

I. A. SANDERS

MINING CONSULTANT

4015 CARLISLE BOULEVARD, N.E., SUITE E
ALBUQUERQUE, NEW MEXICO 87107

REG. PROFESSIONAL ENGINEER
M. CERT. NO. 5041

TELEPHONE: (505) 883-0220

December 28, 1994

HAND DELIVERED

The Director
Mining and Minerals Division
Energy, Minerals and Natural Resources Dept.
2040 South Pacheco St.
Santa Fe, NM 87505



Dear Sir:

Pursuant to Section 11 of the New Mexico Mining Act and Rule 5 of the Rules and Regulations to the Act, and on behalf of San Pedro Mining Corporation, Cedar Crest, New Mexico, I submit herewith six (6) copies of this application for an operating permit for the San Pedro mine, New Placers Mining District, Santa Fe County, New Mexico. A closeout plan, also required by Section 11 of the Act, will be submitted prior to December 31, 1995.

Ownership and Right of Entry

The San Pedro Mining Corporation owns and acquired its properties in Santa Fe County from The Goldfield Corporation by deeds dated July 26, 1977, recorded in Book 351 at pages 398-399 and 543-544, and by deed dated November 26, 1986, recorded in Book 578 at pages 542-543, of the Miscellaneous Records of Santa Fe County. The mining claims are listed in the accompanying Appendix A.

The nature of the interest in the 17 patented mining claims is fee simple, and in the 16 unpatented claims is as grantee of the mineral locator(s). Accordingly, San Pedro Mining Corporation is the owner of both the surface and mineral estates of the patented claims, while the United States of America is the owner of the surface and mineral estates of the unpatented claims. The mailing address for San Pedro Mining Corporation is Post Office Box 65, Cedar Crest, New Mexico 87008.

Site Assessment and Status of Operations

The Site Assessment for the San Pedro mine, required of Existing Mines by the New Mexico Mining Act, was submitted to the Mining and Minerals Division (MMD) of the Energy, Minerals and Natural Resources Department on June 28, 1994, which assessment is incorporated in and made a part of this application. Notice was received on September 29, 1994 that MMD had

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reviewed the assessment and had found it to be complete and that it met all requirements of the Act.

Due to actions taken by Santa Fe County under the terms of its Ordinance 1993-3, no activities have taken place at the San Pedro mine site, other than routine maintenance, since July 6, 1994. Consequently, no revisions to the Site Assessment would be required due to changes in site-specific conditions from those at the time of the assessment. However, at this time it is proposed to expand the permit area described in the Site Assessment to include the entire San Pedro claim group of 17 patented and 16 unpatented mining claims, covering a surface area of approximately 435 acres. Surface disturbance, as defined, in the proposed permit area amounts to approximately 25 acres out of the total surface area. The proposed permit area and surface disturbance is shown on the accompanying topographic map (Appendix B). All of the surface disturbance in the revised permit area is already described in Section IX of the Site Assessment.

The previously mentioned actions on the part of Santa Fe County were initiated on January 24, 1994. On that date, a letter was delivered to San Pedro Mining Corporation stating that the County deemed the San Pedro mine to be abandoned, as defined in the ordinance. This specifies that non-performance of any significant mining land use for a period of three consecutive years after February 15, 1991 constitutes grounds for a rebuttable presumption of abandonment. Obviously, the San Pedro mine could not then be considered abandoned, whatever the activity which had or had not taken place, since the three-year period had not yet expired. This was brought to the attention of the County.

A second letter, containing the same statement concerning abandonment, was hand-delivered by the County to the San Pedro mine site on February 16, 1994. Other issues were also raised in this letter, but abandonment remained the central theme. The letter further stated that violation of County Ordinance 1993-3 constituted a criminal offence, carrying penalties of \$300 per day and/or 90 days imprisonment, each day being considered a separate violation. The County implied that it intended to pursue its remedies under the law. Accordingly, San Pedro Mining Corporation suspended operations at the mine that same day.

On February 18, 1994, San Pedro Mining Corporation filed a complaint against Santa Fe County in First Judicial District Court seeking a Declaratory Judgment in the matter of presumption of abandonment, a Temporary Restraining Order, and an Injunction. Included in the Declaratory Judgment motion was a request for a ruling on the preemption of the County mining ordinance by the New Mexico Mining Act. A hearing in the matter was held before Judge Art Encinias on February 24. The judge ruled that San Pedro Mining Corporation should follow the County's administrative appeals

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procedure before the case could be pursued in District Court. In the meantime he granted a preliminary injunction to prevent the County from interfering with or ending mining activities at San Pedro without adequate due process. The order enjoining the County was entered by the Court on March 10, 1994. Meanwhile, operations at the San Pedro mine were resumed on February 25.

In following the County's appeals procedure, hearings were held by the Land Use Administrator on March 11, 1994, by the County Development Review Committee (CDRC) on April 11, and by the Board of County Commissioners (BCC) on April 29 and May 2, 1994. San Pedro Mining Corporation presented incontrovertible evidence that substantial mining land use activity, including geophysical surveys, geological mapping and sampling, exploratory diamond-drilling, bulk sampling and metallurgical testing, road construction, and open-pit mining, had taken place at the mine site during the three-year period beginning on February 15, 1991. Despite the evidence to the contrary, the Land Use Administrator found the site to be abandoned, as defined, in a decision dated March 14, 1994. The CDRC upheld the decision of the Land Use Administrator, which decision was then upheld by the BCC, despite the presentation of the same incontrovertible evidence, which was not, in fact, contested by the County.

As a result of the BCC decision, the County Attorney informed the Company that he expected operations at the mine site to be suspended forthwith. The Company responded that the County was still under court injunction not to interfere with its operations. A hearing was held in District Court on June 22, 1994 on the County's motion to vacate the preliminary injunction. As a result, an order vacating the injunction was entered on July 14, 1994. Operations at the San Pedro mine had already been suspended on July 6.

On June 2, 1994, the Company filed an appeal of the BCC decision of May 2 in First Judicial District Court. The motion for reversal of the Board's decision was consolidated with the original motion for Declaratory Judgment. On appeal, the reviewing court did not conduct a de novo hearing, but made its determination from the record. On October 13, 1994, Judge Encinias issued a Letter Decision finding that "the County could rationally find that the previous mining land use had been abandoned". He also found that the New Mexico Mining Act "effectively preempts the County's authority to regulate mining operations by ordinance", but stated that "some residual zoning authority remains to the County". The order affirming the May 2, 1994 decision of the Board of County Commissioners was entered by the Court on November 7, 1994.

An appeal of the District Court decision to the New Mexico Court of Appeals was filed on December 6, 1994. Not only does the District Court ignore the

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evidence of mining land use presented by the Company, but it also mistakenly allocates to the year 1994 an extensive diamond-drilling program which actually took place between February and June of 1992. In fact, the drilling took place within the time-frame described by Judge Encinias in his decision as "the critical three-year period governed by the County's ordinance", between February 15, 1991 and February 15, 1994. The judge appears to base his conclusions solely on opinions and observations of neighbors; indeed, he states that "it does not appear that the County offered very much evidence at all".

Meanwhile, operations at the mine site continue in a state of suspension.

Present and Proposed Surface Disturbance

Maps showing the existing and proposed pits, shafts, adits, stockpiles, waste units, impoundments, processing facilities, and support facilities such as office buildings are presented as Appendix B to this application and as Exhibits F and H to the Site Assessment.

Description of Vegetation

A description of the undisturbed vegetation on the proposed permit area is contained in the report entitled "Survey of Vegetation and Wildlife at San Pedro Mine Property, Santa Fe County, New Mexico", prepared by Metric Corporation and dated July 1992. This report is presented as an appendix to the Site Assessment, which is incorporated in and made a part of this application.

Other Applicable Permits

A discussion of existing permits and other regulatory requirements is contained in Section X of the Site Assessment. Since the preparation of the assessment, the crushing and screening facility has been inspected by representatives of the Air Pollution Control Bureau of the New Mexico Environment Department, on June 21 and 22, 1994. As a result of the inspection, it was determined that the modifications to the plant, including the additions of a tertiary crusher, fine screening and a bag-house, required a permit under AQCR 702. Accordingly, an application was prepared and delivered to the Environment Department on December 22, 1994. A copy of the letter of transmittal is presented as Exhibit C with this application. The Environment Department did not require a suspension of plant operations during the processing of the application. A study has determined that the efficiency of the installed pollution control equipment is such that operation of the plant will not cause ambient air quality standards to be exceeded.

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A Storm Water Pollution Prevention Plan was developed for the San Pedro mine site in October 1993 to satisfy the requirements for National Pollution Discharge Elimination System (NPDES) general permits for storm water discharges associated with industrial activity, as described in Federal Register, Vol. 57, No. 175, Part III, September 9, 1992. The NPDES storm water permit number assigned to the San Pedro mine is NMRO0A058. The date of the General Permit Coverage Notice is December 31, 1992; the permit has no fixed expiration date.

In previous operations at San Pedro, tailings from a froth flotation process were disposed of in an impoundment adjacent to the mill, from which ponded water was reclaimed and returned to process. The discharge of tailings was covered by a discharge plan (DP-644) approved by the Ground Water Section of the NM Health and Environmental Department on October 20, 1989. The expiration date of the plan is October 20, 1996. However, the dry screening process currently utilized to produce marketable garnet does not create tailings; therefore, no discharge permit is required.

Designated Agent

The agent designated by San Pedro Mining Corporation to receive written notices from the Director, Mining and Minerals Division, on its behalf, is:

I.A. Sanders
4015 Carlisle Blvd., NE, Suite E
Albuquerque, New Mexico 87107

Public Notice

A copy in English of the proposed form of the public notice required under Rule 9 of the Rules and Regulations to the Mining Act is presented as Exhibit D. A verbatim translation into Spanish will be included in the notice when it is published, posted, or mailed to the recipients designated in Rule 9.

Permit Fee

On October 25, 1994, the New Mexico Mining Commission directed the Mining and Minerals Division to develop guidelines for Rule 2 of the New Mexico Mining Act Rules. The permit fee for the San Pedro mine site has been determined in accordance with those guidelines, which were issued on November 15, 1994.

The disturbed areas, as defined, were marked on the topographic map which is presented as Exhibit B. The acreages, except for roads, were determined by planimeter. In the case of roads, the lengths were measured from the map and standard widths applied over the entire length of each road. The

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disturbed acreages determined by this method are as follows:

Open Pits (including roads)	2.44 acres
Tailings Dam	4.52
Waste Dumps	1.16
Plant Site	<u>16.82</u>
	<u>24.94 acres</u>

Applying the published guidelines to the above acreages, the appropriate permit fee for the San Pedro mine site is, therefore:

Open Pits	\$1,000
Tailings Dams	1,000
Waste Dumps	500
Plant Site	<u>1,500</u>
	<u>\$4,000</u>

Certification

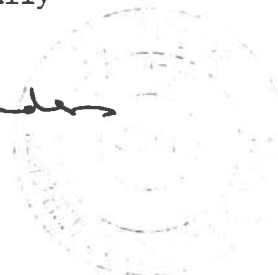
I certify that I have personally examined and am familiar with the information submitted herein and, based on my enquiry of those individuals responsible for obtaining the information, I believe the submitted information is true, accurate, and complete.

I further state that I am a Registered Professional Engineer in the State of New Mexico, Certificate No. 5041, dated June 11, 1971.

Yours faithfully

J. A. Sanders

I.A. SANDERS



APPENDIX A

Seventeen (17) patented mining claims situated, lying and being in portions of Sections 21, 22, 27 and 28, T12N, R7E, New Mexico Principal Meridian, New Placers Mining District, Santa Fe County, New Mexico, wherein the patents and location notices thereof are recorded as follows:

<u>Name</u>	<u>Mineral Survey No.</u>	<u>Book</u>	<u>Page</u>
Apex Lode	951-A (Amended)	K Mining Records	388
Virginia Lode	951-B (Amended)	K Mining Records	388
Copper Belle Lode	951-C (Amended)	K Mining Records	388
Montezuma Lode	951-D (Amended)	K Mining Records	388
Giblin Lode	951-E (Amended)	K Mining Records	388
Hoosier Girl Lode	951-F (Amended)	K Mining Records	388
White Lode	951-G (Amended)	K Mining Records	388
Puzzle Lode	951-H (Amended)	K Mining Records	388
Richman Lode	951-I (Amended)	K Mining Records	388
Ella Lode	951-J (Amended)	K Mining Records	388
Magnolia Lode	951-K (Amended)	K Mining Records	388
Frankfort Lode	951-L (Amended)	K Mining Records	388
Bonanza Lode	951-M (Amended)	K Mining Records	388
Abe Lincoln Lode	1014	134 Mining Records	275
Ingersoll Lode	974	134 Mining Records	270
Anaconda Lode	975	134 Mining Records	279
Beautiful Boy Lode	973 (Amended)	B Mining Records	415

Sixteen (16) unpatented mining claims situated, lying and being in portions of Sections 21, 22, 27 and 28, T12N, R7E, New Mexico Principal Meridian, New Placers Mining District, Santa Fe County, New Mexico, wherein the location notices thereof are recorded as follows:

<u>Name</u>	<u>Book</u>	<u>Page</u>	<u>BLM Serial No.</u>
San Timothy	"O" Mining Locations	134	NMMC-69499
San Jose	"O" Mining Locations	133	NMMC-69498
Santa Rosa	"O" Mining Locations	135	NMMC-69500
San Joaquin	"O" Mining Locations	132	NMMC-69497
Asarco	"O" Mining Locations	565	NMMC-69501
Giblin Extension	"O" Mining Locations	567	NMMC-69505
Montezuma Extension	"O" Mining Locations	566	NMMC-69504
Swan Extension	"O" Mining Locations	566	NMMC-69503
Swan	"O" Mining Locations	565	NMMC-69502
San Pedro	"O" Mining Locations	568	NMMC-69506
San Pedro No. 2	"O" Mining Locations	568	NMMC-69507
San Pedro No. 3	"O" Mining Locations	569	NMMC-69508
San Pedro No. 4	"O" Mining Locations	569	NMMC-69509
San Pedro No. 5	"O" Mining Locations	570	NMMC-69510
San Pedro No. 6	258	31	NMMC-69511
San Pedro No. 8	262	381	NMMC-69512

APPENDIX B

APPENDIX C



December 22, 1994

Bruce Nicholson
New Mexico Environment Department
Air Quality Bureau – Technical Analysis and Permits Section
1190 St. Francis Drive
PO Box 26110
Santa Fe, NM 87502

Dear Mr. Nicholson,

On behalf of San Pedro Mining Corporation (San Pedro), we are submitting the enclosed application for an air emissions permit. The enclosed submission includes the following.

- A signed original and four copies of the permit application, including public notice information.
- A cashier's check for \$100.
- A complete modeling report, including copies of all modeling input and output files in both hard copy and magnetic form.
- Four additional copies of the modeling report, complete except for the modeling input and output files.

The facility at issue is the San Pedro Mine, located in Santa Fe County, New Mexico. The facility is currently in operation and was issued a certificate of registration in 1973.

Emission factors were taken from AP-42 with conservative assumptions. Please note that the facility was modeled as point and volume sources.

The predicted maximum impacts from all sources are below standards. The facility will not cause nor contribute to an exceedance of ambient standards.

Thank you for your help in preparing this application. As always, you and your Bureau have been most cooperative. Please contact me if I can provide any additional information.

Sincerely,

Leslie Kaumo

4665 INDIAN SCHOOL NE

SUITE 106

ALBUQUERQUE

NEW MEXICO

87110

PHO 505 266 6611

APPENDIX D

PUBLIC NOTICE

San Pedro Mining Corporation has applied for a permit as an Existing Mine to continue operations at the San Pedro mine, New Placers Mining District, Santa Fe County, New Mexico. The application has been filed with the Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department. As part of the permitting process, San Pedro Mining Corporation is required to notify the public of the request for an operating permit.

The San Pedro mine is located in Sections 21, 22, 27 and 28, Township 12 North, Range 7 East, N.M.P.M., approximately two miles southeast of Golden, Santa Fe County, New Mexico. The mailing address for San Pedro Mining Corporation is Post Office Box 65, Cedar Crest, New Mexico 87008.

Mining operations will be conducted underground and the mined material will be processed in an existing crushing and screening plant. Some surface reclamation work will also be carried out concurrent with the underground mining.

The normal operating schedule proposed for the facility is 10 hours per day, four days per week.

Please contact the Mining and Minerals Division at the address below should you have any questions or concerns regarding this application.

NM Energy, Minerals and Natural Resources Dept.
Mining and Minerals Division
2040 South Pacheco St.
Santa Fe, New Mexico 87505

SITE ASSESSMENT
SAN PEDRO MINE
NEW PLACERS MINING DISTRICT
SANTA FE COUNTY
NEW MEXICO

PREPARED FOR

SAN PEDRO MINING CORPORATION

BY

I.A. SANDERS
REGISTERED PROFESSIONAL ENGINEER
ALBUQUERQUE, NEW MEXICO

JUNE 1994

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Appendix

Survey of Vegetation and Wildlife at San Pedro Mine Property, Santa Fe County, New Mexico, by Metric Corporation, July 1992, with two plates.

Plate 1 Plant Communities Map

Plate 2 Wildlife Habitat Site Map

Exhibits

Location map	Follows page 6
Photographs	Follow page 22
A. U.S.G.S. San Pedro 7 1/2-minute quadrangle, 1976 Scale: 1 inch = 2000 feet.	
B. U.S.G.S. Golden 7 1/2-minute quadrangle, 1990 Scale: 1 inch = 2000 feet.	
C. San Pedro Mine, Property Map Scale: 1 inch = 500 feet.	
D. Composite Geologic Plan of Underground Workings, San Pedro Mine Area. Scale: 1 inch = 200 feet.	
E. Geologic Map and Structure Sections of the San Pedro Mountains (Plate 4, Bulletin 77, NM Bureau of Mines & Mineral Resources). Scale: 1 inch = 1320 feet.	
F. San Pedro Mine, Topographic Map, November 1968 Scale: 1 inch = 200 feet.	
G. San Pedro Mine, Topographic Map, revised April 1992, showing surface drainages. Scale: 1 inch = 200 feet.	
H. San Pedro Mine, Topographic Map, revised April 1992, with mining claims superimposed. Scale: 1 inch = 200 feet.	

I.

INTRODUCTION

This Site Assessment for the San Pedro Mine, New Placers Mining District, Santa Fe County, New Mexico, has been prepared by I.A. Sanders, Registered Professional Engineer, Albuquerque, New Mexico, on behalf of San Pedro Mining Corporation, Cedar Crest, New Mexico, for submittal pursuant to Section 5 of the New Mexico Mining Act (the Act).

Most of the historical and technical data used in the compilation of this report were obtained from the numerous available technical papers, reports on examinations of the property, publications of the United States government and of various professional organizations, newspaper articles, operating records and reports, and the personal knowledge of the principal author.

Information concerning current operations was provided by San Pedro Mining Corporation, which is developing an underground garnet mining operation at the property.

The Appendix to the Plan, consisting of a survey of vegetation and wildlife at the San Pedro Mine, was provided by Metric Corporation, specialists in Environmental Engineering and Science, Albuquerque, New Mexico.

II

SUMMARY

1. The San Pedro Mining Corporation is the owner of 17 patented and 16 unpatented contiguous lode mining claims, covering approximately 435 acres, in the San Pedro Mountains of southwestern Santa Fe County, New Mexico. The group of claims is identified by the name of the principal mine within the claim boundaries, and is known collectively as the San Pedro Mine. It is located in Sections 21, 22, 27 & 28, Township 12 North, Range 7 East, New Mexico Principal Meridian.
2. The San Pedro Mine is part of the New Placers mining district, which has a long history of production of base and precious metals. Among the principal producing mines of the district have been the San Pedro mine itself and the Carnahan mine, also located within the boundaries of the San Pedro group of claims.
3. The San Pedro mine was first formally located in 1840 under the laws of Mexico. Since that time, the mine has been operated intermittently by a succession of owners or leasers, the periods of inactivity generally corresponding to times of depressed metal prices. The recorded production from the mine totals 470,000 tons of metal-bearing material, from which were recovered 26.5 million pounds of copper, 26,300 ounces of gold, and 365,000 ounces of silver.
4. The Carnahan mine is reported as having been developed in the 1880's and having been operated again in the 1920's. Recorded production from the Carnahan amounts to 27,377 tons of metal-bearing material, all from the period 1925-28, from which were recovered 3.5 million pounds of lead, 4 million pounds of zinc, 16,000 pounds of copper, 380 ounces of gold, and 98,000 ounces of silver.

5. Between January 1, 1970 and May 1976, 156,816 tons of metal-bearing material from the San Pedro mine was mined and milled. The 10,100 tons of concentrates produced by these operations, containing 5,313,420 pounds of copper, 6,389 ounces of gold, and 74,635 ounces of silver, were marketed to the custom smelter of ASARCO, Inc. at El Paso, Texas.
6. The copper mineralization at San Pedro occurs as contact metasomatic deposits hosted by the Madera Limestone of Pennsylvanian age.
7. San Pedro Mining Corporation is currently developing an underground garnet mine in the same contact metasomatic deposits which host the copper mineralization.
8. The presently proposed permit area for the garnet mining and beneficiation operations encompasses 12 patented and four unpatented mining claims, all covering approximately 207 acres.
9. The principal uses for the garnet products will be as common abrasives and as filtration media in potable water systems.
10. It is not expected that the proposed operations will create additions to the existing waste units, impoundments, or stockpiles.
11. A NPDES storm water permit and a pollution prevention plan are in place.
12. It is not anticipated that the operations will have a deleterious effect on air or water quality for neighboring communities. Noise levels will not be obtrusive. The impact of vehicular traffic also will be minimal.

13. Mining operations have been conducted at the site for more than 150 years. It is difficult, therefore, to measure the impact of these operations on wildlife; over the past 25 years there appears to have been little effect. No further impact is expected on wildlife habitat.
14. Estimated tax revenues from the mining operation and from sales of garnet products will initially amount to \$56,000 annually.
15. The San Pedro Mine property is qualified as an Existing Mine as defined in Section 3 of the Act.

Accordingly, this Site Assessment is submitted in compliance with Section 5 of the New Mexico Mining Act.



I.A. SANDERS
Registered Professional Engineer

June 28, 1994

III.

LOCATION AND DESCRIPTION

The San Pedro Mine is situated in the San Pedro Mountains of southwestern Santa Fe County, New Mexico, and forms part of the New Placers mining district. It is located wholly within the SE 1/4 Section 21, SW 1/4 Section 22, NW 1/4 Section 27, and NE 1/4 Section 28, Township 12 North, Range 7 East, New Mexico Principal Meridian. The property lies at a distance of approximately 30 miles northeast of Albuquerque, and is about two miles southeast of the village of Golden on NM State Road 14. Reference is invited to the location map which follows Page 6, and to the San Pedro and Golden U.S.G.S. 7.5-minute topographic quadrangles, attached and incorporated herein as Exhibits A and B.

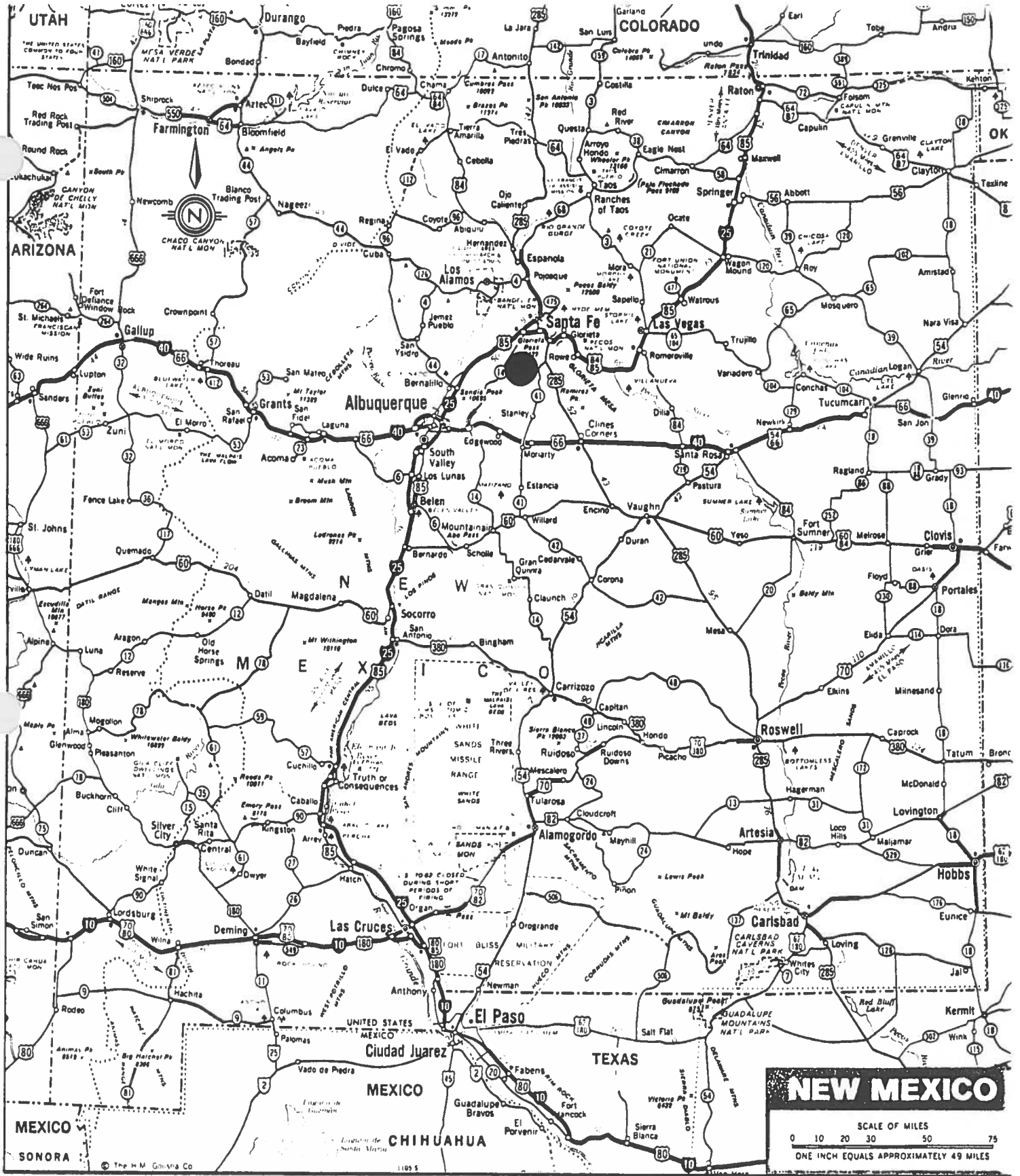
The property may be reached by proceeding east from Albuquerque on Interstate Highway 40 for a distance of approximately eight miles from the city limits to the junction with State Road 14, then northeast on S.R.14 for about 16 miles to its intersection with State Road 344, and southeast on S.R.344 for two miles to the beginning of the gravelled mine road. The mine-mill complex lies approximately one mile north of S.R.344. From Santa Fe, proceed southwest on Interstate Highway 25 to the intersection with State Road 14, then south on S.R.14 for a distance of approximately 32 miles, passing Cerrillos, Madrid and Golden, to the junction with State Road 344. From this point the route is that which is followed when coming from Albuquerque.

The San Pedro Mine consists of 17 patented and 16 unpatented contiguous lode mining claims, all encompassing approximately 435 acres. The area covered by the patented claims is approximately 284 acres and that covered by the unpatented claims is about 151 acres. The configuration of the claim group, as well as the outlines of the individual claims, is shown in Exhibit C (San Pedro

Mine Property Map) and Exhibit H (San Pedro Mine Topographic Map, revised April 1992), attached and incorporated herein.

The proposed permit area for the mining operation would include 12 patented and four unpatented claims, all encompassing approximately 207 acres. The area covered by the patented claims would be 198.6 acres and that covered by the unpatented claims would be 8.4 acres. The proposed permit area is outlined in red on Exhibit H.

Within the boundaries of the claim group, there are two underground mines with extensive workings, as well as several lesser excavations. The mines are named the San Pedro, substantially the more extensive of the two, and the Carnahan (formerly Lincoln-Lucky). Reference is made to Exhibit D (Composite Plan of Underground Workings, San Pedro Mine Area), attached and incorporated herein. The claim group as a whole takes the name of the larger mine.



NEW MEXICO

SCALE OF MILES
0 10 20 30 50 75
ONE INCH EQUALS APPROXIMATELY 49 MILES

IV.

HISTORY AND PRODUCTION

The New Placers mining district, in which the San Pedro mine is located, has a long history of production of base and precious metals. The placer deposits of the district were discovered in 1839. In his book "My Life on the Frontier", Miguel Antonio Otero, a former governor of New Mexico Territory, states that the San Pedro mine was discovered in 1840 and formally located under the mining laws of Mexico. The mine was visited by Lt. J.W. Abert, U.S. Topographic Engineers, in October 1846, as described in his 1848 report to the U.S. Congress.

There are numerous reports and accounts of activities at San Pedro from 1840 onwards, but without any specific production figures until 1889. Recorded production from the San Pedro mine between 1889 and the present totals 470,000 tons of metal-bearing material mined and milled or smelted. Metals recovered from this material, in the form of copper matte or copper flotation concentrates, or contained in direct shipments of crude ore, amounted to 26.5 million pounds of copper, 26,300 ounces of gold, and 365,000 ounces of silver.

Between January 1, 1970 and May, 1976, 156,816 tons of metal-bearing material were mined, and milled in a 300-tons-per-day flotation plant constructed in 1968-69. As a result, 10,100 tons of concentrates were marketed to the custom smelter of ASARCO, Inc. at El Paso, Texas. Metals contained in the concentrates amounted to 5,313,420 pounds of copper, 6,389 ounces of gold, and 74,635 ounces of silver.

Tonnages of metal-bearing material of 2,243 and 2,500 were mined and milled during 1982 and 1989, respectively. However, the 1982 production was commingled with material from another mine before milling. Although the 1989 material was milled separately, the resulting concentrates were commingled with other concentrates

before being marketed. Consequently, no accurate figures for metals produced and marketed are available.

A 125-ton smelter was constructed at the San Pedro mine in 1900 (Mineral Resources of the United States, 1900). Approximately 166,000 tons of metal-bearing material were smelted in the period 1900-1918. Late in the latter year, the smelter was destroyed by fire. The slag pile resulting from these operations, containing approximately 150,000 tons, is still on the property.

Also located on the San Pedro group of claims, and about 1,000 feet south of the San Pedro mine, is the Carnahan (formerly Lincoln-Lucky) lead-zinc-silver mine. All of the recorded production from this mine, a total of 27,377 tons of ore, took place during the years 1925 through 1928, the ore being treated in a 50-tons-per-day flotation mill constructed at the mine (Elston, 1967). Metals recovered from this tonnage, in the form of lead and zinc flotation concentrates, amounted to 3.5 million pounds of lead, 4 million pounds of zinc, and 98,000 ounces of silver. The Carnahan mine has since flooded, and now serves as the principal source of process water for the San Pedro operation.

V.

TOPOGRAPHY AND GENERAL GEOLOGY

The San Pedro Mountains are a small, isolated range located approximately 30 miles northeast of Albuquerque. The range is about four miles long, in an east-west direction, and as much as two miles wide. It is dominated by two eminences, Oro Quay Peak and San Pedro Mountain. These peaks reach elevations of over 8,200 feet, rising about 1,300 feet above the surrounding pediments. The group of claims comprising the San Pedro mine lies at the western end of the range, principally on the southern slopes but also encompassing the San Pedro Mountain peak.

The peaks of the range are typically rugged with steep, narrow upper canyons. A broad alluvial apron surrounds the range. Slopes in the peak areas range from 35 to 65 percent. The slopes are gentler in the lower, alluvial areas, ranging from 5 to 35 percent.

The San Pedro Mountains are one of a chain of four groups of hills in north-central New Mexico; from north to south, they are Los Cerrillos, the Ortiz Mountains, the San Pedro Mountains, and South Mountain. The chain consists of intrusions of monzonite and related porphyry into sedimentary rocks ranging in age from Pennsylvanian to Eocene. The sedimentary rocks in the San Pedro Mountains have been extensively metamorphosed by heat and fluids emanating from the intrusions, yielding tactite, hornfels and marble. In the area of the San Pedro mine the sedimentary beds, in general, have an average dip of 10 to 15 degrees to the east. Important mineral occurrences are found in veins and contact metasomatic deposits in the sedimentary rocks.

In the area of the mine, the sedimentary rocks are represented by the Permian Abo Formation, the Pennsylvanian Madera Limestone, and the Sandia Formation, also Pennsylvanian in age. The Abo Formation

forms the surface of the eastern half of the claim group, and is separated stratigraphically from the Madera Limestone by a rhyolite sill 120 to 130 feet thick. The Madera is divided into upper and lower members by a monzonite porphyry laccolith which ranges in thickness from about 200 to 400 feet. The upper member is approximately 270 feet thick, while the lower has a thickness of about 1,000 feet. The base of the lower member is bounded by a thick monzonite porphyry sill. Below this sill a drill hole has intersected siltstone and arkose which possibly belong to the Sandia Formation. The rhyolite sill, the upper member of the Madera, and the monzonite porphyry laccolith all outcrop in the western half of the claim group. The lower member of the Madera outcrops only in the extreme southwest corner of the claims. Reference is made to Plate 4, Bulletin 77, N.M. Bureau of Mines and Mineral Resources, Geologic Map and Structure Sections of the San Pedro Mountains, Santa Fe County, New Mexico, incorporated herein as Exhibit E. This demonstrates clearly that the entire claim group is underlain by the Madera Limestone, which is the host formation for the known mineral deposits.

The host formation is composed of interbedded limestones, siltstones, and shales. Locally, extensive contact metamorphism has resulted in alteration of the shales and siltstones to hornfels and of the limestones to garnet and/or marble. At San Pedro the garnet alteration is extensive, as reported by both Lindgren and Atkinson. Contact metasomatic copper deposits have formed in the limestone beds in proximity to the laccolith, while lead-zinc deposits of similar origin occur in the limestone further from the laccolith. The copper deposits, which also contain significant amounts of gold and silver, have been extensively exploited in the San Pedro mine. The deposits consist of a wide-spread series of mineralized bodies, separated by garnet or marble, which are distributed through the entire thickness of the upper member of the Madera Limestone. The bodies are generally tabular or pod-shaped and parallel to the bedding planes. They are highly irregular in outline but remain strictly confined to individual favorable beds. The sizes of the

bodies vary from patches of mineralization a few feet across to bodies 100 feet wide and 1,000 feet long. Those deposits currently known are limited to the upper member of the Madera Limestone. However, past exploratory drilling through the monzonite porphyry laccolith has indicated that similar copper mineralization may also occur in the lower member.

Currently, the only recorded production from the lower member of the Madera Limestone on the San Pedro property came from the lead-zinc deposit in the Carnahan (Lincoln-Lucky) mine. This is a limestone replacement deposit of pipe-like shape, elliptical in cross-section, measuring about 60 feet across in the widest places, which dips gently from west to east. It extends over a length exceeding 3,000 feet, following a particular bed in the Madera Limestone, in the southern part of the claim group.

Although the host rocks of both deposits outcrop in the western half of the property, the topography combined with the easterly dip of the beds render the major portion of the deposits not amenable to surface mining methods. The bulk of the recorded production to date from the San Pedro mine has come from underground workings.

VI.

SURFACE DRAINAGE

Drainage from the San Pedro Mountains follows a radial pattern, typical of small mountain ranges. The area covered by the claim group lies principally on the upper slopes, ranging up to more than 8,200 feet in elevation, and is drained by about twenty small shallow arroyos and/or canyons which flow only during thunder-storms or snow-melt. For the most part these arroyos or canyons are not characterized by major branching or side canyons. Three of them are large enough to be named: San Francisco Canyon (also known as Bonanza Gulch) and Old Timer Canyon to the north and northwest, respectively, and San Lazarus Gulch to the east. The remaining arroyos are unnamed.

The canyon drainages open at the break of the slope and discharge into coalescing alluvial/colluvial fans which form an apron around the San Pedro Mountains. Much of the annual precipitation percolates into the ground. However, run-off from major storms over-runs the alluvial/colluvial fans and enters the Arroyo Tuerto, the Cañada de las Narrias, and the Cañon del Agua, which are the principal drainages for the area encompassing the San Pedro Mountains. Reference is made to the San Pedro and Golden U.S.G.S. 7.5-minute topographic quadrangles incorporated herein as Exhibits A and B. Normal annual precipitation for the area of the San Pedro Mountains is generally in the range of 16 to 20 inches, about half of which is snow. Much of the remaining precipitation comes during the summer months in the form of sudden cloudbursts.

The Arroyo Tuerto runs from east to west approximately 1 3/4 miles north of the claim group. The run-off from about 30 acres, or approximately 7 percent of the surface area of the claims, enters the Arroyo and flows approximately 19 miles in a northwesterly direction through the Arroyo Cuchillo, Arroyo Uña de Gato, and

Arroyo Tonque, before entering the Rio Grande near San Felipe Pueblo.

The Cañon del Agua runs from southeast to northwest approximately one mile southwest of the claims. The run-off from about 100 acres, or approximately 23 percent of the surface of the claims, enters the Cañon and flows approximately 20 miles in a northwesterly direction through San Pedro Creek, Arroyo Uña de Gato, and Arroyo Tonque, before entering the Rio Grande.

The Cañada de las Narrias runs from west to east about one-half mile south of the southern boundary of the claim group. The run-off from about 305 acres, or approximately 70 percent of the surface of the claims, enters the Cañada and flows east, then southeast for approximately 10 miles, through Hyer Draw and King Draw, before dissipating in the floor of the Estancia Valley.

There are no perennial water flows or standing bodies of water within the boundaries of the claim group, nor within 1,000 feet of the boundaries of the group. Annual precipitation is reported to be generally 16 to 20 inches, about half of which is snow. The two-year 24-hour rainfall for the mine site is reported to be 1.5 inches. No samples have been taken of storm water run-off. Therefore, no statement can be made as to the water quality.

Surface drainages and catchment areas on the mine site are shown in Exhibit G (San Pedro Mine Topographic Map).

VII.

GROUNDWATER.

Inspections of the San Pedro mine site by the New Mexico Environment Department were carried out in 1991 and 1992. Much of the information on groundwater is taken from the final report on these inspections (Wust, 1993).

The San Pedro mine site lies within the northern boundary of the Estancia Basin. The major aquifers in the area are the Madera Limestone and the Estancia Valley fill, though only the former is present on the mine site. The Madera Limestone is the host rock for the mineral deposits which have been exploited at the site, and the workings of both the San Pedro and the Carnahan mines are located in this formation.

Depth to groundwater at the mine site is 450 feet as measured in the Carnahan well. This well was drilled into the lower workings of the Carnahan mine after they had flooded in order to provide process water for the San Pedro milling operations. It is located at the southwest corner of the toe of the tailings impoundment.

Most residents in the area of the mine site obtain their drinking water from private wells completed in the Madera Limestone. The only wells known to be completed in the Estancia Valley fill are shallow and are used for watering livestock and for non-drinking residential use. Private wells in the Madera also supply drinking water for the residents of Golden, population 60, located 2.2 miles northwest of the mine site.

Populations served by groundwater from the Madera Limestone within four miles of the site are summarized as follows:

<u>Distance in miles</u>	<u>Population</u>
0 - 1/4	26
1/4 - 1/2	35
1/2 - 1	71
1 - 2	51
2 - 3	60
<u>3 - 4</u>	<u>20</u>
<u>0 - 4</u>	<u>263</u>

Water samples were collected during the 1991 inspection from the Carnahan well and nine residential wells along the Cañada de las Narrias (Map Exhibit A). The Carnahan well was sampled again in 1992 because the sampling procedure used in the previous inspection was judged to have been faulty.

For the Carnahan well, the iron content was above the EPA Maximum Contaminant Level at 0.462 part per million. However, this is below the New Mexico standard of 1.0 ppm. No other substances were present in amounts above the EPA standards. The general chemistry analysis for the Carnahan water is reported as follows:

Total dissolved solids	670 gms/litre
Calcium	143
Magnesium	18.7
Potassium	1.6
Sodium	20.1
Bicarbonate	290
Carbonate	0
Chloride	41.4
Sulphate	225
Nitrate	6.1

No elevated levels of hazardous substances were present in any of

the residential drinking wells. Chemical analyses of several private wells showed concentrations of nitrate, sulphate and total dissolved solids elevated above EPA Maximum Contaminant Levels. However, as reported by the New Mexico Environment Department (Wust, 1993), there are no indications that these conditions are the result of activities at or contamination from the San Pedro mine site.

It does not appear that past mining operations have had any deleterious impact on water quality in residential drinking wells, and it is not anticipated that future operations will have any effect. One of the principal uses for the larger sizes of garnet products is as filtration media in potable water systems.

VIII.

CURRENT OPERATIONS

San Pedro Mining Corporation is currently developing an underground garnet mine and is modifying the existing mill on site to process the garnet into forms suitable for marketing as common abrasives and as filtration media for potable water. The mine will exploit the same mineralized beds in which mining of copper had been performed during previous operations.

An adit is being driven along strike in one of the thickest of the series of mineralized beds which occur in the upper member of the Madera Limestone on the San Pedro mine site. Once sufficient strike length has been developed in the adit, the ore will be extracted both up-dip and down-dip from the strike drive by stoping on a regular room-and-pillar pattern. The adit is collared at a point approximately 200 feet north of the Old Spanish Workings at map coordinates 12,100 North, 11,350 East on the topographic map of the San Pedro Mine (Exhibit G). Currently, the strike drive has a length of approximately 100 feet.

The garnet ore will be delivered to the coarse ore bin at the mill by dump truck. The road from mine to mill, a distance of approximately 3,200 feet, has already been widened to accommodate the haulage operation.

Only the crushing section of the existing mill is to be utilized for processing the garnet ore. This consists of a primary jaw crusher, a secondary cone crusher, and conveyor belts and a vibrating screen closing the secondary crushing circuit. From the fine ore bin the crushed material will be moved by conveyor belt to the former concentrate drying pad at the west end of the mill building. From there it will be transported by front end

loader a distance of 150 feet to a tertiary crushing plant, currently under construction west of the mill building. This circuit incorporates a rotary dryer, a vertical impact crusher, fine screening, and associated conveyor belts.

The garnet products will be shipped from the mine site in trucks, each carrying from 20 to 25 tons.

Work is also in progress to cover the old mill tailings; approximately 20 percent of the surface area has already been covered.

IX.

SURFACE DISTURBANCE

Most of the mining activities at the San Pedro Mine over the years have been concentrated on the south flank of San Pedro Mountain. The state of the surface of the claims in November 1968 and April 1992 as a result of these activities is shown in detail in the topographic maps of Exhibits F and G. The oblique aerial photographs following page 22 taken in January 1990, show most of the area of activity.

By far the greater part of the surface disturbance at San Pedro took place before November 1968, much of it many years before; for example the slag dump south of the common section corner dates from a period of operations between 1901 and 1918. With the exceptions of the Swan open pit and overburden dump, essentially all of the disturbance between November 1968 and April 1992 took place prior to January 1, 1970. Between April 1992 and June 18, 1993, there was no new surface disturbance. There has been little change in the surface since the effective date of the Act, apart from the new mine adit and the partial covering of the tailings pile. A survey to up-date the 1992 topographic map is under way, but the revised map is not yet available.

There are tens of thousands of feet of unimproved road on the property. In addition to providing access and the means of moving from one part of the property to another, a major use for these roads was for the drilling of exploratory holes from the surface. Many of the roads are, therefore, located in the surface areas overlying the San Pedro, Carnahan and Apex-Virginia underground workings. Much of the road work dates from periods of activity in the 19th and early part of the 20th centuries. Surface drilling activity in the 1940's, 1950's and 1960's resulted in the construction of substantial additional footage of drill road. Several hundred feet

of drill road in the Apex-Virginia area were also constructed in the 1989-90 period.

The mine office, mill and shop buildings, and associated facilities, are located in proximity to the main entry to the San Pedro mine, the Swan Tunnel. This, in all probability, is one of the two tunnels reported in the September 1880 edition of Mining World. The tunnel portal is located about one-half mile south of the San Pedro Mountain peak at an elevation of 7527 feet. Those buildings not shown in the 1968 map were completed in 1969, and now appear in the 1992 map. The increased size of the mill tailings pile is the result of milling operations between 1969 and 1990. This dump now contains approximately 260,000 tons of tailings and covers about 4 1/2 acres. Since 1992, approximately one acre of the surface has been covered with overburden and topsoil. The small dump located west of the mill building contains about 10,000 tons of mine waste and covers approximately one-half acre.

The new tertiary crushing and screening plant is located on the open space to the west of the existing mill building, at a distance of approximately 150 feet.

About 1000 feet north of the Swan Tunnel portal is the Richman Shaft, with associated dump, possibly dating from the 1890's or early-1900's; the shaft is now impassable. The ore hoisted through the Richman Shaft was treated in a smelter located immediately to the north of the slag dump. The foundations of the smelter buildings and the remains of some of the structures are still visible. The smelter, the operations of which created the slag dump, was destroyed by fire in 1918. The dump contains about 150,000 tons of smelter slag and covers approximately two acres.

The Swan open pit, located to the south of the Richman Shaft, was mined between late-1974 and early-1976. The associated waste over-

burden stripped from the orebody was placed in the dump to the southwest of the mine office building. This dump contains about 60,000 tons of material and covers approximately 1 1/2 acres.

Northwest of the Swan pit are the Home Tunnel and a small open pit adjacent to the tunnel portal. The tunnel possibly dates from the operations of the 1880's or 1890's, while the open pit was mined in 1989-90 to provide a bulk sample for testing in the mill.

Still further to the northwest are the No. 2 Tunnel, the old Spanish workings, and another small open pit in proximity to the Spanish workings. There are also several small dumps associated with the open pit. The No. 2 Tunnel is possibly the second of the two tunnels mentioned in the September 1880 Mining World. The Spanish workings are probably the site of the earliest activity at San Pedro. The open cut almost certainly dates from the 1840's, as do some of the underground workings. This area is probably that referred to in the October 1880 issue of Mining World, which states that ...

"Previous operators had excavated an open cut about 100 feet long on the lode and had then driven underground for a distance of approximately 75 feet. Crosscuts 35 feet long on either side of the drift had failed to reach the walls of the lode. Assays of samples taken from the ribs were reported to range from 12 to 46 percent copper."

Some material was taken from the Spanish open cut in 1989-90 for testing in the mill. The open pit adjacent to the old Spanish workings was mined in 1968-69.

The portal of the new mine adit is located approximately 200 feet north of the old Spanish workings. Currently, the adit has a length of about 100 feet.

In the extreme northwest corner of the San Pedro Mine property are the Virginia and Apex underground workings, also possibly dating from the 1880's.

The underground workings of the Carnahan mine are located along

the southern boundary of the property. Entry to the mine, which was first developed in the 1880's, was gained through a tunnel at the west end of the mine and four vertical shafts along the course of the workings toward the east. Three of these shafts are named Baca, Anaconda and Carnahan, while the fourth, the nearest to the tunnel portal, is not named in existing property maps. All four shafts are now impassable to personnel. The un-named shaft, together with the Baca and Anaconda Shafts, probably date from the 1880's. The Carnahan Shaft, which is located in close proximity to the old mill site, may date from the same period of activity or from the 1920's, the last period of sustained production from the mine. The foundations for the mill and for the mine hoist and headframe are still visible. These are located about 400 feet southwest of the southwest corner of the present San Pedro mill tailings dump.

There are also a number of other vertical or inclined shafts on the property, dating from early periods of activity at San Pedro, many of which do not appear on existing property maps. Of those that do appear, most are un-named. An exception to this is the Montezuma Shaft, a vertical shaft over 100 feet deep, which is located on the patented claim of the same name in the northwest part of the property. This shaft is mentioned by name in several issues of Mining World, and probably dates from the late-1870's or early-1880's.

It is anticipated that, apart from small "surge" piles between mine and crusher, there will be no additions to the existing waste units, impoundments or stockpiles.



Aerial view of San Pedro Mine looking due north.



Aerial view of San Pedro Mine looking S 80°E.

X.

EXISTING PERMITS AND REGULATORY REQUIREMENTS

The existing treatment plant at San Pedro is a conventional froth flotation mill with the capacity to process 300 tons of ore daily, totally enclosed in a metal building. The plant was constructed in 1968-69 and was registered with the Air Quality Division of the NM Environmental Improvement Department in February 1973. Accordingly, the plant was "grandfathered" to continue to operate as long as it was not modified. In order to produce garnet suitable for marketing as common abrasives and filtration media, certain modifications to the existing plant are required. The present grinding and flotation circuits will no longer be operated. Instead, a vertical impact crusher, with additional fine screening, is substituted for the ball mill, flotation cells, thickener and filter. This modification requires a re-evaluation of the entire plant to determine whether a new air quality permit is required. This evaluation is currently being undertaken.

In the past, the tailings from the froth flotation process were disposed of in an impoundment adjacent to the mill, from which ponded water was reclaimed and returned to process. However, it is not anticipated that the dry screening process contemplated for producing marketable garnet will create tailings. The discharge of tailings during previous operations was covered by a discharge plan (DP-644) approved by the Ground Water Section of the NM Health and Environmental Department on October 20, 1989. The expiration date of the plan is October 20, 1996.

Under the National Pollutant Discharge Elimination System (NPDES) of the U.S. Environmental Protection Agency (EPA), the San Pedro Mine is authorized to discharge storm water associated with

industrial or construction activity under the terms and conditions imposed by EPA's NPDES storm water general permit issued for use in the state of New Mexico. The NPDES storm water permit number assigned to the San Pedro Mine is NMROOA058. The date of the General Permit Coverage Notice was December 31, 1992; the permit has no fixed expiration date.

XI.

IMPACT ON COMMUNITY

The nearest communities to the San Pedro mine site are Cedar Crest, Sandia Park, Golden, Madrid and Cerrillos, all on N.M. State Road 14, Cedar Grove, on N.M. State Road 344, and the town of Edgewood at the intersection of S.R.344 and Interstate Highway 40. In addition, there are about 50 houses extending east along S.R.344 from its junction with the San Pedro mine road. Reference is invited to the location map which follows Page 6, and to the San Pedro and Golden U.S.G.S. 7.5 minute topographic quadrangle maps, incorporated herein as Exhibits A and B.

The present work force at the mine totals eight persons, five of whom live in Edgewood, two in Albuquerque, and one in Rio Rancho.

For the above personnel, payroll taxes are approximately \$27,000 per year. Based on an annual output of 30,000 tons of garnet products, Severance and Resource Excise taxes are estimated to be \$17,000, with Ad Valorem taxes on personal property and mineral reserves amounting to approximately \$12,000.

It is proposed to operate the mine and crushing plant on a 10 hours per day, four days per week schedule. This will avoid an obtrusive level of plant noise during the night hours. Underground blasting in the mine should not be audible.

The shipping of 30,000 tons of product per year will require about 25 trucks per week, or 5 trucks per day. Every effort will be made to ensure that the trucks do not leave the mine at times when the concentration of local traffic on S.R.344 is at its highest, mid-morning and early-afternoon.

As detailed in the section on Groundwater, it is not anticipated

that operations at San Pedro will have any deleterious effect on the quality of water in neighboring residential drinking wells. Neither is it anticipated that air quality will suffer. Currently, at times of high winds plumes of particulate emissions are carried from the tailings pile, generally towards the east. As the work of covering the pile progresses, this situation should be alleviated. The new crushing and screening plant must operate in compliance with New Mexico Environment Department rules and regulations with respect to particulate emissions. Bag-houses are incorporated in the circuit to capture as much as possible of the particulate emissions from the drying, crushing and screening processes.

XII.

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APPENDIX

SURVEY OF VEGETATION AND WILDLIFE
AT SAN PEDRO MINE PROPERTY
SANTA FE COUNTY, NEW MEXICO

PREPARED FOR

SAN PEDRO MINING CORPORATION
TRUTH OR CONSEQUENCES, NEW MEXICO

PREPARED BY

METRIC CORPORATION
ALBUQUERQUE, NEW MEXICO

JULY 1992

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SURVEY OF VEGETATION AND WILDLIFE
AT SAN PEDRO MINE PROPERTY
SANTA FE COUNTY, NEW MEXICO

INTRODUCTION

METRIC Corporation has developed for San Pedro Mining Corporation a survey of vegetation and wildlife resources in response to Santa Fe County Ordinance No. 1991-2, Section 5.4.1, A.2.b.7)d). The project area comprises about 435 acres in southern Santa Fe County and is located within T.12N., R.7E., Sections 21, 22, 27, and 28.

VEGETATION

Vegetation of the San Pedro Mine was surveyed using conventional techniques and procedures.

Methods

Line Intercept - The sample unit of a line transect is one of length and vertical dimension only. The intercept of the plants by species, through which a vertical projection of the transect must pass, is directly measured (Bonham, 1989). The accuracy of this method depends primarily on the accuracy of the vertical projection. Setup and analyses involve the following:

A 100-foot tape, subdivided into 1.0-foot intervals, is stretched between two(2) stakes. The sampler moves along the line and for each interval, records the plant species found and the distance it covers along that portion of the line intercept. The sampler considers only those plants or seedlings touched by the line or lying under or over it. For flora canopies below eye level, the distance covered by the downward projection of the foliage above is measured.

Multiple vegetation levels are included for cover determinations. Measurements of individual plants are read to the nearest .1-inch.

This method is objective and relatively accurate when estimating cover of grassland and shrub vegetation (Canfield, 1941). In mixed-plant communities, line transects were found to be more accurate than quadrant measurements for crown cover (Bonham, 1989; Mueller-Dombois, and Ellenberg, 1974). By direct measurement of small samples, line transects will obtain estimates of known reliability concerning the vegetation, its composition, and ecological structure.

The measurements which are calculated from the line intercept transect are:

$$\text{cover} = \frac{\text{total intercept length, species A}}{\text{total transect length}} \times 100$$

$$\text{frequency} = \frac{\text{intervals in which species occurs}}{\text{total number of transect intervals}} \times 100$$

Belt Transect - This sampling method is used to determine density of perennial shrubs and trees found within the area. Density is defined as number of individuals or stems per unit area. Density estimates are useful for monitoring plant response to change in the environment (Bonham, 1989). The size of the belt transect is based on size, spacing and distribution of plants.

Productivity - Productivity was ocularly estimated in the field and cross referenced with USDA-Soil Conservation Service range site descriptions provided in the appropriate soil survey. The determination of range condition in combination with field observations allows for a nonquantitative estimate of plant production.

Transect Location and Sample Adequacy. Transects were located in representative points within each plant community. The number of transects per plant community is a function of the area occupied by that community. The larger the area the greater number of transects used. Sample size adequacy was not addressed for this initial investigation.

Plant Communities

Based on field observations and data collection, three plant communities were identified within the project area (PLATE 1). Plant communities can be defined as the product of differences in the environmental tolerances of various plants comprising the flora, and the heterogeneity of the environment (Daubenmire, 1968). Delineation of plant communities involves assessment of the interrelated complex of plants, animals, edaphic and aerial characteristics.

Names used to define plant communities includes the names of species that differentiate them. Data collected for vegetation sampling is used to determine the different attributes of the communities. The vegetative parameters collected in field investigation are used to classify the vegetation into plant communities. The combined study of aerial photos, field data, and soil surveys allows for accurate delineation of community borders.

Brown and Lowe (1980) described the biotic communities of the San Pedro Mountains as Great Basin Conifer Woodland and Madrean Evergreen Woodland. The plant communities observed in and surrounding the project area are: 1) *Bouteloua gracilis*/*Gutierrezia sarothrae* (Blue Grama/Broom Snakeweed), 2) *Pinus edulis*/*Juniperus monosperma*/*Bouteloua gracilis* (Pinyon/Juniper/Blue Grama), and 3) *Quercus gambelii*/*Koeleria*

crisitata (Gambel Oak/Prairie Junegrass). Presented below is a description of the identified plant communities.

Blue Grama/Broom Snakeweed. The first plant community described for the San Pedro Mine area is a mixed-prairie or Mixed Grassland Association (Castetter, 1956). In this association, blue grama is the dominant and numerous shrub and half-shrubs are expressed. In areas of this association where past range deterioration has taken place, broom snakeweed increases in abundance.

A more detailed classification of the mixed-prairie or mixed grassland association resulted in a *Bouteloua gracilis/Gutierrezia sarothrae* (Blue Grama/Broom Snakeweed) subassociation. The dominant plant species are blue grama, codominants include broom snakeweed, bottlebrush squirreltail (*Sitanion hystrix*), and galleta (*Hilaria jamesii*).

Total canopy cover measured for the Blue Grama/Broom Snakeweed subassociation was 36 percent with grasses representing 21 percent, forbs 1 percent, and shrubs 14 percent (TABLE 1). Of the 21 percent cover for grasses, 17 percent of this was recorded by blue grama. Grasses and Forbs accounted for 61 percent of the total cover for this subassociation. Broom snakeweed recorded 12 percent of the shrub cover resulting in 33 percent of the total plant cover. Frequency values were calculated as 57.5 and 42.5 percent for blue grama and broom snakeweed, respectively. Broom snakeweed recorded the greatest density for this association with 16,843 individuals per acre (TABLE 2). Other important shrubs reported were cane cholla and plains pricklypear. Range condition was determined to be good. Production was ocularly estimated to be from 500 to 650 pounds per acre air-dry forage (USDA-SCS, 1975).

TABLE 1

AVERAGE PERCENT CANOPY COVER AND FREQUENCY
FOR THE BLUE GRAMA/BROOM SNAKEWEED PLANT COMMUNITY

SPECIES	% COVER	FREQUENCY
<u>GRASSES</u>		
<i>Agropyron smithii</i> western wheatgrass	0.26	3.5
<i>Bouteloua gracilis</i> blue grama	17.33	57.5
<i>Hilaria jamesii</i> galleta	1.35	5.0
<i>Sitanion hystrix</i> bottlebrush squirreltail	1.78	6.5
TOTAL	20.72	72.5
<u>FORBS</u>		
Annual Forb	0.02	1
<i>Astragalus mollissimus</i> var. <i>mollissimus</i> woolly milkvetch	0.18	1
<i>Erigeron divergens</i> spreading fleabane	0.35	4
<i>Euphorbia fendleri</i> var. <i>chaetocalyx</i> spurge	0.01	1
<i>Kochia scoparia</i> summercypress	0.05	1
<i>Lappula redowskii</i> European stickweed	0.04	1.5
<i>Leucelene ericoides</i> babywhite aster	0.30	1.5
<i>Sphaeralcea coccineo</i> scarlet globemallow	0.25	1.5
TOTAL	1.20	12.5

TABLE 1 (CONTINUED)

AVERAGE PERCENT CANOPY COVER AND FREQUENCY
FOR THE BLUE GRAMA/BROOM SNAKEWEED PLANT COMMUNITY

SPECIES	% COVER	FREQUENCY
<u>SHRUBS AND SHRUBLIKE</u>		
<i>Gutierrezia sarothrae</i> broom snakeweed	12.28	42.5
<i>Opuntia imbricata</i> cane cholla	1.05	3.5
<i>Opuntia polyacantha</i> plains prickypear	0.80	3.5
TOTAL	14.13	49.5

TABLE 2

AVERAGE DENSITY ESTIMATIONS FOR THE
BLUE GRAMA/BROOM SNAKEWEED PLANT COMMUNITY

SPECIES	INDIVIDUALS/ACRE
<u>HALF SHRUBS</u>	
<i>Artemesia frigida</i> fringed sagebrush	109
<i>Gutierrezia sarothae</i> broom snakeweed	16,843

<u>SHRUBS</u>	
<i>Corypantha vivipara</i> corypantha	36
<i>Opuntia imbricata</i> cane cholla	799
<i>Opuntia polyacantha</i> plains prickypear	799

<u>TREES</u>	
<i>Juniperus monosperma</i> one-seed juniper	36'
<i>Pinus edulis</i> pinyon pine	72'

¹ Individuals less than one foot in height

Pinyon/Juniper/Blue Grama. The second plant community encountered was classified by Castetter (1956) as a Woodland biome, characterized by small trees typically belonging to the genera *juniperus*, *Pinus*, and *quercus*. The Woodland association consist mainly of one-seed juniper (*Juniperus monosperma*) and pinyon pine (*Pinus edulis*).

Further examination of the association resulted in a phase or subassociation called Pinyon/Juniper/Blue Grama (*Pinus edulis/Juniperus monosperma/Bouteloua gracilis*). In this phase, a total canopy cover of 26 percent was reported with 6 percent grasses, 1 percent forbs, 3 percent shrubs, and 16 percent trees (TABLE 3). The dominant grass was blue grama with 4 percent canopy cover, making up 15 percent of the total. The frequency of blue grama was 15 percent. One-seed juniper and pinyon pine combined to represent 16 percent of the canopy cover, and 62 percent of the total cover. The combined frequency for pinyon and juniper was 22 percent. Pinyon pine recorded the greatest density with 508 individuals per acre (TABLE 4). One-seed Juniper recorded 463 individuals per acre. Gambel oak was the most recorded shrub with a density of 427 stems per acre. It should be noted that due to the growth form of many shrub species, determination of individual plants is most difficult. In these cases, stems of the entire colony or population are counted and recorded. Range condition was determined to be poor to fair. Production was ocularly estimated to be between 250 and 500 pounds per acre air dry forage (USDA-SCS, 1975).

TABLE 3

AVERAGE PERCENT CANOPY COVER AND FREQUENCY
FOR THE PINYON/JUNIPER/BLUE GRAMA PLANT COMMUNITY

SPECIES	% COVER	FREQUENCY
<u>GRASSES</u>		
<i>Agropyron smithii</i> western wheatgrass	0.05	0.13
<i>Aristida fendleriana</i> fendler threawn	0.11	4.88
<i>Bouteloua gracilis</i> blue grama	3.97	15.00
<i>Bromus tectorum</i> cheatgrass brome	0.26	1.13
<i>Hilaria jamesii</i> galleta	0.03	0.13
<i>Koeleria cristata</i> prairie junegrass	0.69	2.38
<i>Sitanion hystrix</i> bottlebrush squirreltail	0.31	1.38
<i>Sporobolus airoides</i> alkali sacoton	0.81	0.38
TOTAL	6.23	25.41
<u>FORBS</u>		
<i>Arabis fendleri</i> fendler rockcress	0.08	0.25
<i>Asclepias</i> sp. milkweed	0.04	0.25
<i>Eriogonum jamesii</i> James buckwheat	0.33	0.88
<i>Jymenoxys argentea</i> hymenoxys	0.13	0.63
<i>Lesquerella pinetorum</i> bladderpod	0.13	0.50
<i>Penstemon</i> sp. penstemon	0.01	0.13
<i>Sphaeralcea coccinea</i> scarlet globemallow	0.14	0.75
<i>Zinnia grandiflora</i> Rocky Mountain zinnia	0.01	0.13

TABLE 3 (CONTINUED)

AVERAGE PERCENT CANOPY COVER AND FREQUENCY
FOR THE PINYON/JUNIPER/BLUE GRAMA PLANT COMMUNITY

SPECIES	% COVER	FREQUENCY
<u>SHRUBS AND SHRUBLIKE</u>		
<i>Artemesia frigida</i> fringed sagebrush	0.50	3.25
<i>Corypantha vivipara</i> corypantha	0.05	0.25
<i>Gutierrezia sarothrae</i> broom snakeweed	0.06	0.25
<i>Opuntia imbricata</i> cane cholla	0.06	0.25
<i>Opuntia polycantha</i> plain pricklypear	0.23	0.88
<i>Quercus gambelii</i> Gambel oak	1.84	3.50
<i>Ribes cereum</i> wax currant	0.28	1.25
<i>Yucca baccata</i> datil yucca	0.11	0.75
	—	—
TOTAL	3.99	13.90
<u>TREES</u>		
<i>Junperus monosperma</i> one-seed juniper	1.61	2.75
<i>Pinus edulis</i> pinyon pine	14.0	19.25
	—	—
TOTAL	15.61	22.00

TABLE 4

AVERAGE DENSITY ESTIMATIONS FOR THE PINYON/JUNIPER/BLUE GRAMA
PLANT COMMUNITY

SPECIES	INDIVIDUALS/ACRE
<u>HALF SHRUBS</u>	
<i>Gutierrezia sarothae</i> broom snakeweed	145
<u>SHRUBS</u>	
<i>Corypantha vivipara</i> corypantha	36
<i>Echinocereus viridiflorus</i> green hoghead	9
<i>Opuntia imbricata</i> cane cholla	154
<i>Opuntia polyacantha</i> plains pricklypear	191
<i>Ribes cereum</i> wax current	303 ²
<i>Quercus gambelii</i> Gambel oak	427 ²
<i>Yucca baccata</i> datil yucca	54
<u>TREES</u>	
<i>Juniperus monosperma</i> one-seed juniper	18 ¹ /463
<i>Pinus edulis</i> pinyon pine	36 ¹ /508

¹ Individuals less than 1 foot in height.² Based on stems per acre.

Gambel Oak/Prairie Junegrass. Castetter (1956) described the third plant community as Petran Montane Forest Association. This association is generally at elevations from 7,000 to 9,500 feet and receives more effective precipitation. At our location, this association is limited to the higher more mesic, northern exposed slopes. The dominant species include ponderosa pine (*Pinus ponderosa*), Douglas fir (*Psuedotsuga menziesii*), and white fir (*Abies concolor*). These species were observed for this community; however, none were recorded during sampling. In addition, numerous shrubs play an important role in this association.

Based on data collected during field activities, the subassociation Gambel Oak/Prairie Junegrass (*Querus gambelii/Koeiria cristata*) was characterized for the above mentioned association. Total cover was recorded as 44 percent, with 14 percent grass and grasslike, 2 percent forbs, 26 percent shrubs, and 2 percent trees (TABLE 5). Prairie junegrass was the most recorded grass species with 9 percent cover, representing 20 percent of the total cover. Frequency for Prairie Junegrass was calculated to be 30 percent. Of the 26 percent cover reported for shrub species, Gambel oak had a cover value of 11 percent. This represented 25 percent of the total cover for this association. Fourteen and a half percent frequency was calculated for Gambel Oak. Range condition was estimated to be in good condition. Production was ocularly estimated at 600-800 pounds per acre air dry forage (USDA-SCS, 1975). A density of 5,264 stems per acre was recorded for Gambel oak (TABLE 6). This value represented the greatest density for this plant community. Pinyon pine had a recorded density of 363 individuals per acre.

Species of plants observed within the three plant communities of the San Pedro Mine are outlined in TABLE 7.

TABLE 5
 AVERAGE PERCENT COVER AND FREQUENCY FOR THE
 GAMBEL OAK/PRAIRIE

SPECIES	% COVER	FREQUENCY
<u>GRASS AND GRASSLIKE</u>		
<i>Carex gereyi</i> elk sedge	0.80	4.0
<i>Koeleria cristata</i> prairie junegrass	9.40	30.0
<i>Muhlenbergia montana</i> mountain muhly	0.35	1.5
<i>Stipa comata</i> needle and thread	0.15	0.5
<i>Stipa lobata</i> littleawn needlegrass	2.95	11.5
TOTAL	13.65	47.50
<u>FORBS</u>		
<i>Artemisia ludoviciana</i> Louisiana sagebrush	0.85	6.0
<i>Eriogonum jamesii</i> James buckwheat	0.30	2.0
<i>Heuchera rubescens</i> alumroot	0.15	1.0
<i>Lepidium montanum</i> mountain pepperweed	0.30	2.5
<i>Taraxacum officinale</i> dandelion	0.15	1.0
<i>Thelesperma montanum</i> greenthread	0.30	1.5
TOTAL	2.05	14.0
<u>SHRUB AND SHRUBLIKE</u>		
<i>Cercocarpus montanus</i> mountain mahogany	5.00	9.0
<i>Holodiscus dumosa</i> rock spirea	2.85	4.5

TABLE 5 (CONTINUED)
 AVERAGE PERCENT COVER AND FREQUENCY FOR THE
 GAMBEL OAK/PRAIRIE

SPECIES	% COVER	FREQUENCY
<i>Prunus virginiana</i> choke cherry	0.50	2.0
<i>Quercus gambelii</i> Gambel oak	10.50	14.5
<i>Quercus undulata</i> wavyleaf oak	1.90	2.0
<i>Ribes inerme</i> gooseberry	4.85	8.0
<i>Ribes leptanthum</i> trumpet gooseberry	0.15	1.0
TOTAL	25.75	41.00
 <u>TREES</u>		
<i>Pinus edulis</i> pinyon pine	2.15	5.5
TOTAL	2.15	5.5

TABLE 6

AVERAGE DENSITY ESTIMATIONS FOR THE GAMBEL OAK/PRAIRIE
JUNEGRASS PLANT COMMUNITY

SPECIES	STEMS/ACRE
<u>SHRUBS</u>	
<i>Cercocarpus montanus</i> mountain mahogany	4,175
<i>Holodiscus dumosus</i> rock-spiraea	1,997
<i>Prunus virginiana</i> chokecherry	508
<i>Physocarpus monogyus</i> ninebark	508
<i>Quercus gambelii</i> Gambel oak	5,264
<i>Ribes cereum</i> wax current	2,468
 <u>TREES</u>	
<i>Pinus edulis</i> pinyon pine	<u>INDIVIDUALS/ACRE</u> 363

TABLE 7

LIST OF PLANTS OBSERVED ON THE
SAN PEDRO MINE, SANTA FE COUNTY, NEW MEXICO

SCIENTIFIC NAME	COMMON NAME
<u>GRASS AND GRASSLIKE</u>	
<i>Agropyron smithii</i>	Western wheatgrass
<i>Aristida fendleriana</i>	Fendler threeawn
<i>Boutelona gracilis</i>	Blue grama
<i>Bromus tectorum</i>	Cheatgrass
<i>Carex gereyi</i>	elk sedge
<i>Hilaria jamesii</i>	galleta
<i>Koeleria cristata</i>	prairie junegrass
<i>Muhlenbergia montana</i>	mountain muhly
<i>Stipa comata</i>	needle and thread
<i>Stipa lobata</i>	littleawn needlegrass
<i>Sitanion hystrix</i>	bottlebrush squirreltail
<i>Sporobolus airoides</i>	alkali sacaoton
<u>FORBS</u>	
<i>Arabis findleri</i>	fendlers rockcrest
<i>Artemisia ludoviciana</i>	Louisiana sagebrush
<i>Asclepias</i> sp.	milkweed
<i>Astragalus mollissimus</i>	wooly milkvetch
<i>Chrysopsis canescens</i>	golden aster
<i>Corydalis aurea</i>	birdbeak
<i>Cryptantha</i> sp.	hidden flower
<i>Draba cuneifolia</i>	whitelowgrass
<i>Erigeron</i> sp.	fleabane
<i>Erigeron divergens</i>	spreading fleabane
<i>Eriogonum jamesii</i>	James buckwheat
<i>Euphorbia fendleri</i>	spurge
<i>Erodium cicutarium</i>	heronbill
<i>Galium</i> sp.	bedstraw
<i>Gilia subnuda</i>	spike gilia
<i>Heuchera rubescens</i>	alumroot
<i>Hymenoxys argentea</i>	hymenoxys
<i>Kochia scoparia</i>	sumercypress
<i>Lappula redowskii</i>	European stickweed
<i>Lepidium motanum</i>	mountain pepperwood
<i>Lesquerella</i> sp.	bladderpod
<i>Lesquerella pinetorum</i>	bladderpod
<i>Leucelene ericoides</i>	baby whiteaster
<i>Linum puberulum</i>	flax

TABLE 7 (CONTINUED)

LIST OF PLANTS OBSERVED ON THE
SAN PEDRO MINE, SANTA FE COUNTY, NEW MEXICO

SCIENTIFIC NAME	COMMON NAME
<i>Lithospermum incisum</i>	stone seed
<i>Lupinus brevicaulis</i>	Lupine
<i>Marrubium vulgare</i>	hoarhound
<i>Oenothera albicaulis</i>	eveningprimrose
<i>Penstemon</i> sp.	penstemon
<i>Phlox nana</i>	Santa Fe phlox
<i>Senecio neomexicanus</i>	New Mexico groundsel
<i>Sphaeralcea coccinea</i>	scarlet globemallow
<i>Sphaeralcea fendleri</i>	fendler globemallow
<i>Sphaeralcea incana</i>	globemallow
<i>Taraxacum officinale</i>	dandelion
<i>Thelesperma montanum</i>	greenthread
<i>Thermopsis montanum</i>	mountain thermopsis
<i>Townsendia exscapa</i>	stemless townsendia
<i>Verbascum thaspus</i>	flannel mullion
<i>Verbena wrightii</i>	Wright's verbene
<i>Vicia americana</i>	American vetch
<i>Zinnia grandiflora</i>	Rocky Mountain Zinnia

SHRUBS

<i>Artemisia frigida</i>	fringed sagebrush
<i>Cercocarpus montanus</i>	mountain mahogany
<i>Corypantha vivipara</i>	corypantha
<i>Echinocereus viridiflorus</i>	green hoghead
<i>Gutierrezia sarothrae</i>	broom snakeweed
<i>Holodiscus dumosus</i>	rock-spiraea
<i>Lycium</i> sp.	wolfberry
<i>Opuntia imbricata</i>	cane cholla
<i>Opuntia polyacantha</i>	plains pricklypear
<i>Prunus virginiana</i>	choke cherry
<i>Physocarpus monogyus</i>	ninebark
<i>Quercus gambelii</i>	gambel oak
<i>Quercus undulata</i>	wavyleaf oak
<i>Ribes cereum</i>	wax current
<i>Ribes inerme</i>	gooseberry
<i>Ribes leptanthum</i>	trumpet gooseberry
<i>Symphoricarpos utahensis</i>	Utah snowberry
<i>Yucca baccata</i>	detil yucca

TABLE 7 (CONTINUED)

LIST OF PLANTS OBSERVED ON THE
SAN PEDRO MINE, SANTA FE COUNTY, NEW MEXICO

SCIENTIFIC NAME	COMMON NAME
<u>TREES</u>	
<i>Juniperus monosperma</i>	one-seed juniper
<i>Pinus edulis</i>	pinyon pine

Threatened and Endangered Floral Species

A literature review and conferral was conducted for Santa Fe county to identify any listed threatened, endangered, sensitive and/or candidate floral species. Based on that information, 5 species were identified (Siviski, per. comm.). Presented below is a brief summary of current status, habitat affinities, and key phenological characteristics.

Cyanic milkvetch (*Astragalus cyaneus*) is a low tufted perennial, with grayish hairs that lie flat. Flowers are pealike and pinkish purple. The fruit is a pod with thick greenwalls, becoming woody when dry. Cyanic milkvetch flowers from April to June. It is found in pinyon and juniper on sandy to gravelly hillsides (Fletcher, et. al., 1984). The current listings for this species is New Mexico rare and sensitive plant species (Sivinski and Lightfoot, 1992).

Santa Fe milkvetch (*Astragalus feensis*) is a loosely tufted perennial with mostly prostrate stems. Flowers are pealike and reddish purple. Fruit is a pod that is curved through a half circle and covered with flat lying hairs. Santa Fe milkvetch flowers in May and June. It likes dry slopes and is usually associated with pinyon and junipers (Fletcher, et. al., 1984). Santa Fe milkvetch is currently listed as a New Mexico rare and sensitive plant species.

Wright's pincushion cactus (*Mammillaria Wrightii*) is usually a solitary stemmed cactus with distinctive hooked reddish spines. Flowers are pink to purple and can be tinged with white or yellow. Fruit is rounded and rust red at maturity. Wright's pincushion flowers from May through April. This cactus is listed as a plant species that is endangered in New Mexico.

Little Simpson's cactus (*Pediocactus simpsonii*) stems can be 5cm in diameter with smooth spines, the central ones dark reddish brown. It produces a pink to yellow flower from May through June. Little Simpson's cactus prefers the higher sites in the pinyon and juniper where it can be found on fine dry soils. It is listed as a plant species endangered in New Mexico.

Grama grass cactus (*Toumeyia papyracantha*) is a solitary stemmed cactus. Its spines are flattened and resemble dry grass blades. The flowers are white and may appear from April to June. It prefers grama grass and galleta grasslands associated with short grass prairie. Grama grass cactus is presently listed as a plant species endangered in New Mexico, category two(2) by the U.S. Fish and Wildlife Service, and Forest Service sensitive (FSS) by the U.S. Forest Service.

Survey methods included wandering specific transects through select prime habitats, in an attempt to locate any species of concern. Areas that appeared to be most suitable for the state endangered flora were surveyed by walking set transects at specific intervals (7-15 feet) to obtain a more comprehensive coverage of these areas. Initiation of the survey was done in an attempt to optimize chances of finding the targeted species (if flowering period). Based on three days of field activities and survey during May 1992, no species of concern were identified.

WILDLIFE HABITATS

The initial phase of the wildlife survey was to assess the number and types of wildlife habitats in the San Pedro Mine area. The permit area elevation ranged from 8242 to 7200 feet with slopes ranging from 8 to 67 percent. The combined effects of elevation, aspect, topography and soils results in distinct changes in the

vegetation. These differences in vegetation along with topography relief determine the structure, abundance, and location of wildlife habitat sites. The combination of plant communities and topography as wildlife habitat sites dictates how vertebrate wildlife will utilize a geographic area. Habitat sites on the San Pedro Mine property are identified by their ability to fulfill wildlife needs for; 1) food, 2) cover, 3) space, and 4) interspersation (Bailey, 1984). The resultant wildlife habitat site map is presented in PLATE 2.

Aerial photographs and topographic maps were used to pre-assess the number and locations of habitat sites. Tentative boundaries of habitat sites were sketched onto a base map. A reconnaissance field survey was undertaken to confirm habitat sites, boundaries, and to identify important/dominant plant species present. General characteristics of the vegetation, based on number of species, was determined while ground truthing habitat sites. Plant species and communities were identified utilizing regional sources (Alexander et. al., 1987, Eberhardt 1978, Elmore 1976, Kearney 1969, Martin and Hutchins 1961).

Two wildlife habitat sites are identified and described for the San Pedro Mine area.

Pinyon-juniper Woodlands

Pinyon-juniper Woodland dominates nearly 1.24 million square miles of the southwestern United States (Lanner, 1975). The Pinyon-juniper Woodland is a transition zone between desert shrub and grassland at lower elevation and the ponderosa pine or mountain-brush type at higher elevations (Lymbery and Pieper 1983, Daniel et. al., 1966).

In the San Pedro Mine area, the dominant overstory vegetation is composed of pinyon pine, one-seed juniper and Rocky Mountain juniper. The understory is dominated by broom snakeweed, blue grama, and galleta. The major plant communities are Pinyon/Juniper/Blue Grama and Blue Grama/Broom Snakeweed. This habitat site varies from dense stands of pinyon pine to open grasslands with scattered trees.

The habitat site occupies a range of soils from Laporte-Rock outcrop to a gravelly clay loam. Soils for the most part are shallow with low fertility. Very slow permeability layers exist near the surface. Runoff can be rapid and erosion severe during extreme storm events. Slopes range from 8 to 65 percent and occupy a variety of aspects and topography (USDA-SCS, 1975). This habitat occurs from 7200 to 8240 feet elevation in the mine area.

Upland Forest

The Upland Forest habitat site is encountered in the higher, moister elevations of the mine area. The site is distinguished by steep, talus slopes and a mixture of conifer and mountain brush species. Slopes are steep and range from 45 to 68 percent. Elevations range from 7700 to 8180 feet. This habitat site is restricted almost entirely to northern aspects. Dominant overstory species are white fir, Douglas-fir, and ponderosa pine. This site is found on the upper slopes of ridges, where it forms mosaics with stands of mountain spray, common hoptree, and prairie junegrass. Where fire plays a role, this site can become dominated by oak species (Alexander et. al., 1987). Gambel Oak/Prairie Junegrass and portions of the Pinyon/Juniper/Blue Grama plant communities are present within this habitat site.

The land type of the Upland Forest is Stony Rock land. Permeability is moderate. Runoff is rapid on steep slopes, and the hazard of erosion can be severe.

WILDLIFE

The wildlife survey and results are based on conventional field techniques and observations, as well as consideration of survey results in other areas of the vicinity.

Birds

Birds were censused along a 1.5 mile Emlen (1971, 1977) transect that began at 7200 feet elevation near the southeast corner of the mine area and ended at 7900 feet elevation on the north facing slope in the project's northwest corner (PLATE 2). This allowed sampling of the bird population across the entire elevational gradient of the mine area. Birds were recorded as they were seen and/or heard by the observer as he slowly walked along roads or through woodlands along the transect. Counts were conducted on 4 mornings: 15 May, 25 May, 4 June, and 11 June 1992.

Bird counts were totaled by species for each count and then a mean was calculated for the 4 counts. A mean number for each species was also calculated per mile of transect.

A total of 32 species of birds were documented along census transects (TABLE 8). If a year-round study had been conducted, it is likely that the species total would have approached 53, as found in the nearby Ortiz Mountains (Pegasus 1991).

Twenty-five (78%) species were recorded on 3 or all 4 of the counts (TABLE 8) and should be considered breeding species within

TABLE 8

BIRDS CENSUSED ON SAN PEDRO MOUNTAIN, MAY-JUNE 1992

Species	Number counted				% Occ.	Avg./ Count	Avg./ Mile
	5/15	5/25	6/04	6/11			
Rufous-sided Towhee	10	17	12	10	100	12.3	8.2
Black-headed Grosbeak	9	5	8	9	100	7.8	5.2
Plain Titmouse	1	9	7	5	100	5.5	3.7
Ash-throated Flycatcher	5	8	5	3	100	5.3	3.5
Chipping Sparrow	4	6	7	2	100	4.8	3.2
Say's Phoebe	4	5	4	2	100	3.8	2.5
Western Wood-Pewee	3	1	4	5	100	3.3	2.2
Mountain Chickadee	2	5	2	3	100	3.0	2.0
Mourning Dove	3	3	2	3	100	2.8	1.9
Rock Wren	2	1	4	4	100	2.8	1.9
Virginia's Warbler	2	4	1	2	100	2.3	1.5
Solitary Vireo	1	3	2	1	100	1.8	1.2
Broad-tailed Hummingbird	2	2	1	1	100	1.5	1.0
Canyon Wren	1	1	2	1	100	1.3	0.9
American Robin	1	1	1	1	100	1.0	0.7
Common Raven	1	1	1	1	100	1.0	0.7
Pinyon Jay	1	15	1		75	4.3	2.9
Scrub Jay	2	6	5		75	3.3	2.2
Bewick's Wren	6	2	2		75	2.5	1.7
Mountain Bluebird	3	3	3		75	2.3	1.5
Brown-headed Cowbird	2		1	1	75	1.0	0.7
Hairy Woodpecker	1		2	1	75	1.0	0.7
White-breasted Nuthatch	2	1	1		75	1.0	0.7
Steller's Jay		3	1	1	50	1.0	0.7
Cordilleran Flycatcher			1	1	50	0.5	0.3
Dusky Flycatcher	1	1			50	0.5	0.3
Hepatic Tanager		1		1	50	0.5	0.3
House Finch	1	1			50	0.5	0.3
Lark Sparrow				3	25	0.8	0.5
Pine Siskin	3				25	0.8	0.8
Northern Flicker				1	25	0.3	0.2
Western Tanager	1				25	0.3	0.2
Unidentified			3	1	--	1.0	--
<hr/>							
Totals	74	105	79	66	--	---	--
No. of species/count	27	24	23	24	--	---	--

the project area. The remaining 7 species may breed there, too, but this can not be confirmed from the existing data set. Rufous-sided Towhees were the most abundant, while 12 other species that regularly nest in pinyon-juniper woodland were also common.

Species that nested in more limited habitats, i.e., Canyon Wrens on rocky slopes or Virginia's Warblers in oak-conifer woodlands, were less abundant (TABLE 8). The mean number for each species per mile of transect is also given in TABLE 8 so that comparisons may be made if counts are conducted on the San Pedro Mountains in the future.

Bird species encountered in the San Pedro Mountains were comparable to those found in the nearby Sandia (Tatschl 1967) and Ortiz (Pegasus 1991) Mountains. Densities can not be compared because of differences in censusing techniques, but in general appear to be comparable. No threatened, endangered, or sensitive species were encountered, nor are any likely to regularly occur in the San Pedro Mountains.

Mammals

Mammals (or their sign) that were encountered during bird censusing are listed in TABLE 9. Only one bat has been documented to date; a Townsend's Big-eared Bat was found roosting in a shallow mine shaft near the top of the mountain on 15 May 1992. Additional bat species and their potential for occurrence are summarized in TABLE 10.

TABLE 9

MAMMALS DOCUMENTED (BY SIGHT OR SIGN)
ON THE SAN PEDRO MOUNTAINS, MAY-JUNE 1992

Common Name	Scientific Name
Townsend's Big-eared Bat	<i>Plecotus townsendii</i>
Cottontail	<i>Sylvilagus auduboni</i>
Chipmunk	<i>Eutamias</i> spp.
Rock Squirrel	<i>Spermophilus variegatus</i>
Mule Deer	<i>Odocoileus hemionus</i>

TABLE 10

ADDITIONAL SPECIES OF BATS THAT MIGHT BE PRESENT IN THE
SAN PEDRO MINE AREA

Common Name	Scientific Name	Roost in Mine Shafts
<u>Likely Present</u>		
Fringed Myotis	<i>Myotis thysanodes</i>	Yes
California Myotis	<i>M. californicus</i>	No
Big Brown Bat	<i>Eptesicus fuscus</i>	Yes
Pallid Bat	<i>Antrozous pallidus</i>	No
Braxilian Free-tailed Bat	<i>Tadarida brasiliensis</i>	No
<u>Possibly Present</u>		
Small-footed Myotis	<i>M. liebii</i>	No
Southwestern Myotis	<i>M. auriculus</i>	Yes
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	No
Hoary Bat	<i>Lasiurus cinereus</i>	No

Potential Species Occurrence. Species of birds, mammals and reptiles which may potentially occur in the San Pedro Mine vicinity are outlined in TABLE 11. These species have been recently recorded to have been present in the nearby Ortiz Mountains (Pegasus, 1991).

TABLE 11

SPECIES WITH POTENTIAL FOR OCCURRENCE IN THE SAN PEDRO MOUNTAINS
SANTA FE COUNTY, NEW MEXICO

Common Name	Scientific Name
<u>Reptiles</u>	
Wandering Garter Snake	<i>Thamnophis elegans</i>
Bullsnake	<i>Pituophis melanoleucus</i>
Prairie Rattlesnake	<i>Crotalus viridis viridis</i>
Western Diamondback Rattlesnake	<i>C. atrox</i>
Western Fence Lizard	<i>Sceloporus occidentalis</i>
New Mexico Whiptail	<i>Cnemidophorus neomexicanus</i>
Mountain Short-horned Lizard	<i>Phrynosoma douglassi</i> <i>hernandesi</i>
<u>Mammals</u>	
Townsend's Big-eared Bat	<i>Plecotus townsendii</i>
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>
Brush Mouse	<i>Peromyscus boylii</i>
White-footed Mouse	<i>P. leucopus</i>
Deer Mouse	<i>P. maniculatus</i>
Pinyon Mouse	<i>P. truei</i>
White-Throated Woodrat	<i>Neotoma albigula</i>
Ord's Kangaroo Rat	<i>Dipodomys ordii</i>
Least Chipmunk	<i>Eutamias minimus</i>
Red Squirrel	<i>Tamiasciurus hudsonicus</i>
Abert's Squirrel	<i>Sciurus aberti</i>
Rock Squirrel	<i>Spermophilus variegatus</i>
Black-tailed Jackrabbit	<i>Lepus californicus</i>
Desert Cottontail	<i>Sylvilagus auduboni</i>
Black Bear	<i>Ursus americanus</i>
Striped Skunk	<i>Mephitis mephitis</i>
Porcupine	<i>Erethizon dorsatum</i>
Coyote	<i>Canis latrans</i>
Red Fox	<i>Vulpes vulpes</i>
Cougar	<i>Felis concolor</i>
Bobcat	<i>Lynx rufus</i>
Mule Deer	<i>Odocoileus hemionus</i>
Elk	<i>Cervus elaphus</i>

TABLE 11 (CONTINUED)

SPECIES WITH POTENTIAL FOR OCCURRENCE IN THE SAN PEDRO MOUNTAINS
SANTA FE COUNTY, NEW MEXICO

Common Name	Scientific Name
<u>Birds</u>	
Duck species	<i>Anas</i> spp.
Turkey Vulture	<i>Cathartes aura</i>
Cooper's Hawk	<i>Accipiter cooperii</i>
Sharp-shinned Hawk	<i>A. striatus</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Golden Eagle	<i>Aquila chrysaetos</i>
American Kestrel	<i>Falco sparverius</i>
Great Horned Owl	<i>Bubo virginianus</i>
Flammulated Owl	<i>Otus flammeolus</i>
Greater Roadrunner	<i>Geococcyx californianus</i>
Common Nighthawk	<i>Chordeiles minor</i>
Common Poorwill	<i>Phalaenoptilus nuttallii</i>
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>
Ladder-backed Woodpecker	<i>Picoides scalaris</i>
Hairy Woodpecker	<i>P. villosus</i>
Northern Flicker	<i>Colaptes auratus</i>
Western Wood-Pee-wee	<i>Contopus sordidulus</i>
Dusky Flycatcher	<i>Empidonax oberholseri</i>
Say's Phoebe	<i>Sayanoris saya</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Cassin's Kingbird	<i>Tyrannus vociferans</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>
Steller's Jay	<i>Cyanocitta stelleri</i>
Scrub Jay	<i>Aphelocoma coerulescens</i>
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>
Clark's Nutcracker	<i>Nucifraga columbiana</i>
American Crow	<i>Corvus brachyrhynchos</i>
Common Raven	<i>C. corax</i>
Mountain Chickadee	<i>Parus gambeli</i>
Plain Titmouse	<i>P. inornatus</i>
Bushtit	<i>Psaltriparus minimus</i>
Red-breasted Nuthatch	<i>Sitta canadensis</i>
White-breasted Nuthatch	<i>S. carolinensis</i>
Brown Creeper	<i>Certhia americana</i>

TABLE 11 (CONTINUED)

SPECIES WITH POTENTIAL FOR OCCURRENCE IN THE SAN PEDRO MOUNTAINS
SANTA FE COUNTY, NEW MEXICO

Common Name	Scientific Name
Canyon Wren	<i>Catherpes mexicanus</i>
Bewick's Wren	<i>Thryomanes bewickii</i>
Rock Wren	<i>Salpinctes obsoletus</i>
Golden-crowned Kinglet ¹	<i>Regulus satrapa</i>
Ruby-crowned Kinglet	<i>R. calendula</i>
Western Bluebird	<i>Sialia mexicana</i>
Mountain Bluebird	<i>S. currucoides</i>
Townsend's Solitaire	<i>Myadestes townsendi</i>
Hermit Thrush	<i>Catharus guttatus</i>
American Robin	<i>Turdus migratorius</i>
Crissal Thrasher	<i>Toxostoma dorsale</i>
Northern Mockingbird	<i>Mimus polyglottos</i>
Solitary Vireo	<i>Vireo solitarius</i>
Virginia's Warbler	<i>Vermovira virginiae</i>
Yellow-rumped Warbler	<i>Dendroica coronata</i>
Townsend's Warbler	<i>D. townsendi</i>
Grace's Warbler	<i>D. graciae</i>
Wilson's Warbler	<i>Wilsonia pusilla</i>
Western Tanager	<i>Piranga ludoviciana</i>
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Rufous-sided Towhee	<i>Pipilo erythrophthalmus</i>
Green-tailed Towhee	<i>P. chlorurus</i>
Canyon Towhee	<i>P. fuscus</i>
Chipping Sparrow	<i>Spizella passerina</i>
Black-chinned Sparrow	<i>S. atrogularis</i>
Vesper Sparrow	<i>Poocetes gramineus</i>
Lark Sparrow	<i>Chondestes grammacus</i>
Dark-eyed Junco	<i>Junco hyemalis</i>
Brown-headed Cowbird	<i>Molothrus ater</i>
Scott's Oriole	<i>Icterus parisorum</i>
House Finch	<i>Carpodacus mexicanus</i>
Red Crossbill	<i>Loxia curvirostra</i>
Pine Siskin	<i>Carduelis pinus</i>
Evening Grosbeak	<i>Coccothraustes vespertinus</i>

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