to give to Arizona its senior Senator, Carl Hayden.

Michael Goldwater established a trading post at Ehrenburg. He ran wagon trains through hostile Indian territory to carry supplies to mining camps in Prescott, and established trading posts wherever they were needed. Some of this family's trading posts are still doing remarkably well -- in Phoenix and in Scottsdale. His grandson, Barry, is doing pretty well for himself -- and for Arizona too.

Following the Civil War, many more Arizona towns were started as mining camps. Most of the mines that gave life to these towns began as silver producers. Only a few copper mines were worked in those days, and then only if they had high grade surface deposits and a very high silver content.

Some of the towns developed in the post-Civil War period were Bisbee, Clifton, Morenci, Globe, Ray, Jerome, Superior, Florence and, of course, Tombstone.

Earlier I spoke of some of the pioneer merchants who followed the miners into the Arizona territory. During this period many of them became even more closely identified with mining. Many of them grubstaked miners for a share in their claims. Others bought and sold mining claims. One of these men was Louis Zeckendorff, a family name familiar to most of you, I am sure, and to nearly every one on Wall Street. At one time or another, Zeckendorff owned many of what became the great Arizona copper mines, including those at Bisbee and Ray.

Rickard's 'History of Mining' states, "In the early seventies, Louis Zeckendorff and Albert Steinfeld, merchants of Tucson, were attracted by some copper deposits in Pinal County on Mineral Creek.....and they spent a considerable sum of money in

developing these prospects which were sold to an English company in 1898." I am particularly interested in that bit of history since the mines in question now are a part of Kennecott's Ray Mines Division.

Another feature of mining in this post-Civil War period was its attraction to Arizona of eastern brains and capital. Dr. James Douglas, superintendent of a copper treatment plant in Pennsylvania, was asked to come to Arizona to help develop recovery processes at the Bisbee mine. On his way to Bisbee, he stopped off at the United Verde at Jerome. Dr. Douglas became a part of Arizona history and his son, Lewis, has made history himself as budget director for Franklin D. Roosevelt and Ambassador to the Court of St. James' under President Truman.

Much eastern money was attracted to Arizona during this period by the mines, particularly to the Clifton-Morenci properties and the many mines at Tombstone.

The brains and money brought to Arizona originally by the mines have done much to help develop our rocky desert into a rich state.

Until the 1880's, silver was king in Arizona, but copper was soon to overthrow it.

Full utilization of Arizona's vast copper deposits was delayed because of lack of transportation, lack of demand and lack of needed equipment. Until the 1880's only the highest grades of copper could be mined at a profit.

But two things happened in the last 20 years of the 19th century that left a lasting impression on the economy of the state.

First, the railroads came to Arizona. And, second, the growing use of electricity created a new demand for copper.

It would not be fair to state that the copper mines alone brought the railroads to Arizona. But I think it is a fair assumption that even if there had been no other factors involved, the increased demand for copper alone would have forced a decision to extend the railroads into Arizona. At any rate, in 1880 the Southern Pacific completed its line through Tucson and in 1882 the Atlantic and Pacific (later the Santa Fe) was completed through the northern part of the state.

The railroad opened the way for the development of lower grade copper ores. Not only did rail transportation cut the cost of shipping the ores, but it made it economically possible for the mines to ship in the latest type of equipment needed to produce copper from the lower grade ores.

Many mines laid their own spur lines to the main lines of the S. P. and the Santa Fe, thus linking many of the cities of Arizona together for the first time and opening new potentials for growth for all of them. Many a city which today boasts that it is located on a railroad owes its good fortune to the mining companies that first built those railroads.



The post Civil War period and the early 1900's marked the beginning of a more settled economy in Arizona. Until then, many mines were discovered. The surface deposits were quickly extracted, and the mines -- and the mining camps -- vanished from the scene.

But as the mines were able to bring in modern equipment and develop large underground deposits of low grade ore, a certain stability was brought into the economy. Most of the mines were there to stay for many years and the townspeople and merchants and supporting industries could make their permanent plans accordingly.

There have been many changes in mining since the turn of the century. The industry has weathered a great depression and has proved itself indispensable to our nation's defense in two great wars.

During those early days, mining almost single handedly brought the industrial revolution to a barren desert. It helped bring in the railroads. It brought the best mining engineers and scientists from the east to Arizona. It brought in the merchants who made family life in the wilderness bearable. It attracted capital from the eastern states to help build the industry.

And it made bankers all over the United States aware of the opportunities for investment in Arizona.

It is not usually remembered now, but mining even helped bring natural gas to Arizona in later years. Phelps Dodge helped build the first pipe line into Douglas to bring in natural gas for use in its smelter. That line was later extended to Tucson and Phoenix and other communities in the state.

Robert Page, President of Phelps Dodge, pointed out recently in Phoenix that the mines have even contributed to the development of farming and irrigation interests in the Salt River Valley.

Mr. Page recalled that "one of the six major water storage reservoirs of the Salt River Project was constructed by and at the expense of Phelps Dodge in exchange for the first 250,000 acre feet of water developed by this reservoir." A lot of water has passed over Horseshoe Dam -- much more than 250,000 acre feet -- and all of it now goes to the Salt River Project for distribution throughout the Salt River Valley.

Today more than 16,870 families in Arizona owe their livelihoods directly to mining. National statistics show that for every job in a basic industry, four jobs are created in allied or service industries. Those statistics are based on a national average. But since the mining industry in Arizona is not able to purchase all of its equipment from local suppliers, much as it would like to, I will use a figure of three created jobs for every job in mining. That means that the total number of families in Arizona dependent on mining directly or indirectly is about 67,000. Using a conservative three persons per family as the average, that brings the number of persons in Arizona directly or indirectly dependent upon the mining industry to a total of more than 190 thousand.

During all of its years of mining, Arizona has produced more than seven million ounces of gold, 215 million ounces of silver, 16 million tons of copper, 476 thousand tons of lead, and 511 thousand tons of zinc. The value of all mineral production is greater than eight billion dollars. That's a lot of money. Why that's even more money than our representatives in Congress can spend in one month! Of course, I'm speaking of an average month.

Now some people might ask, "Shouldn't we be concerned because so much of our natural wealth has been taken from the earth? Aren't the mines depleting our natural resources and leaving us nothing in return?"

Nothing could be further from the truth, and I'm going to tell you why.

First I must try to explain to you the difference between ore and waste rock. The difference is sometimes intangible.

By definition, ore is rock which bears useful minerals in sufficient quantity to make their extraction economically possible. The key word in that definition is "economically."

It is usually possible, using certain physical and chemical processes, to extract minerals from any mineral bearing rock. But if it costs more to extract those minerals than they are worth, extracting them is not economically possible.

What then determines whether rock bearing a certain percentage of mineral is worthless or whether it is a valuable ore? There are two things that have a bearing on that determination. First, of course, is the price that can be obtained from the mineral. Second is the cost of freeing that mineral from the waste rock.

If the cost is greater than the price, then you can do one of two things. You can sit around and wait for the price to rise; or you can do something -- or many things -- to cut down on the cost.

Let's go back for a moment to our friend Don Antonio Espejo who discovered the first silver mine in Arizona. Senor Espejo found that he couldn't remove that silver from the rocks and sell it at a profit. As far as he was concerned, that rock was worthless.

Yet when Don Espejo's rock was processed by the United Verde Mine -- using the most modern methods then available and equipment costing millions of dollars -- it yielded a billion dollars worth of metals.

Earlier I mentioned how Louis Zeckendorff and Albert Steinfeld sold the Ray Mines to an English concern -- Ray Mines, Ltd. When the Englishmen first became interested in working the mines their assays showed ore averaging four per cent copper. But somebody made a mistake, because they later found that the ore averaged only two per cent copper. They abandoned that mine because to them two per cent copper was worthless rock.

Today the Ray Mines Division is producing 60 thousand tons of copper a year from those same mines -- and now the ore contains less than one per cent copper. That worthless rock has become valuable ore because Kennecott has learned how to extract copper profitably from such low grade ore. AND because Kennecott has invested millions of dollars in the new plants, equipment and machinery necessary to extract copper from that ore.

So it has been with the entire mining industry in Arizona. Despite the fact that more than 8 billion dollars worth of minerals have been taken from the ground in Arizona, there are today more known ore reserves in Arizona than at any previous time in our history.

The main reason for this increase in reserves is the knowledge the industry has gained in extracting the first eight billion dollars worth of minerals, knowledge that now enables it to convert yesterday's waste materials into valuable ore for today and tomorrow.

Other reasons for the increased reserves are the improved methods and increased activity in mineral exploration.

No longer are mineral deposits found on the surface of the earth. Geologists now pick likely sites through scientific testing and confirm their guesses through expensive diamond drilling hundreds of feet below the surface of the earth.

Even after they find minerals, the problems have just begun. Usually the ore deposits lie so far beneath the surface and are so low in grade that the big problem is how to get them out economically.

And that takes money ... lots of it!

I'm sure most of you know that one of the greatest mines discovered in recent years in the United States is at San Manuel. Have you any idea how much money Magma Copper Company spent before it sold a pound of copper from its San Manuel mine? More than one hundred million dollars.!

Sinking that much money in the Arizona desert was quite a risk to take. I think you'll agree that the stockholders in Magma who were willing to take that risk are entitled to a fair return on that investment.

Which brings me to another point. What happens to the money a company receives for selling the minerals it finds, mines and processes in Arizona?

Well, much of it goes into payrolls. The approximately 16,870 men working for the mines in Arizona today earn more than \$108 million a year. In addition, it costs the mine owners another approximately 25 million dollars for employee benefits -- pension plans, health and welfare insurance payments, social security, accident insurance premiums, and so on.

Then there are the local purchases made from suppliers in Arizona, another 30 million dollars a year.

And of course there are taxes. In 1960, the mining industry paid 21 million, five hundred thousand dollars in property and production taxes alone in Arizona -- not to mention sales taxes on purchases, plus state and federal income taxes. No other single Arizona industry pays as much in taxes as the mining industry -- a whopping 22 per cent of the entire state tax load, according to the Arizona Department of Mineral Resources.

And I hope none of you is under the impression that mining is still the largest industry in Arizona. It is topped now by the manufacturing industry and the agricultural industry. In 1960, the total value of minerals produced was approximately 410 million dollars. Agricultural marketings totaled 455 million and manufacturing sales were approximately 700 million.

Much of the income from mining in Arizona is being poured back into expanded plants, more modern equipment and new developments.

Industrial development is a big thing in Arizona right now. All of us are thrilled and proud when, from time to time, we read how new industries are coming to Arizona and investing one million or two million dollars in new plants in Tucson, Phoenix, Casa Grande or elsewhere in the state.

Yet, in our eagerness to attract new industries to Arizona, are we perhaps overlooking a significant development in our oldest vital industry?

Do you realize that in the past two years Arizona's mining industry has completed or committed itself to complete an expansion program which will cost a total of -- not one or two million, or even 10 or 12 million -- but more than 100 million dollars?

That includes the expansion of the Ray Mines Division, now nearing completion; the new Million Mine under development by ASARCO, south of Tucson, an enlargement of the Lavendar Pit; new equipment at Bagdad, and development for production of Inspiration's Christmas mine between Winkelman and Globe.

It does not include the development of the Pima Open Pit and Duval operations in Pima County or the San Manuel mine, all of which began production within the past five years.

Adding together the cost of all of the mining projects which have been completed or started in the past five years, you will come up with a total of approximately 250 million dollars.

Not only has this expansion and development gone almost unnoticed, it has also been practically unsolicited by the state of Arizona and its residents.

The Governor's Committee for Industrial Arizona and the Arizona Development Board recently put together an information kit entitled "The Arizona Story", aimed at attracting industry to Arizona.

Included is the statement that, "Arizona wants new industry, hence its civic and business leaders not only are friendly toward new endeavors but also make sure that new enterprises find a healthy, progressive climate for success and expansion."

It further states, "In short, Arizona is a growing state that offers limitless opportunities to new endeavors to grow along with it. And it helps to guarantee that growth by giving industry a 'break' where it counts most."

Unfortunately many of the "breaks" which apply to new industry are not applicable at all to the mining industry.

For example, one of the points made in the "Arizona Story" is that the retail privilege or sales tax in Arizona is generally passed on to the consumer.

This is true for almost all industries, except mining.

Those firms that sell finished products at retail in Arizona merely pass this tax along to the consumer. Most industries that sell at wholesale don't pay the tax at all. But the mines must pay a one and one-half per cent tax on the value of the metals produced after certain statutory deductions.

As far as the mines are concerned they can't possibly pass the sales tax on to the ultimate consumer. The price of copper is set on the world market and a buyer of copper isn't going to pay one and one-half per cent more for each pound produced in Arizona just because the Arizona mining company paid that tax.

Now the mining industry in Arizona isn't asking for any special favors that would give it an unfair advantage over any other industry. But I often wonder just what the mining industry might accomplish for Arizona if it were only given the same "breaks" that other industries receive.



*Kennett*

**DEPARTMENT OF MINERAL RESOURCES**  
**STATE OF ARIZONA**  
**FIELD ENGINEERS REPORT**

Mine ' Ray pit, and office

Date September 22, 1960

District Mineral Creek District, Pinal County

Engineer Lewis A. Smith

Subject: Interviews with R. James (Chief Geologist for mines) and R. B. Young (Assistant General Manager).

A discussion of capping indications in a group of specimens from the east and south borders of the present pit was held. Mr. James stated that the pit would approach into the north edge of Sonora. Drilling indicated considerable chance of further development in these directions. However, the ore area tends to feather out to the east. The deeper drilling indicated more than one enrichment zone may be present within the pit area. These may possibly be related to Gila Conglomerate history, which is believed by some to have 3 distinct divisions.

Mr. Young seemed satisfied with the flux situation and the L.P. F. Process, generally.