CIRCULAR 76

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Abstract

This report describes sixty known barite deposits in New Mexico and covers briefly twenty-four other miscellaneous occurrences in which barite has been reported as a minor coproduct or gangue constituent. History and production of barite in the state, types of occurrences, mineralogy, uses, and grade specifications are discussed.

Total recorded production of barite in New Mexico up to and including 1962 was 36,118 tons mined in nine of the state's thirty-two counties. However, 96.5 per cent of the total was obtained from a single deposit, the Mex-Tex mine in Socorro County.

Sixty-eight character samples were taken of barite exposed in various deposits, and four larger samples were collected for beneficiation tests. Bench-scale flotation tests yielded marketable-grade barite with indicated recoveries ranging from about 40 to 84 per cent. Because many barite deposits in the state are barite-fluorite complexes, concentration tests were also made for fluorite. Acid-grade fluorspar was obtained in tests on three samples in quantities indicating that 53 to 78 per cent of the fluorite present in an ore could be recovered.

Introduction

Known barite occurrences are limited to the mountainous central part of the state in Bernalillo, Dona Ana, Lincoln, Luna, Sandoval, Santa Fe, Sierra, Socorro, and Torrance counties. In addition, unconfirmed occurrences have been reported in Grant, Otero, and Valencia counties.

Field investigation for this report was begun in August 1956, suspended in March 1957, resumed in September 1960, and completed in May 1963. During these periods, fifty-three deposits were examined. History, production, ownership, and geologic setting are discussed for most of the deposits examined. Ownerships, as given in this report, are based on the latest information available to the authors. Where necessary, mapping and sampling was done to enhance investigation of the deposits.

Where possible, all deposits are posted on maps according to section, township, and range. Some are fixed by projection where they fall in unsurveyed land areas. The township and range designations refer to the New Mexico base and meridian.

As used in this report, the term *deposit* covers any occurrence known to contain noteworthy barite mineralization. *Prospect* refers to any occurrence showing some barite mineralization with little or no indication of significant ore tenor on the basis of present exposures or information in earlier reports. A number of the properties fall in this category, including some explored or mined for other minerals. A classification as *prospect* does not mean that a deposit necessarily lacks potential. With additional exploration or under more favorable economic conditions, such occurrences could easily have importance as barite resources, particularly those containing several cominerals that can be recovered and sold. The term *mine* connotes a deposit from which mining operations have produced ore in commercial amounts.

ACKNOWLEDGMENTS

Property owners were very cooperative in furnishing information concerning their claims. Many assisted by accompanying the writers to individual properties. Special acknowledgment is due the staff of the New Mexico Bureau of Mines, whose work and previous reports have been used freely in preparation of this paper. All owners whose addresses are known have given permission to publish data pertaining to their individual properties.

HISTORY AND PRODUCTION

Barite has been found in significant amounts in nine of New Mexico's thirty-two counties (fig. 1). The first ore sold was mined at Las Cruces, Dona Ana County, in 1918, when a trial shipment of more than 100 tons was sent to El Paso, Texas by William Petters of Las Cruces (Loughlin and Stose, 1921). Another early discovery was a large deposit of barite associated with high-grade fluorspar near Derry, Sierra County, developed by William Petters and Frank D. Rivera of Las Cruces. A sample analyzed by the New Mexico College of Agriculture contained 95.74 per cent $BaSO_4$. A carload of barite was shipped to El Paso, Texas (Loughlin and Stose).

In 1921-1922, J. E. Brazeal, operator of the Tonuco mine in northwest Dona Ana County, stockpiled about 200 tons of low-grade barite as a coproduct from fluorspar beneficiation. The

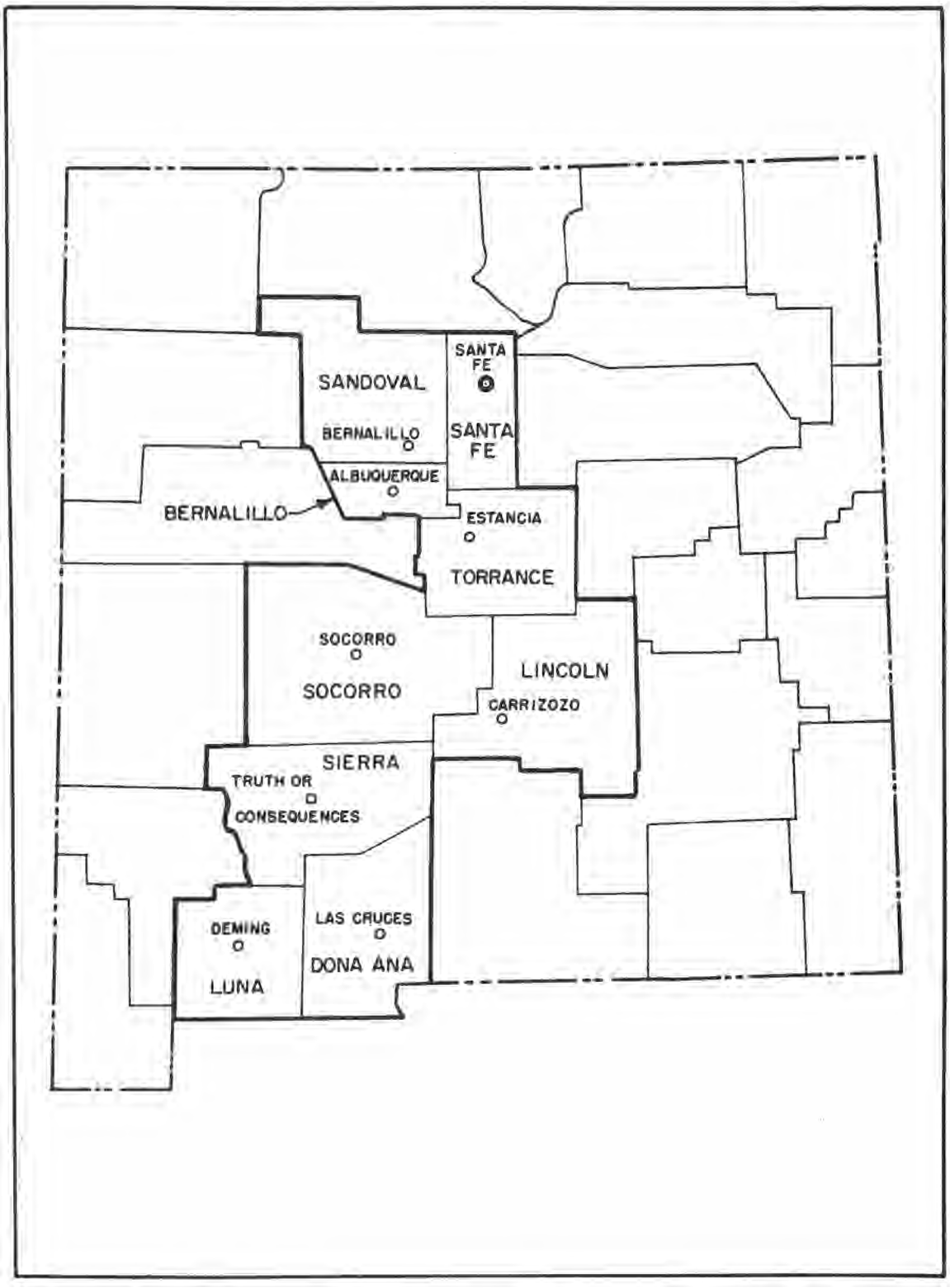

Figure 1

MAP OF NEW MEXICO SHOWING COUNTIES KNOWN TO HAVE BARITE DEPOSITS

company segregated barite from fluorspar with the hope that it could be sold at some future date (Johnston, 1928). A sample taken from mill heads contained 47.33 per cent CaF_2, 17.26 per cent $BaSO_4$, and 29.49 per cent $Si0_2$. No information could be obtained about eventual disposal of the stockpile.

A, record of barite operations in New Mexico in the decade preceding 1932 could not be found locally, and production was not reported in the Federal Bureau of Mines, *Minerals Yearbook* during that period.

In October 1932, the *Alamogordo* (New Mexico) *News* reported that a carload of barite was shipped from the Stevens mine in the Organ Mountains of Dona Ana County to the Mid-Continent Mud Company of Houston, Texas. The barite was apparently used as a weighting material for drilling mud (Talmage and Wootton, 1937).

Bates and Long, of El Paso, Texas, shipped twelve carloads of barite in the spring of 1933 from the White Spar mine in secs. 33 and 34, T. 23 S., R. 4 E., in the southern part of the Organ Mountains, Dona Ana County. The barite was shipped to Houston, Texas, and was used as weighting material for drilling mud *(Arizona Mining Journal,* 1931).

The authors could not obtain any information about barite production and history for the years from 1933 to 1948.

In 1948, the Mudrite Chemical Corporation, J. W. O'Brien, owner, developed the Palm Park barite deposit near Hatch, in the northwest part of Dona Ana County, and constructed a mill near Rincon. Jigged ore was screened to three sizes at the rate of about 100 tons of barite a month. The first 50 tons of milled barite had a specific gravity of 4.338 *(Engineering and Mining Journal,* 1949). Operations were suspended in April 1950, after 450 tons of barite concentrate were produced.

In 1949 the Mex-Tex Mining Company sold its property in the Hansonburg mining district of Socorro County to Erwin and Bishop of Houston, Texas *(Engineering and Mining Journal).* Development work was started by the new owners in 1950. An upgrading plant near San Antonio, New Mexico, was placed in operation in April 1951. A flotation circuit was added ten years later by the Atomic Mineral Corporation.

Barite production in 1956 was solely from the Mex-Tex Mining Company's mine in the Hansonburg district. Four thousand and fifty-nine tons of ground barite were sold to the oil industry for use as weighting material in drilling mud. The barite, occurring as a coproduct of lead, was processed in the Mex-Tex Mining Company's mill near San Antonio until it was closed in 1958.

Construction of a barite mill near Bernalillo, Sandoval County, was begun in 1958 by the Barite Corporation of America, but it was not completed.

In 1959, the Atomic Mineral Corporation acquired the Mex-Tex Mining Company's mine and mill and, under operation by Galbar, Inc., a subsidiary, produced 3500 tons of barite-lead ore from which 320 tons of ground barite were recovered. During the next year, 492 tons of ground barite were sold. Total production from the mill during the decade 1951-1960 was 34,868 tons of barite, representing 96.5 per cent of New Mexico's recorded barite production. Lead concentrate from the mill was shipped to the American Smelting and Refining Company plant at El Paso, Texas. Ground barite was sold to the oil industry for weighting drilling mud.

Table 1 is a recapitulation of barite production by year, county, and property. Production to date has been limited to three counties, Dona Ana, Sierra, and Socorro.

TABLE 1. BARITE PRODUCTION IN NEW MEXICO

COUNTY	YEAR	PROPERTY	SHORT TONS	TOTALS
Dona Ana	1918	Petters	100[a]	
	1932	Stevens mine	50[b]	
	1933	White Spar mine	600[c]	
	1949-50	Palm Park mine	450[d]	
		Total, Dona Ana County		1,200
Sierra	1918	Petters and Rivera	50[b]	
		Total, Sierra County		50
Socorro	1951-58	Mex-Tex Mining Co.	34,056[d]	
	1959	Galbar, Inc.	320[d]	
	1960	Galbar, Inc.	492[d]	
		Total, Socorro County		34,868
		Total, New Mexico		36,118

a Estimated.
b Tonnage estimated, reported as one carload.
c Tonnage estimated, reported as twelve carloads.
d Reported by owners or lessees.

MINERALOGY AND OCCURRENCES

The important barium minerals from a commercial standpoint are barite (barium sulfate, $BaSO_4$) and witherite (barium carbonate, $BaCO_3$). Witherite occurs only rarely in New Mexico and is of no commercial importance in the deposits of the state. Barite is a heavy, nonmetallic mineral containing 65.7 per cent BaO and 34.3 per cent SO_3 that crystallizes in tabular (flat) orthorhombic crystals having lateral dimensions several times their thickness. The mineral is translucent to opaque with a vitreous luster, commonly colorless, but sometimes red, yellow, or blue in light hues.

Barite has a hardness of 3 to 3.5 on Moh's scale. This is about the same as the hardness of calcite ($CaCO_3$), a little less than that of fluorite (fluorspar, CaF_2), and considerably less than that of quartz ($Si0_2$). These four minerals are frequently associated in nature. Intergrown crystals of barite, fluorite, and calcite sometimes form in successive stages, with the last mineral to solidify forced into distorted, partly developed crystal forms occupying the voids between the others. Varieties of silica or quartz are the most common gangue minerals in barite ores.

Barite in pure form has a specific gravity of 4.5 and thus is the heaviest of the nonmetallic minerals. In fact, the name is derived from the Greek word *barys,* meaning heavy. When pure, barite is distinguishable by its greater weight. However, because of intergrowth with calcite and fluorite, specimens may be considerably lighter. Figure 2 shows the relation of specific gravity and barite content in per cent to volume of rock in place for barite ores having a siliceous gangue.

Barite is widely distributed in mineral deposits. It commonly is associated with metallic ores as a gangue mineral but is also found in veins with other nonmetallic minerals. Sandstones and breccias are occasionally cemented with barite; limestone and dolomite often contain the mineral. Residual deposits derived from weathering of limestones and dolomites have been found, notably in the Southern states, but no deposits of this type were seen in New Mexico during this investigation. New Mexico barite occurs in all three major rock types, igneous, metamorphic, and sedimentary, but chiefly in limestone host rocks. Most of the ores also contain fluorspar, which in some instances is the major ore constituent. A few deposits are primarily lead-silver occurrences in which the barite is classed as a gangue mineral, although it may be economically recoverable.

USES AND SPECIFICATIONS

Barite is an essential raw material used in many industries both as a rock product valuable for its physical properties and as an ingredient of chemical, glass, ceramic, paint, and other products. The chief market from a volume standpoint is the well-drilling segment of the petroleum industry, which consumes more than 90 per cent of the barium minerals sold.

Appropriate preparation of barite for industrial use may require no more than crushing, grinding, and sizing, steps which may be performed by the producer, at least in part, or in an intermediate plant. Some ores as mined may require concentration by gravity or flotation methods to make an upgraded salable product. In the production of barium chemicals, as well as some other industrial items, additional processing, including roasting and leaching, is necessary. The industrial specifications that govern the purchase of barite ore products depend on use requirements. For example, in well drilling, barite increases the weight of drilling muds and improves their ability to restrain high gas or other fluid pressures encountered in rock formations, thus preventing blowouts (undesirable release of pressure at surface). For maximum weighting effect, the minimum specific gravity of an acceptable barite product is set at 4.2, which in turn calls for a minimum content of 92 per cent $BaSO_4$. The product must also be chemically inert under the conditions of use, free of soluble salts, and finely ground (90 per cent through a 325-mesh screen).

The high specific gravity of barite makes it valuable as an aggregate in concrete for use where extra weight is desirable, such as keeping pipelines buried in swamps. A special use, based on the excellent shielding effect of the element barium against radioactivity, is suggested by recent experiments. Barite-aggregate concrete has been proposed as a relatively inexpensive construction material for air-raid shelters and missile sites.

In the glass industry, typical specifications call for a barite product with a minimum content of 98 per cent $BaSO_4$ and a maximum content of 1.5 per cent $Si0_2$, 0.15 per cent aluminum oxide ($A1_2O_3$), and 0.15 per cent iron oxide (Fe_2O_3). Iron oxide is especially objectionable. Several standards relating to sizing of material acceptable to the glass industry are in current use. Some plants require crushed material sized between 16- and 20-mesh range. An alternate specification calls for

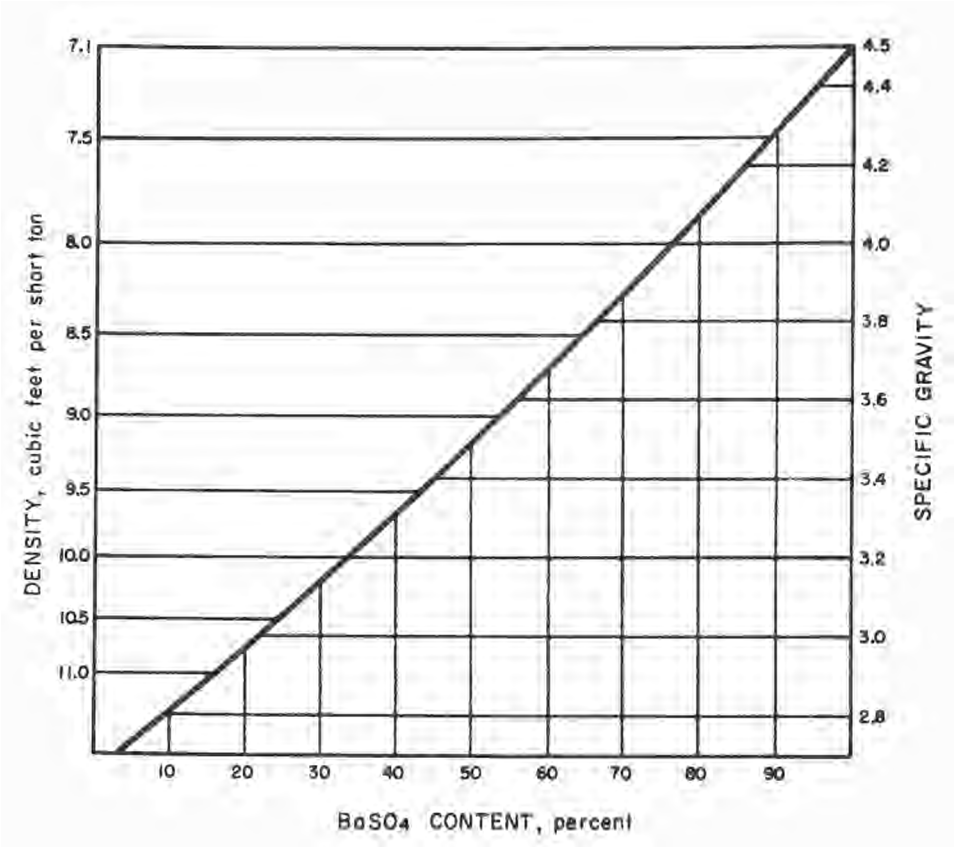

Figure 2
RELATION OF VOLUME OF ORE IN PLACE TO $BASO_4$ CONTENT AND SPECIFIC GRAVITY

a mixture ranging between 30 and 140 mesh in size. More finely ground barite may be substituted, but too fine a grind (minus 325 mesh) is not desirable.

The only rigid specification for barite used as filler material in the manufacture of paint, inks, oilcloth, linoleum, and rubber is fineness of grind. A mixture of finely ground barite and synthetic rubber is used as an asphalt additive to make a superior paving material.

Still other specifications apply to barite for manufacture of chemicals in plants such as the new Barium Chemicals plant of the Pittsburgh Plate Glass Company at Natrium, West Virginia. Barium carbonate and sulfur compounds are produced in this plant by roasting barite mixed with ground coal in a rotary kiln and then leaching the kiln product *(PPG Chemicals)*. Typical specifications for barite in the chemical industry call for a minimum of 94 per cent $BaSO_4$, a maximum 1 per cent each of iron oxide (Fe_2O_3) and strontium sulfate ($SrSO_4$), and no more than a trace of fluorine. Plant feed sizing between 4 and 20 mesh is usually specified, although some plants will purchase lump barite. Finer material is undesirable because it contributes to dust loss in processing, and intimate contact between reacting chemicals is lacking with coarser material.

In virtually all of its many uses, barite is consumed, and no secondary recovery is made of the barium content of discarded products.

Description of Deposits

BERNALILLO COUNTY

P & G DEPOSIT

Only one barite occurrence is known in Bernalillo County (locality 1, fig. 3) The P & G property, consisting of three unpatented claims, P & G Nos. 1-3, is in NW 1/4 sec. 26, T. 10 N., R. 5 E., Tijeras Canyon district. It is reached by traveling south 1.4 miles on State Highway 10 from its intersection with U.S. Highway 66, some 16 miles east of the center of Albuquerque.

The property is owned by M. J. Giannini and John Parsons. Ownership history prior to 1942, when the claims were located for barite as the Santo Domingo prospect, is unknown. An abandoned 285-foot inaccessible shaft is at the northern end of the property. According to Mr. , this shaft, locally known as the Longfellow shaft, may have been sunk as early as July 1879. Oxides of copper are found adjacent to the cratered surface at the shaft collar, but no barite is evident. A short adit a few yards west of the shaft contains no barite.

About 1000 feet south of the old shaft, barite occurs in a 3-inch vein that strikes N. 8° E. and dips 70° W. White, medium-sized crystals of barite were deposited in a vein in Madera Limestone. Barite is found at the face of a 75-foot adit in the vein and at the bottom of a 65-foot vertical shaft sunk at the mouth of the adit. No production has been reported.

DONA ANA COUNTY

All the known barite deposits of Dona Ana County lie east of the Rio Grande which traverses the county from northwest to southeast (fig. 4).

There are thirteen known occurrences in the county; six are within the boundary of the White Sands Missile Range, a military proving ground in south-central New Mexico. Only one of the deposits within the missile range was visited (Lot 0M-69). Information herein pertaining to the other deposits occurring within the restricted area was obtained from previous reports.

Total known barite production for the county amounts to about 1200 tons (table 1).

Those deposits in the northwest part of the county (Caballo Mountains) are mostly associated with volcanic rocks, whereas those in the east and southeast (San Andres and Organ mountains) occur in limestones. In all deposits, barite is intermixed with fluorspar in veins, in some wall rock replacement, and in cementing material of breccia in fault zones.

PALM PARK MINE

The Palm Park mine (locality 1, fig. 4), locally known as Palmer Park, is in sec. 10, T. 18 S., R. 3 W., Rincon mining district. It is reached by traveling 2.8 miles north from Hatch on U.S. Highway 85 and then eastward 7.8 miles along an unimproved mine road. The mine is on the west slope and near the southern limits of the Caballo Mountains at an altitude of 4950 feet. It is flanked on the east and west by prominent escarpments 200 feet high. A broad park area of recent gravels lies to the south.

The property embraces six contiguous unpatented claims. Three claims, Palm Park 1, 2, and 3, were originally located in July 1925 by J. P. Pinkerton of Hatch. The claims were relocated in June 1942 and leased to J. W. O'Brien. Mr. O'Brien located three additional claims, Hatch Extension 1 and 2 and Millsite Claim, in May 1945 and bought the three original claims under the name Mudrite Chemical Corporation. The corporation constructed a small jigging plant at Rincon in 1948 and processed 450 tons of barite from 1949 to 1951, after which production was discontinued.

A location notice posted at the property shows that R. W. Umphres of Phillips, Texas, relocated the three Palm Park claims in 1960. No activity was noticed when the claims were visited in June 1962.

Barite occurs in irregular, discontinuous veins in a low-dipping brecciated rhyolite sill that intruded a contact between limestone and shale. The veins trend N. 40° W. and dip almost vertically. The barite is wholly within the rhyolite, and the occurrence might be considered a blanket deposit with lateral dimensions usually greater than the known depth. The width of the contact zone ranges from 4 to about 15 feet. Barite crops out for about 7500 feet along the strike, but

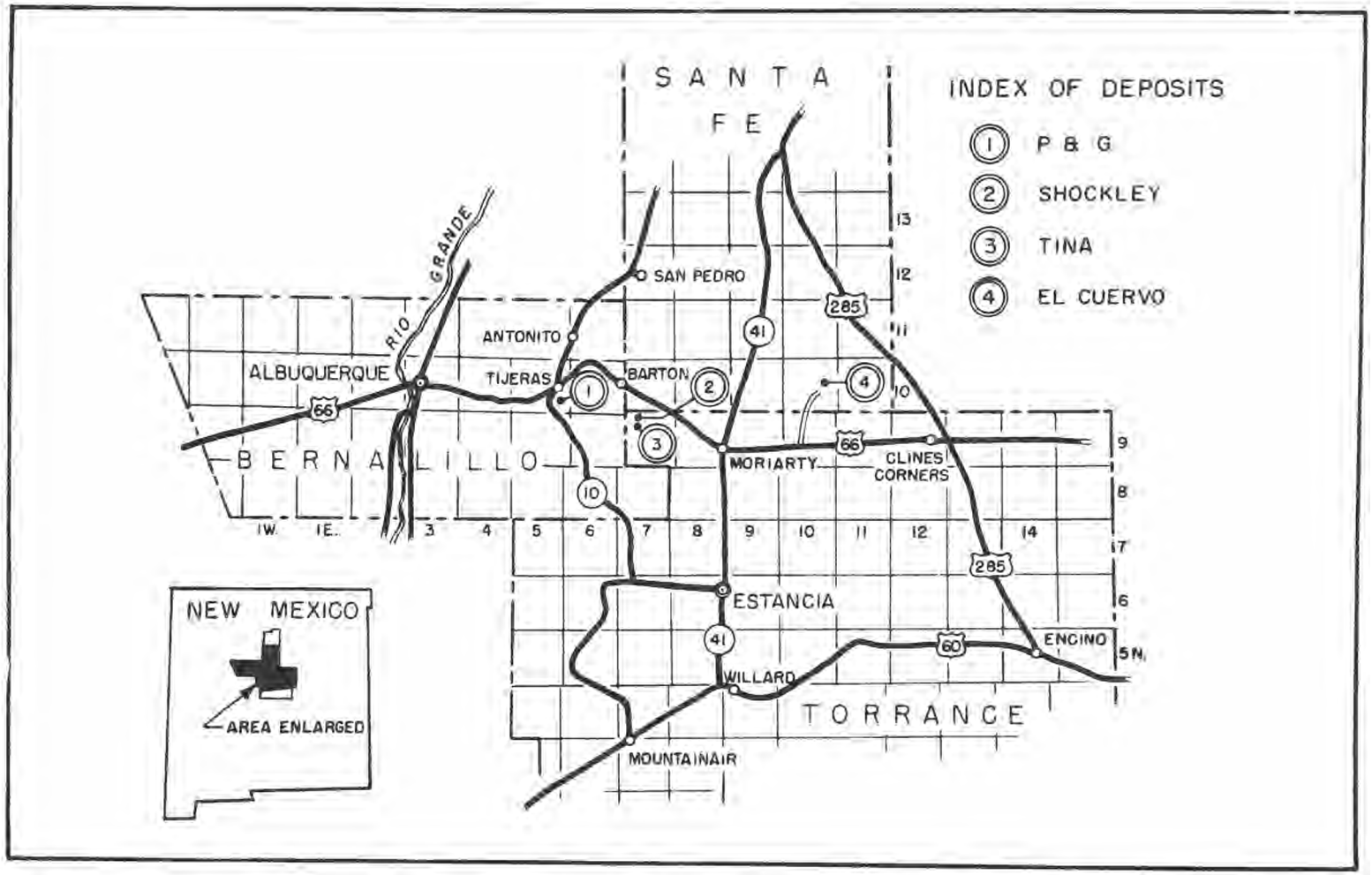

Figure 3

BARITE DEPOSITS OF SANTA FE, BERNALILLO AND TORRANCE COUNTIES, NEW MEXICO

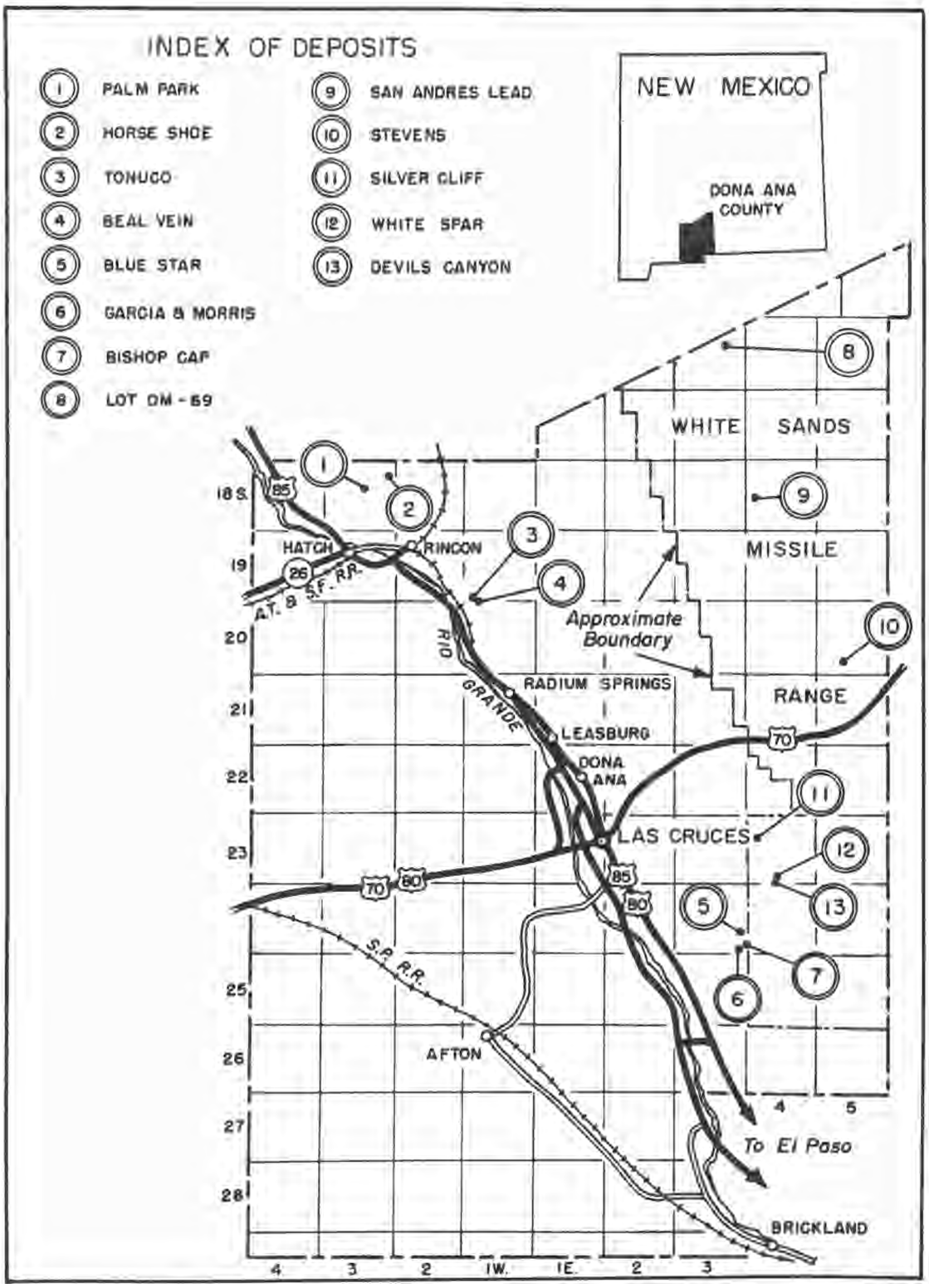

Figure 4

BARITE DEPOSITS OF DONA ANA COUNTY, NEW MEXICO

minable ore probably is limited to 2000 feet along the southeastern part of the contact zone. The veins become narrow toward the northwest. Only Palm Park claims Nos. 1-3 show mineralization. Barite occurs with chert and minor amounts of quartz, fluorite, calcite, and hematite stain. Platy barite crystals as much as four inches across their faces are found near the southeastern terminus of the vein system. Figure 5 shows these crystals in a large boulder found near the main workings.

A composite of nineteen channel samples taken by Forest J. Sur (1946a) for the U.S. Bureau of Mines assayed 58.8 per cent $BaSO_4$, 25.5 per cent SiO_2, 3.9 per cent $CaCO_3$, 2.0 per cent CaF_2, and 1.0 per cent Fe_2O_3. A 5-foot chip sample taken across an open cut assayed 56.2 per cent $BaSO_4$, 36.1 per cent SiO_2, and 1.6 per cent CaF_2.

The deposit has been explored with a few small crosscuts on one of the larger veins near its southeastern limit.

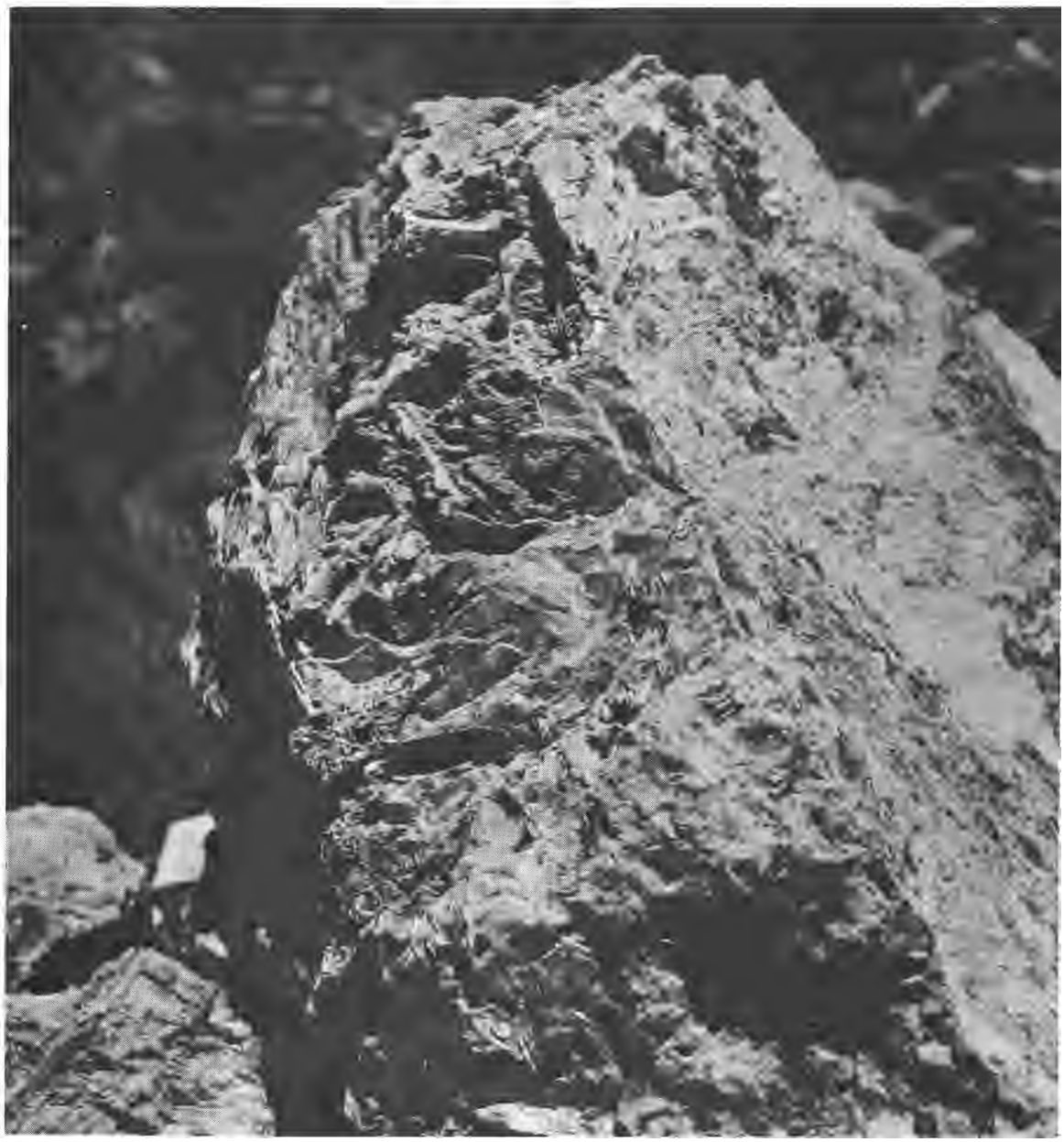

Figure 5
BARITE BOULDER FROM THE PALM PARK MINE, DONA ANA COUNTY (knife is 2 inches long)

HORSESHOE DEPOSIT

The Horseshoe deposit (locality 2, fig. 4) is in secs. 1 and 12, T. 18 S., R. 3 W., Rincon mining district, about 1.5 miles northeast from the Palm Park mine. From the village of Rincon, travel 2.5 miles north, then 11.6 miles east to a water reservoir for cattle. Four unpatented claims located by R. C. Woodward are 0.8 miles southwest of the reservoir, near the crest and along the southwest slope of a small rounded hill at an altitude of 4950 feet.

Barite occurs in a vein in limestone and in a brecciated overthrust fault zone. The vein strikes N. 30° E., dips vertically, and is exposed for 350 feet from its southwestern limit to where it merges into the overthrust fault, which strikes N. 30° W. and dips steeply westward. The total length of the showing is 500 feet. Barite cannot be traced northeast beyond the overthrust. No production has been reported.

Ore is found in a crosscut 100 feet long, 15 feet wide, and 8 to 10 feet deep at the point where the vein encounters the overthrust. Barite forms cementing material for limestone fragments in a brecciated zone along the overthrust. Jasper and hematite dilute the ore and very little wall rock replacement is evident. The vein is 4 feet wide in the brecciated zone exposed in the open cut. There, a chip sample across the vein contained 68.0 per cent $BaSO_4$ and 0.2 per cent CaF_2. The vein narrows abruptly to a few inches immediately northwest of the open cut. The vein is also exposed in three shallow pits near the extreme southwestern part of the deposit some 350 feet from the open cut. Here, the vein makes sharp contacts with the limestone host and ranges in width from 8 to 15 inches. Barite breaks cleanly from the limestone. Overlying alluvium prevents tracing the vein beyond the pit farthest to the southwest.

TONUCO (BEAL) MINE

The Tonuco mine and Beal vein (localities 3 and 4, fig. 4) are fluorspar deposits on San Diego (Tonuco) Mountain in the S1/2 sec. 31, T. 19 S., and the N 1/2 sec. 6, T. 20 S., R. 1 W. The mine is accessible from Hatch by traveling 10.5 miles south on U.S. Highway 85 and then 2 miles east to the prominent peak.

The properties have been described separately but, in this report, they are considered as one because history and ownership indicate that the two were owned as a single unit in 1940.

Originally, the Tonuco mine (west workings as described herein) was located by Roy and Pete Beal in July 1918 as the Fluorine group of nine claims. Some 2350 tons of fluorspar ore were mined from the group and sold in 1918 and 1919. In 1918, the Ore Production Company obtained at least partial ownership and constructed the Heathdon mill in sec. 36, T. 19 S., R. 2 W., one mile west of the Tonuco mine. The millsite was claimed in March 1921. In 1920, the Beals located claims on the east side of the mountain on what is referred to as the Beal vein. About 1200 tons of fluorspar ore were taken from this deposit in the early 1920's. About 5300 tons of ore were milled at the Heathdon mill from 1919 to 1921; it is probable that this total included the Beals' 1200 tons. One hundred and seventy tons were also milled in 1928; this production presumably came from various lessees who were working a number of adits and open cuts on the original Tonuco mining claim (Johnston). About 200 tons of low-grade barite were stockpiled at the millsite, but none was marketed (Clippinger, 1949). Final disposition of the stockpile was not disclosed.

In 1940, the Newallpitt Corporation of Pittsburgh, Pennsylvania, obtained Beulah May Nos. 1 and 2 claims, which covered both the Tonuco and the Beal veins (fig. 6). The corporation drove the 440-foot Hot tunnel but marketed no ore. Current ownership of the deposit is unknown.

In June 1962, the workings were badly obstructed and caved in some places, and it was generally impossible to obtain representative data concerning the deposit. Because little work other than Newallpitt's tunnel has been done since the late 1920's, most of the descriptions herein are from Johnston.

Barite and fluorite occur with quartz as fissure filling in a fault cutting Precambrian granite and schist. Generally, the two ore minerals have crystallized in large, easily separated masses of medium-sized crystals. In places, wall rock inclusions dilute the ore.

The mine workings are described as they occur from west to east along the vein. The western workings are on the Tonuco vein and the eastern workings on the Beal vein. Figure 6 shows their approximate locations.

Near the northwest end of Beulah May No. 1 claim, a 40-foot open cut extends into a 70-foot adit that bears S. 70° E. along the vein (locality 1, fig. 6). The vein is 10 feet wide near the portal of the adit, extends to a maximum width of 25 feet about 60 feet from the portal, and then narrows

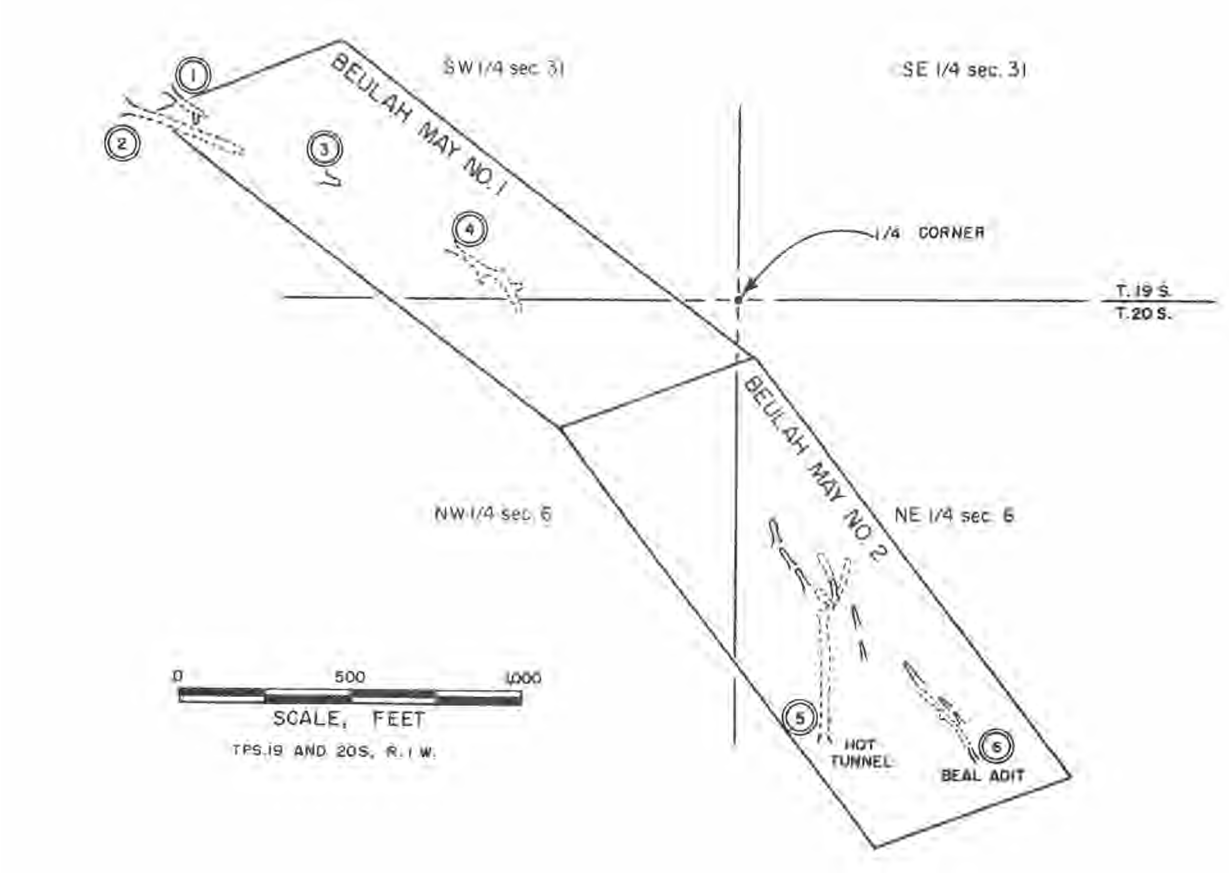

Figure 6
PLAT OF BEULAH MAY Nos. 1 AND 2 CLAIMS, TONUCO (BEAL) MINE, DONA ANA COUNTY, NEW MEXICO

to 10 feet for the remaining distance to the face of the adit, where the vein dips 75° SW. The ore is intergrown barite and fluorspar diluted by country rock. Johnston estimated that the ore contained from 20 to 60 per cent barite, 35 to 60 per cent fluorspar, and 5 to 20 per cent country rock. A parallel vein of mixed ore 2 feet wide is exposed a few feet north of the main vein, possibly a split from the main vein.

Southwest of the combination open cut and adit and 50 feet lower on the hillside, a 350-foot adit was driven S. 75° E. in an unsuccessful attempt to intersect the vein (locality 2, fig. 6).

About 500 feet southeast from the 350-foot adit, a 40-foot open cut exposes some 3 feet of ore similar to that in the long adit (locality 3, fig. 6).

Some 500 feet farther southeast across a small ravine, a 400-foot adit was driven along the vein, which strikes N. 25° W. Here the dip changes to about 60° SW. The vein width ranges from 5 to nearly 20 feet through the length of most of the tunnel but pinches to a few inches, chiefly barite, at the face. Open stopes extend from the tunnel to the surface along a strike length of about 200 feet. A 65-foot winze, 100 feet from the portal, showed that the vein pinched rapidly to 2 or 3 feet. This tunnel is known locally as the Blacksmith tunnel (locality 4, fig. 6).

On the east slope of the mountain on Beulah May No. 2 claim, a 440-foot adit bearing north encountered a sizable vein of mixed ore 360 feet from the portal. Here the vein strikes N. 20° W. and dips 70° SW. True width and assay value of the vein could not be determined in early 1962, but it is estimated that the vein is at least 5 feet wide and contains more than 40 per cent barite (locality 5, fig. 6). Where ore material is visible, barite occurs as clear, platy crystals that break cleanly from intergrown fluorspar. This adit is known locally as the Hot tunnel. Figure 7 shows a view of the Hot tunnel, looking north.

About 400 feet east from the portal of the Hot tunnel, a 200-foot adit and a series of short trenches explored the eastern or Beal vein (locality 6, fig. 6).

Figure 7
VIEW LOOKING NORTH AT HOT TUNNEL (LEFT) AND BEAL ADIT (RIGHT), TONUCO MINE, LOCALITIES 5 AND 6, RESPECTIVELY OF FIGURE 6.

Four grab samples taken from scattered stockpiles on the Beulah May No. 2 claim contained a weighted average of 42.8 per cent $BaSO_4$, 32.1 per cent CaF_2, 21.6 per cent SiO_2, and 1.1 per cent $CaCO_3$.

BLUE STAR DEPOSIT

The Blue Star deposit (locality 5, fig. 4) is in sec. 25, T. 24 S., R. 3 E., Bishops Cap mining district, on the east slope of prominent Bishops Cap Peak. It is accessible from Las Cruces by traveling south on U.S. Highway 80-85 for 10 miles, turning west past the Mossman Ranch for 4.7 miles, and proceeding southward for 2.3 miles along a dim truck road. Altitude at the deposit is 5000 feet.

The deposit is covered by fourteen contiguous unpatented claims, Blue Star Nos. 1-14, located in July 1954 by Fred C. Leach of Las Cruces. Reported production amounts to 12 tons of fluorspar ore but no barite.

Barite occurs sparingly in fracture zones as cavity filling and as partial replacement of the limestone host rock. One fracture zone 1 to 6 feet wide with a generally east-west trend is traceable for about 100 feet on the surface. It contains barite veinlets ranging from 2 to 15 inches in width. Depth of the deposit is unknown. Barite deposition was irregular and discontinuous. The barite is generally massive, but some medium-sized platy crystals were formed in cavities. A composite sample, collected from numerous places in the deposit, contained 26.5 per cent $BaSO_4$, 9.9 per cent CaF_2, and 1.1 per cent $CaCO_3$. Quartz with minor iron staining constitutes the gangue. Alluvium cover prevents tracing the veins continuously.

The main workings consist of two small open cuts, a 30-foot adit, and a 75-foot adit.

GARCIA & MORRIS AND BISHOPS CAP DEPOSIT

Two properties lying on the south and southeast slopes of Bishops Cap Peak (localities 6 and 7, fig. 4) contain small percentages of barite but are predominantly fluorspar deposits. A sample from the deposit in sec. 36, T. 24 S., R. 3 E., owned by P. M. Garcia and J. H. Morris of Las Cruces contained 6.8 per cent $BaSO_4$, 40.1 per cent CaF_2, and 49.1 per cent $CaCO_3$. The other deposit, Bishops Cap, owned by B. Samaniego of Las Cruces, is in secs. 25 and 26, T. 24 S., R. 3 E. A composite sample collected from minable parts of the vein at the Bishops Cap deposit contained 11.1 per cent $BaSO_4$, 47.5 per cent CaF_2, 23.5 per cent SiO_2, and 14.9 per cent $CaCO_3$ (Sur, 1946b).

SAN ANDRES LEAD MINE

The San Andres lead mine (locality 9, fig. 4) was not visited. It is reported because it is a known occurrence of barite. The following description of the deposit is from Dunham's report (1935, p. 255-256). The property, owned by W. J. Stevens of Las Cruces, is in the White Sands Missile Range. The mine is in the SW 1/4 sec. 18, T. 18 S., R. 4 E., on the north wall of San Andres Canyon at an average altitude of 5150 feet.

The irregular deposit replaces the Fusselman Dolomite adjoining a fault zone that strikes N. 15° W. and dips steeply westward. Barite, quartz, and galena are intermixed in a deposit about 200 feet long by 20 feet wide. The deposit was worked as an open cut, which exposed a 15-foot zone containing barite, quartz, and minor amounts of galena. A shaft was sunk near the center of the cut. An adit driven along the fault at a lower level intersected the shaft bottom about 400 feet from the portal. Barite was not encountered in the adit. A winze of unknown depth was sunk in the fault from a point in the adit 20 feet south from the shaft bottom. An eastward-trending crosscut driven from the shaft bottom also was barren. The property is only a barite prospect on the basis of the showings.

Development of the property took place from 1900 to 1904. No work has been done since that time.

STEVENS MINE

The Stevens mine (locality 10, fig. 4) is in secs. 28 and 33, T. 20 S., R. 5 E., Bear Canyon district, and is within the White Sands Missile Range in the San Andres Mountains. The mine is 2 miles north of U.S. Highway 70 at a point 37 miles northeast of Las Cruces. It was not visited; most of the information contained herein is from Dunham's report (p. 257-262).

Deposits in the district were developed chiefly by J. Bennett toward the end of the last century. Mr. Bennett sold all the property in the district, consisting of twenty-six unpatented claims, to W. J. Stevens and J. G. Stewart of Las Cruces in 1906.

Barite deposits occur in two distinct groups. One group contains replacement deposits related to a low-angle fault in the El Paso Limestone. These deposits crop out in the foothills. The other group consists of irregular replacement deposits in the Fusselman Dolomite near the summit of the mountain range. Some barite, fluorite, and galena are exposed in a short tunnel and an open cut in the Summit claims. It is not known whether barite has been sold from these claims. The deposits in the foothills group have been more thoroughly exploited. Barite was mined through several small shafts and open cuts on three claims, Fairview, International, and Southern. Minerals associated with the barite are fluorite, quartz, cerussite, anglesite, vanadinite, and wulfenite. A carload of barite was shipped in late 1932 (Talmage and Wootton).

WHITE SPAR DEPOSIT, DEVIL'S CANYON, SILVER CLIFF AND LOT OM-69 PROSPECTS

These occurrences are within the White Sands Missile Range. Only one prospect was visited, Lot OM-69, from which two samples were collected. Descriptions are from previous reports as indicated.

The White Spar deposit (locality 12, fig. 4), in secs. 33 ,and 34, T. 23 S., R. 4 E., is near the southern end of the Organ Mountains. Reportedly this vein-type deposit in limestone is nearly worked out (Talmage and Wootton). Twelve carloads of crude barite were shipped from it in 1933.

The Devil's Canyon prospect (locality 13, fig. 4) is in the SW 1/4 sec. 33, T. 23 S., R. 4 E. Barite has replaced marble, forming a mass about 20 feet wide by 100 feet long. It was exposed to a depth of 25 feet in an open cut. The deposit trends north-south. A small amount of fluorite is associated with the barite. The property is owned by A. H. and A. Beasley of Las Cruces. An unknown amount of barite was shipped from the open cut from 1932 to 1934 (Dunham).

The Silver Cliff prospect lies between Dripping Springs and the mouth of Fillmore Canyon, probably in sec. 6 or 7, T. 23 S., R. 4 E., near the southern end of the Organ Mountains (locality 11, fig. 4). According to Dunham, colorless barite and fluorite were introduced into a brecciated fault zone, and the deposit is apparently of no economic importance.

Lot OM-69 prospect is in sec. 10, T. 16 S., R. 3 E., near the southern end of the San Andres Mountains (locality 8, fig. 4). A vein deposit of unknown dimensions occurs in limestone, of which a sample contained 77.8 per cent $BaSO_4$, 14.8 per cent SiO_2, and 0.3 per cent $CaCO_3$. Mineralization extends northwestward into Sierra County, in secs. 4, 5, and 9, T. 16 S., R. 3 E. A chip sample taken from the northern end of the vein contained only 19.6 per cent barite.

LINCOLN COUNTY

There are thirteen known occurrences of barite in Lincoln County. Eleven are in the Gallinas district within the Cibola National Forest near the northwest corner of the county. The other two, the Fox Lode and Helen Rae, are near the towns of Jicarilla and Carrizozo, respectively (fig. 8).

No barite production has ever been reported; it is doubtful that any has been marketed.

In the Gallinas district, the barite in all the deposits examined is an accessory mineral with fluorspar occuring as fissure filling in fractured quartzitic sandstone or in brecciated contact zones between sandstone and igneous intrusives. In the west-central and south-central parts of the county, barite in the Fox Lode and Helen Rae deposits occurs as erratic fissure filling in limestone with no associated fluorspar.

GALLINAS DISTRICT

The Gallinas district (locality 1, fig. 8) occupies approximately ten square miles near the eastern edge of the Gallinas Mountains and is wholly within the Cibola National Forest. The mines or deposits examined are at altitudes ranging from 7500 feet to 8000 feet. They are primarily fluorspar deposits. Mines in the Gallinas district are accessible over two dirt roads branching from U.S. Highway 54 (fig. 9). One road passes through Red Cloud Canyon and the other goes to Rough Mountain. These roads lead to a lookout tower on Gallinas Peak, which is about 12 miles from U.S. Highway 54. Descriptions of access to the Red Cloud and Old Hickory mines are given in detail. Access to other deposits described herein are referred to those two prominent mine workings. Each deposit occurs adjacent to its access road.

Figure 9, a map of part of the claims in the area, shows the approximate locations of deposits. Some additional claims, the exact locations of which were unavailable to the authors, are not shown. The missing claims cover the Conqueror (Rio Tinto), Bottleneck, All American, and Big Ben (Sky High) deposits. Mines in the district have been operated intermittently since about 1885 (Griswold, 1959). Barite is associated with fluorspar in the eleven deposits examined in the district but has not been produced commercially.

In addition to the report by Griswold, other excellent reports on fluorspar mines in the district have been made by Rothrock, Johnson, and Hahn (1946) and by Soule (1946). They have been used freely by us in describing the deposits of the district.

Barite mineralization in the district was disclosed during extensive trenching and sampling by the U.S. Bureau of Mines in 1943 and 1944 (Soule). Based on this work, the following ranges in per cent of chief constituents were determined: 43.76 to 65.68 CaF_2, 11.72 to 28.56 $BaSO_4$, 8.2 to 25.2 SiO_2, and 1.0 to 5.5 $CaCO_3$.

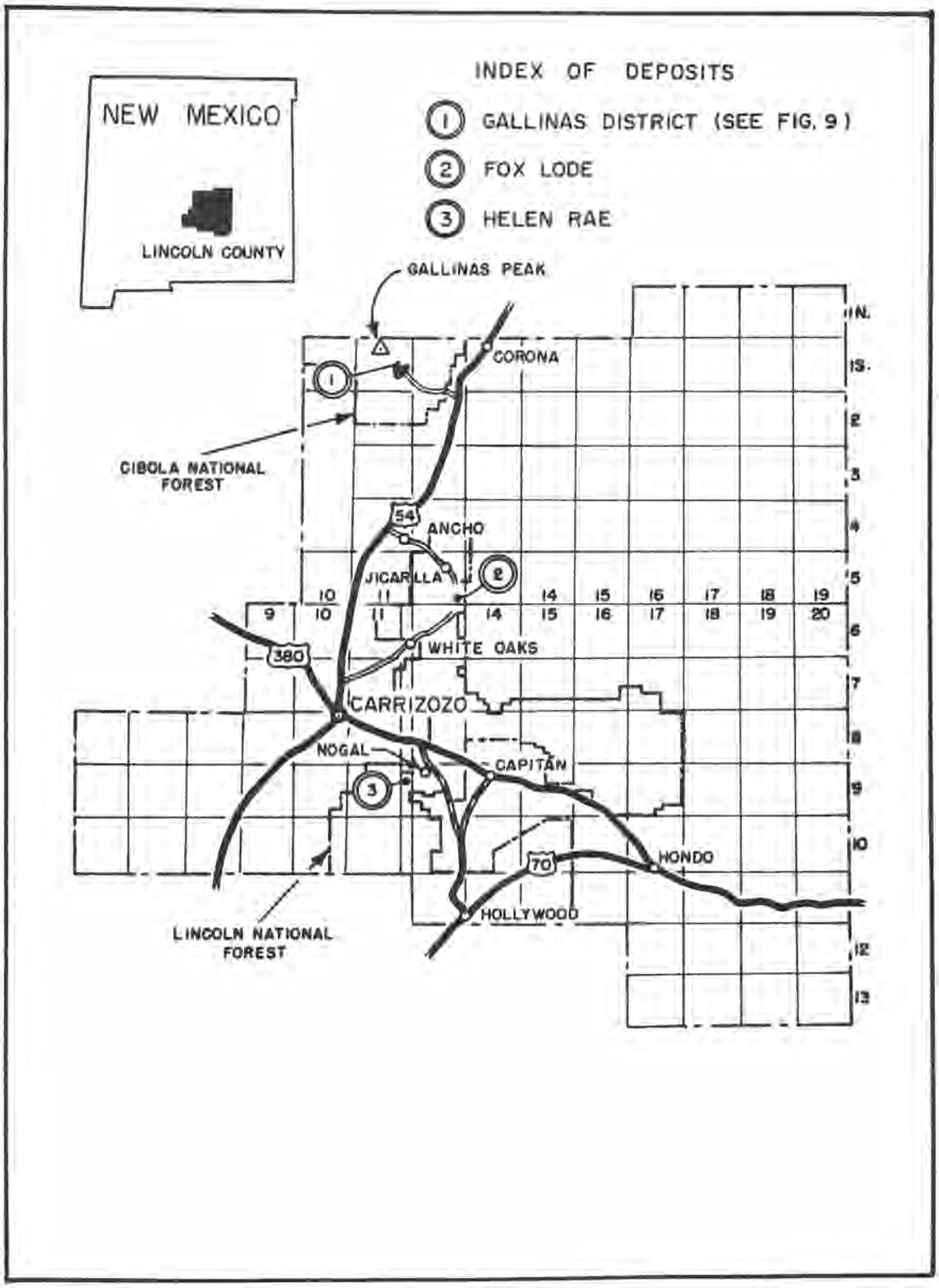

Figure 8

BARITE DEPOSITS OF LINCOLN COUNTY, NEW MEXICO

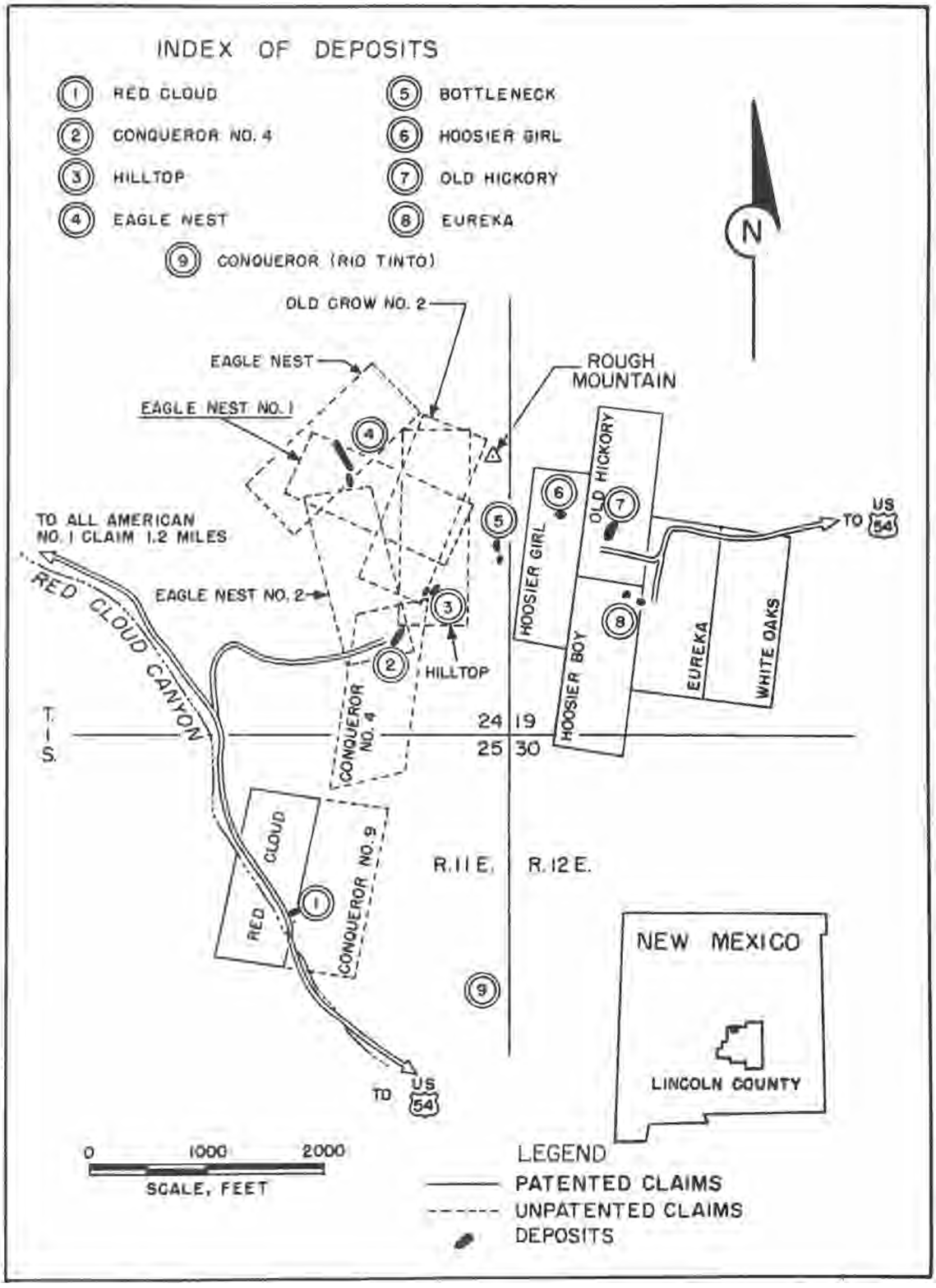

Figure 9

CLAIM MAP, FLUORITE-BARITE DEPOSITS, GALLINAS MINING DISTRICT, LINCOLN COUNTY, NEW MEXICO

Most of the deposits are fine-grained masses of lavender-to-purple fluorspar containing small bodies of light peach-colored, finely crystalline barite within the fluorspar matrix. In many places, minerals occur in brecciated zones within quartzitic sandstone or along contacts between sandstone and intrusive rock. Sunlight bleaching of the outcrops of massive-type deposits makes visual identification of mineralization in sandstone difficult. Coarse crystalline, pale green fluorite occasionally is found in veinlets in the fracture zones. Barite also occurs in the Neinlets, usually as large, easily recognized crystals.

RED CLOUD MINE

The Red Cloud mine (locality 1, fig. 9) in the NE1/4 sec. 25, T. 1 S., R. 11 E. is virtually a fluorspar mine, but it also contains barite, calcite, quartz, and the rare-earth mineral, bastnasite. It is reached by traveling 9.8 miles south from Corona on U.S. Highway 54, 1.3 miles west on a dirt ranch road, 2 miles north to a road fork, and 3.2 miles northwest through Red Cloud Canyon. The comprises two claims, crossed by the road. The Red Cloud, a patented claim, is owned by C. S. Thomas; the unpatented Conqueror No. 9 claim belongs to William E. Heim.

Mineralization occurs in a brecciated and altered sandstone body that lies along the common boundary of the two claims. The conspicuous workings are adjacent to and east of the road. Barite is intermixed with crystalline fluorite and ranges from finely crystalline to granular. Two composite samples were assayed by the U.S. Bureau of Mines (Soule). One, representing six samples collected from the outcrop, contained 52.07 per cent CaF_2 and 17.62 per cent $BaSO_4$; the other, made up of three samples collected from the 35-foot level, contained 46.14 per cent CaF_2 and 28.56 per cent $BaSO_4$.

When examined in the spring of 1962, the mine workings were badly caved and unsafe.

OLD HICKORY MINE

The Old Hickory mine (locality 7, fig. 9) on the east slope of Rough Mountain in the NW 1/4 sec. 19, T. 1 S., R. 12 E. is covered by one patented claim owned by Edna Lehman Davis and Adele Lehman of Alhambra, California. It can be reached by traveling southwest 4.5 miles from Corona on U.S. Highway 54 and 5.3 miles west on a dirt road.

The deposit is predominantly fine-grained, dense fluorspar with associated barite. Calcite, quartz, and dolomite are gangue minerals. Mineralization occurs in a north-trending trachyte dike and in adjacent quartzitic sandstone (Griswold, 1959). A composite sample of ore assayed by the U.S. Bureau of Mines contained 56.0 per cent CaF_2, 15.4 per cent $BaSO_4$, and 15.1 per cent SiO_2 (Soule).

The deposit has been worked through a 200-foot vertical shaft connecting with 100- and 200-foot levels. The vein at the surface is 180 feet long by 13 feet wide, but diminishes to 65 feet long by 3 feet wide at the 200-foot level (Griswold, 1959). This is one of three better developed mines in the district. No barite has been sold.

HOOSIER GIRL DEPOSIT

The Hoosier Girl deposit (locality 6, fig. 9) is about 500 feet west of the Old Hickory mine in the SW1/4 sec. 19, T. 1 S., R. 13 E. The claim is one of five owned by Adele Lehman and Mrs. Edna Lehman Davis of Alhambra, California.

Mineralization occurs in a pipelike, elliptical body having a maximum cross section of 40 feet. Fluorite with a minor amount of barite constitutes the ore. The deposit has been explored by three shallow shafts, ranging from 20 to 35 feet in depth. A composite of trench samples taken from the ore body contained 54.23 per cent CaF_2 15.00 per cent $BaSO_4$, and 8.20 per cent SiO_2 (Soule).

EUREKA DEPOSIT

The Eureka deposit (locality 8, fig. 9) in the SW1A sec. 19, T. 1 S., R. 12 E. is also a part of the property owned by Adele Lehman and Mrs. Edna Lehman Davis of Alhambra, California. It lies about 700 feet south from the Old Hickory mine. Part of the mineralization extends into the Hoosier Boy claim of the same group.

It is a vein-type deposit of fluorite, barite, quartz, and appreciable quantities of the rare-earth mineral, bastnasite. A composite of several samples contained 43.76 per cent CaF_2, 25.50 per cent $BaSO_4$, and 10.84 per cent SiO_2 (Soule).

EAGLE NEST PROSPECT

The Eagle Nest prospect (locality 4, fig. 9) is 0.7 mile north of the Red Cloud mine in the E 1/2 sec. 24, T. 1 S., R. 11 E. Three unpatented claims, Eagle Nest and Eagle Nest Nos. 1 and 2, constitute the property. The claims are part of a group of seven purchased from C. E. Degner by the Allied Dye and Chemical Company in 1946.

The showing is predominantly fluorspar with minor amounts of barite, quartz, and calcite which occur in a wide northwest-trending breccia zone in quartzitic sandstone. It was explored by three small pits and seven trenches, is about 420 feet long and ranges from 7 to 21 feet wide. A composite sample, representing 31 samples collected from the prospect trenches and pits, contained 65.68 per cent CaF_2, 16.42 per cent $BaSO_4$, 13.40 per cent SiO_2, and 1.00 per cent CaO (Soule). No production is reported from the property.

BOTTLENECK DEPOSIT

The Bottleneck deposit (locality 5, fig. 9) in the SE 1/4 sec. 24, T. 1 S., R. 11 E. is about 0.7 mile northeast of the Red Cloud mine.

This fluorspar deposit contains a significant quantity of barite. The deposit, similar to others in the district, is a vein in highly brecciated quartzitic sandstones. The irregular vein strikes north and dips 40° west; it is about 110 feet in length and 43 feet in maximum width; its ends taper to 5 feet in width. A composite of nine trench samples from the deposit contained 47.94 per cent CaF_2, 21.12 per cent $BaSO_4$, and 25.20 per cent SiO_2 (Soule). No production has been obtained from the property.

CONQUEROR No. 4 AND HILLTOP DEPOSITS

The Conqueror No. 4 (locality 3, fig. 9) and Hilltop (locality 4, fig. 9) deposits are in part of a group of unpatented claims owned by the Allied Dye and Chemical Company. They are located in the SE 1/4 sec. 24, T. 1 S., R. 11 E. and conflict in part with two Eagle Nest claims owned by the same company.

These deposits, like others in the district, are predominantly fluorite with a minor amount of barite. Mineralization occurred in a series of brecciated zones that strike generally northeast. Total dimensions of both deposits, as determined by U.S. Bureau of Mines trenching (Soule), are about 650 feet by 150 feet. The weighted average content of ten samples obtained from the trenches was 63.38 per cent CaF_2, 14.60 per cent $BaSO_4$, and 17.84 per cent SiO_2, from the Conqueror No. 4 claim. The weighted average content of eleven samples from the Hilltop claim was 57.41 per cent CaF_2, 21.20 per cent $BaSO_4$, and 20.84 per cent SiO_2. No production has been reported.

CONQUEROR (RIO TINTO) MINE

The Conqueror or Rio Tinto mine (locality 9, fig. 9) is in the E1/2 sec. 25, T. 1 S., R. 11 E. The mine lies a few hundred feet north of Red Cloud Canyon road at a point 1.4 miles downstream from the Red Cloud mine.

The property comprises twenty-three unpatented contiguous claims owned by C. E. Degner of Carrizozo. The deposit is primarily fluorspar with associated minerals of copper and lead and a minor amount of barite in the gangue. The mineralization occurs in two brecciated zones in limestone that trend northerly and northwesterly. The deposit was mined through a 230-foot vertical shaft and 200 feet of drift on the 130-foot level. Also, a small pit was dug on the outcrop of the deposit. A hand-cobbed sample from the pit contained 18.0 per cent CaF_2, 6.2 per cent $BaSO_4$, and 0.14 per cent Cu. About 300 tons of fluorite-copper-lead ore were shipped in 1956, but no barite was sold.

ALL AMERICAN DEPOSIT

The All American deposit (not shown on fig. 9) in sec. 23, T. 1 S., R. 11 E. is adjacent to the road to Gallinas Peak lookout tower about 1.5 miles northwest of the Red Cloud mine and near the head of Red Cloud Canyon. One unpatented claim owned by E. D. French covers the deposit (Griswold, 1959).

As in other mines of the district, fluorspar constitutes the major ore mineral; it is associated with barite, calcite, and oxides of copper. Mineralization occurs in veins and veinlets that are erratic both in dimension and orientation. Brecciated and altered limestone is the major host rock. Several wagon-drill samples were collected. A composite of these samples contained 54.27 per cent CaF_2 and 11.72 per cent $BaSO_4$ (Soule).

The deposit was worked through about 185 feet of drift extending westward and southwestward from a 2-compartment vertical shaft at the 85-foot level. Several small pits and shallow bulldozer trenches were cut at random on the surface. Judging from unweathered scratches on rocks and freshly broken tree roots seen in the spring of 1962, most of the surface work was fairly recent. No barite has been marketed.

BIG BEN PROSPECT

The Big Ben prospect is covered by two unpatented claims, Big Ben and Sky High, owned by C. E. Degner and associates of Carrizozo. The claims are in the SE 1/4 sec. 14, T. 1 S., R. 11 E., about 2 road miles beyond the Red Cloud mine on the Gallinas Peak lookout road (not shown on fig. 9). A caved adit and an inaccessible shaft, estimated to be about 100 feet deep, were the major workings on the property when visited in the spring of 1962.

Mineralization exposed in a small pit appears to be similar to that of other deposits in the .district, fluorite predominating with minor amounts of barite and calcite. Analysis of a small grab sample collected near the Big Ben shaft showed 61.4 per cent CaF_2, 6.6 per cent $CaCO_3$, and 2.4 per cent $BaSO_4$. No production has been reported.

Fox LODE PROSPECT

The Fox Lode group (locality 2, fig. 8), formerly known as the Ward Leslie group, comprises twenty-two unpatented lode claims, Nos. 1-22, in sec. 36, T. 5 S., R. 12 E. in the Lincoln National Forest. The property is accessible from Carrizozo by traveling 3.3 miles north on U.S. Highway 54, turning northeast 12.5 miles through White Oaks, then 4.2 miles north at a road fork to the Foster ranch house. The group of claims is 0.4 mile east of the ranch house at an altitude of 6800 feet.

The property was originally located by Ward Leslie of Carrizozo in about 1930. Currently, the property is owned by J. H. Gallagher and associates of White Oaks, New Mexico.

Barite occurs as fissure filling in limestone. Traces of copper oxide staining are found associated with the barite. The vertical vein deposit is erratic and irregularly mineralized but strikes generally east-west. Maximum exposed vein width, in a localized pocket, is 2 feet. Barite is medium crystalline, white, and appears relatively pure. No fluorite or quartz could be detected with a hand lens. A 2-foot chip sample taken across the localized pocket contained 89.7 per cent $BaSO_4$, 2.4 per cent $CaCO_3$, and had a specific gravity of 4.2. The deposit is traceable for about 100 feet before alluvium masks the westward extension of the vein.

An open cut 100 feet long, 50 feet wide, and 6 feet deep constitutes the major prospect work. About 400 feet south of the major cut, shallow alluvium cover was bulldozer-stripped, exposing small stringers of barite running parallel to the major vein. Eastward from the main exposure there are several shallow inaccessible shafts, presumably dug by gold prospectors during the first decade of this century. No barite has been sold from the property.

HELEN RAE MINE

The Helen Rae mine (locality 3, fig. 8), owned by Clinton Rice and associate of Carrizozo, is essentially a gold property located in the NW 1/4 sec. 13, T. 9 S., R. 12 E., about 3.5 miles southwest of Nogal. According to Griswold (1959), two northwest-striking barite veins occur 200 to 300 feet east from the main north-striking gold vein. The property was not visited by us; no detailed data on the barite veins are available.

LUNA COUNTY

Only two deposits of barite are known in Luna County. Both are in the Florida Mountains a few miles southeast of Deming, the county seat (fig. 10).

The deposits are primarily fluorspar, but barite is an associated mineral. Some assays of the ore returned a higher percentage of barite than fluorspar. Both desposits occur in fissure veins in volcanic agglomerates.

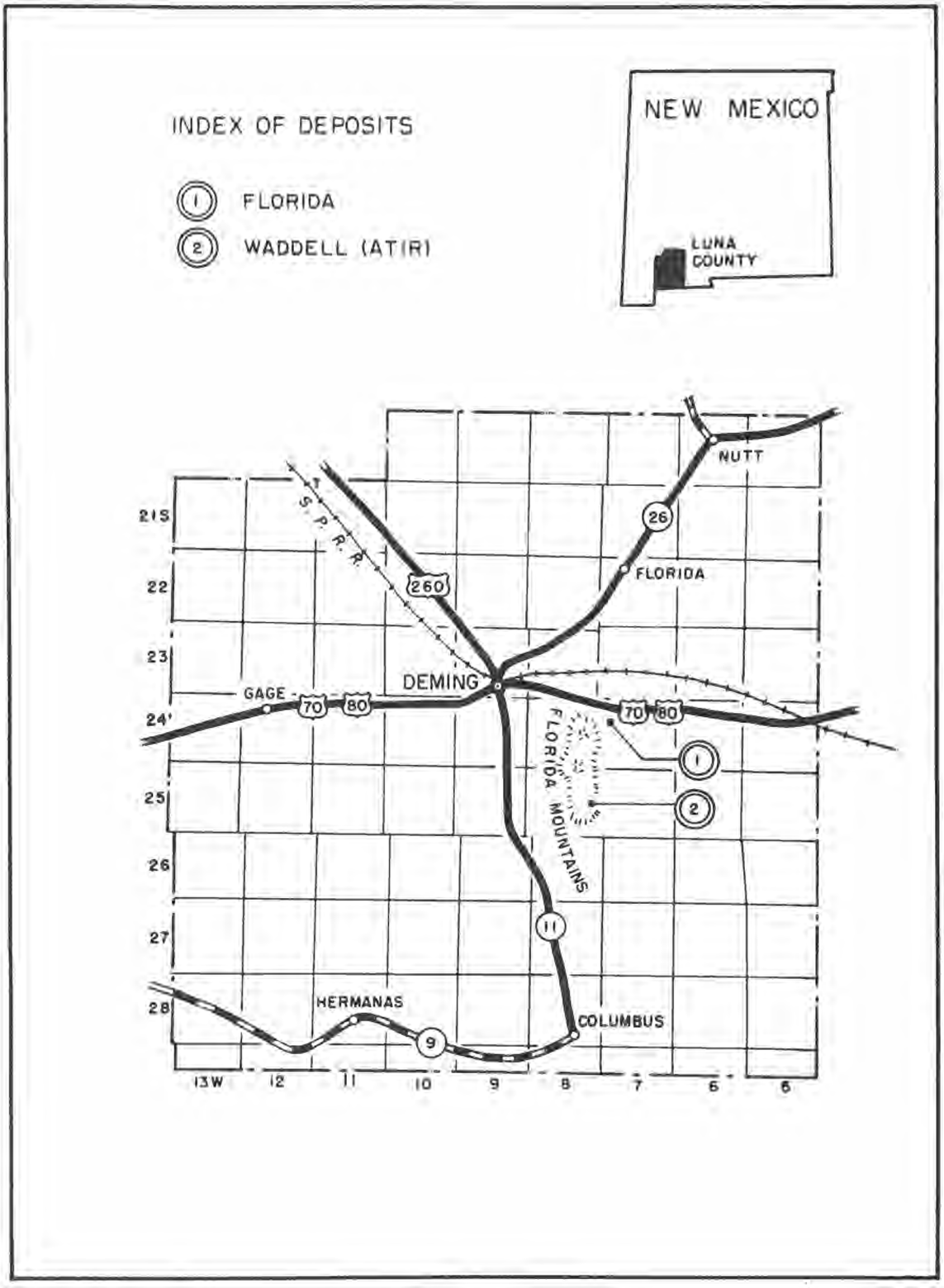

Figure 10
BARITE DEPOSITS OF LUNA COUNTY, NEW MEXICO

FLORIDA MINE

The Florida mine (locality 1, fig. 10) is in secs. 7 and 8, T. 24 S., R. 7 W., about 1 mile south of U.S. Highway 70-80 at a point 12 miles east of Deming. It lies on the northeast slope of the Little Florida Mountains at an altitude of 4400 feet.

The property, consisting of six contiguous claims patented in 1925, was originally located by the late Dr. J. T. Duryea under the names Spar and Spar Nos. 1-5. In July 1939, the. General Chemical Company purchased four of these claims and intermittently exploited them solely for fluorspar until 1951. One thousand and thirty-three tons of fluorspar ore were sold, but no barite was reported to have been marketed. Johnston (p. 88-91) described the property as the Duryea claim. An abstract of his descripiton is used here.

Mineralization occurs in several veins, three of which are significant. Volcanic agglomerate or conglomerate is the host rock. Fluorite is the major ore mineral, but barite, calcite, quartz, and iron or manganiferous oxides are also present. A grab sample from scattered stockpiles of ore contained 74.0 per cent $BaSO_4$, 9.5 per cent CaF_2, and 12.5 per cent SiO_2. The high percentage of barite is the result of hand-sorting the barite from the fluorite ore. Fluorspar and barite occur as fissure filling with partial wall-rock replacement, in veins ranging from 1 to 3.5 feet in width.

Two of the three most significant veins strike due north and dip 50° to 75° E. The third vein strikes N. 45° W. and dips steeply northeast. Prior to patenting the claims, 33 shafts, 2 tunnels, 4 pits, and 17 trenches had been opened on these veins. All were of shallow depth. Recently each of the veins has been worked extensively through a 150-foot vertical shaft and two 100-foot inclined shafts (Griswold, 1961).

WADDELL PROSPECT

The Waddell prospect (locality 2, fig. 10) in the S 1/2 sec. 24, T. 25 S., R. 8 W. consists of two mining claims and a millsite. The prospect, at an altitude of 6350 feet in the northeastern part of the Florida Mountains, is about 1 mile south of Florida Peak. Topography of the area is extremely rugged. To reach the property, travel east from Deming on U.S. Highway 70-80 for 6.9 miles, then south 4.1 miles to the Spanish Stirrup Ranch. From the ranch, travel easterly 4 miles through a broad saddle formed between the Little Florida and Big Florida Mountains, and then southerly 4 miles along the east flank of Florida Mountain to a road fork. Follow the ranch road westward 2 miles past a windmill, and up a steep road on the south side of a ravine to the millsite. The mine lies 1.5 miles from the millsite at the end of a steep trail.

Sometime in the interval between 1910 and 1920, the Waddell claims were located by Cantwell and English. The claims were leased to W. B. Walters, San Antonio, Texas, and associates in 1942. Walters filed "Notice of Intention to Hold" in mid-1949. Claims history since then is unknown.

Mineralization occurs in a well-defined quartz vein at the contact between andesite and rhyolite. The vein strikes N. 60° E., dips 55° SE, and ranges in width from 5 to 12 feet over an exposed distance of 200 feet. Overburden prevents tracing the vein farther. Ore minerals in the vein are barite, fluorite, and galena; quartz and calcite constitute gangue material. A grab sample taken from rock in a mine car contained 41.0 per cent $BaSO_4$, 19.7 per cent CaF_2, and 1.8 per cent Pb.

The prospect was worked through a 90-foot adit on the vein. The sample mentioned above was taken from the last loaded car (McMillan, 1950). No production has been recorded from the property.

SANDOVAL COUNTY

The three known occurrences of barite in Sandoval County are in the Placitas mining district (fig. 11). All occur in limestone host rock; one is a vein deposit, the other two are replacement deposits along thin, limestone bedding planes.

LAS HUERTAS DEPOSIT

The Las Huertas deposit (locality **1,** fig. 11) **is located by projection in the S1/2 sec. 34, T. 13 N., R. 5 E.** It is in an unsurveyed Spanish land grant, San Antonio de Las Huertas, about 1.5 miles east of Placitas. The deposit is at an altitude of 6500 feet, on the west flank of the Crest of Montezuma, a prominent north-trending ridge.

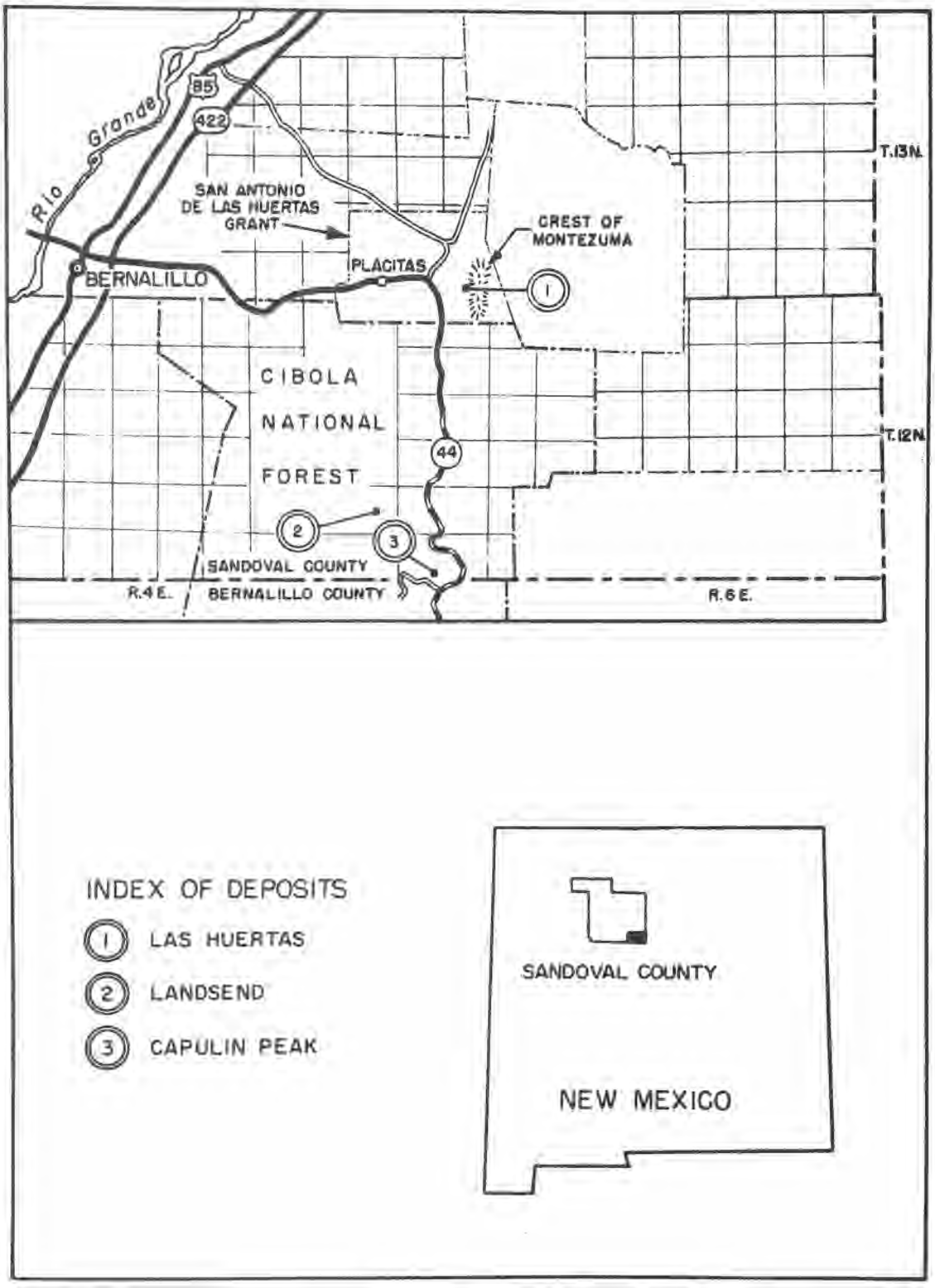

Figure 11

BARITE DEPOSITS OF SANDOVAL COUNTY, NEW MEXICO

Ownership is divided among descendants of the original grantee to the land, but mineral rights have been leased to the Barite Corporation of America. No production is reported from the deposit.

Barite is associated with minor amounts of fluorite and galena in a replacement deposit in thin-bedded limestone and sandstone along the crest of an anticline trending N. 35° W. Mineralization exposed for a maximum of 6 feet in thickness near the crest of the anticline thins downward along each limb. The deposit is traceable in an outcrop for 60 feet along the crest and **10** to 15 feet downward on each limb. Overburden prevents visual tracing of the deposit farther.

A 60-foot adit bearing approximately parallel to the anticline was driven along the southwest limb near its crest. A winze, now caved, was sunk near the adit face. A chip sample collected vertically across a 6-foot section near the adit face contained 74.1 per cent $BaSO_4$, 9.8 per cent CaF_2, and 0.17 per cent Pb. A few tens of feet southward down the slope from the **60-foot adit are** a 10-foot-deep pit and a 20-foot-long adit that expose fluorite associated with minor amounts of galena, but barite is not present.

LANDSEND DEPOSIT

The Landsend deposit (locality 2, fig. 11) is in sec. 29, T. 12 N., R. 5 E., high on the east slope of the Sandia Mountains at an altitude of 9750 feet. It is accessible by traveling 2.4 miles south from Placitas on State Highway 44 and turning west on a dim trail road for 4.6 miles. The road ascends 3750 feet in the last 4 miles.

The property comprises two mining claims, Landsend Nos. 1 and 2, owned by Howard S. McKenzie of Albuquerque. The claims were recorded in June 1959. Formerly a group of 15 claims named Lone Star group was owned by the Barite Corporation of America, Guy W. Tooker, agent. Mr. McKenzie obtained the abstract of title from the corporation. No production has been reported.

Mineralization has been introduced along bedding planes in limestone. There appears to have been moderate stuctural deformation and slight warping of relatively horizontal limestone beds resulting in some fracturing, brecciation, and bedding-plane slippage. Alternating bands of barite, from 2 to 18 inches thick, occur with silicic bands in the limestone. At one point observed along the bedding planes, barite mineralization was 4 feet in thickness, but length of the deposit could not be measured because of overburden. Fluorite and galena crystals are associated with coarse barite crystals.

Part of the property has been explored by eight bulldozer trenches spaced at random along a northwest-trending line for 0.5 mile. The five northernmost trenches, each approximately 100 feet long by 20 feet wide and up to 15 feet deep, exposed the most favorable mineralization.

CAPULIN PEAK PROSPECT

The Capulin Peak prospect in the SE 1/4 sec. 33, T. 12 N., R. 5 E. (locality 3, fig. 11) is primarily a fluorspar deposit; however, an insignificant amount of small, thin, platy barite crystals was formed contemporaneously with the fluorite. Barite content is estimated to be less than 5 per cent, and no production has been reported.

SANTA FE COUNTY

EL CUERVO PROSPECT

There is only one known barite deposit in Santa Fe County. The El Cuervo deposit (locality 4, fig. 3) is in sec. 15, T. 10 N., R. 10 E., about 0.5 mile west of prominent El Cuervo Butte (locally known as Crow Peak). It is reached by traveling 7.7 miles east from Moriarty on U.S. Highway 66, then northward along a dirt ranch road for 7.8 miles to the property.

Local inquiry disclosed that the property, on state land, has been leased by various operators from time to time, but no production has been reported.

Barite occurs as fissure filling in a shattered thrust fault between limestone and quartzitic sandstone. The fault zone strikes N. 40° E. and dips irregularly northwest. Usually the mineralization follows smalls fractures in limestone, but one key vein averages 2.5 feet in width. Some mineralization occurs in gouge material and sandstone as stringers parallel to the general strike of the fault zone. Mineral deposition for a known length of 200 feet is exposed to a depth of 15 feet in a 140-foot

bulldozer trench that cuts N. 70° W. across the fault zone. Two other shallow bulldozer trenches, both about 50 feet in length, expose the side of the vein on a downhill slope about 200 feet southwest from the 140-foot trench.

SIERRA COUNTY

There are eight major occurrences of barite in Sierra County, only one of which is outside the White Sands Missile Range (fig. 12). All but one, the American group, were visited during the field investigation. Those deposits within the missile range were examined in company with a guide furnished by the Department of the Army. The deposits were reached by many roads and trails that are not shown on available maps of the restricted area. No attempt was made to obtain detailed road directions; travel commenced from the Hardin Ranch just inside the west missile range boundary.

Of the eight deposits examined, five occur in limestone, two in limestone-porphyry contact zones, and one in granite. All the mineralization occurs as fissure filling with some associated wallrock replacement and minor zones of brecciation. In general, the deposits are dense and show crystallization only locally. This characteristic contrasts with deposits of barite occuring farther north in the San Andres and Oscura mountains of Socorro County.

CAROLYN (PAXTON) GROUP

The Carolyn group of claims (locality 1, fig. 12) is in sec. I, T. 15 S., R. 4 W. and sec. 6, T. 15 S., R. 3 W., about 2 miles southeast of Palomas Gap, a prominent gap in the central part of the Caballo Mountains. The property, the only known barite deposit in Sierra County outside of the White Sands Missile Range, is reached from Truth or Consequences by traveling 10.4 miles east on State Highway 52, then 5.7 miles south on a graveled road, and 5.5 miles west on a dim truck road. The main workings are on the south slope of a small rounded hill at an altitude of 5050 feet.

The property was originally located in 1944 by E. B. Paxton of Hillsboro and comprised five claims covering about 100 acres. The original claim names were White King, White Queen, White Queen Extension, White Duke, and White Duchess. These claims were leased for a short period to J. W. O'Brien of Houston, Texas, who also leased and later purchased the Palm Park deposit in Dona Ana County. The Carolyn group, which includes the ground covered by the original claims, consists of seventeen unpatented claims, Carolyn Nos. 1-17, located in 1950 by Charles Bernitz and associates. In 1960, Jim L. Hudson fired claim to the same group. The property is currently claimed by James F. Hum of Farmington.

Two nearly parallel veins about 900 feet apart in limestone and clayey sandstone contain barite and minor amounts of quartz and fluorspar. Both veins are vertical and strike N. 50° E. The eastern vein in sec. 1, T. 15 S., R. 4 W. is 2 feet wide, exposed in a shallow pit. A chip sample taken across the exposed vein in the pit contained 88 per cent $BaSO_4$ (Sur, 1945). The eastern vein crops out for about 400 feet. The western vein in sec. 6, T. 15 S., R. 3 W. crops out for an aggregate distance of 1500 feet. This vein was explored by a 75-foot vertical shaft and two 40-foot drifts from the shaft bottom. Where exposed in the workings 60 feet below the surface, the vein is 4 feet wide. A sample chipped across the vein at this point contained 88.5 per cent $BaSO_4$, 1.0 per cent CaF_2, 4.7 per cent SiO and had a specific gravity of 4.25.

No production has been reported from the property, although a few tons are stockpiled near the shaft.

SALINAS MINE

The Salinas mine (locality 2, fig. 12) is in the NW 1/4 sec. 1, T. 12 S., R. 4 E., in the White Sands Missile Range. The mine is on the north slope of a small hill about 2 miles west-northwest of Salinas Peak, at an altitude of 6600 feet.

Last private owners of the two unpatented claims covering the deposit were A. E. Richter and R. R. Filts. Property ownership was relinquished to the government when the area was withdrawn for use as a missile range. A few tons of copper-lead ore were produced in the late 1940's, but no barite production was reported.

Mineralization occurs in a brecciated fault zone between porphyry intrusives and dark gray limestone. The zone trends N. 80° E. and dips 40° N. It may extend as much as 1 mile eastward where mine openings on the north slope of Salinas Peak *(see* Old Pitt) expose zones having similar

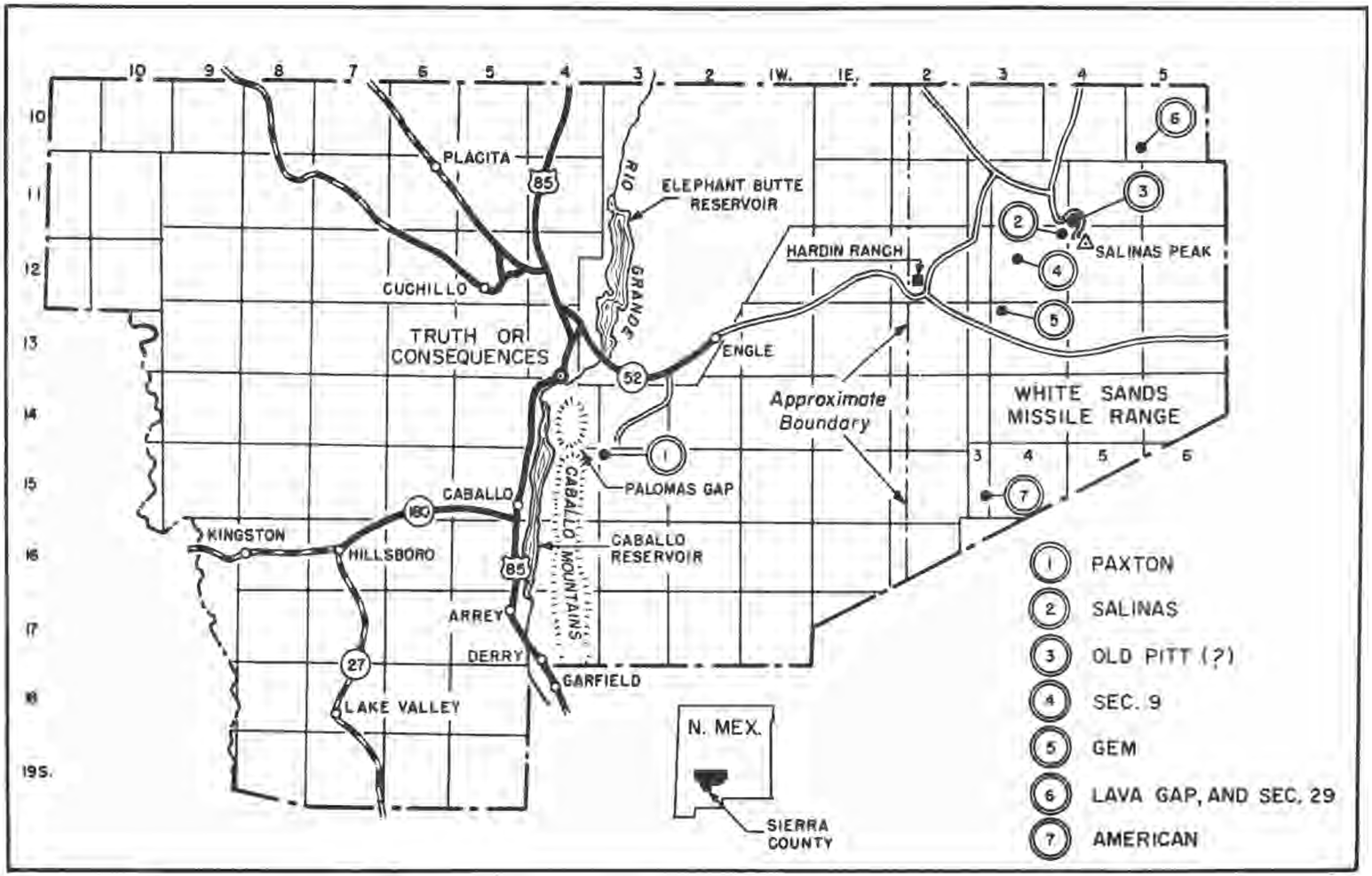

Figure 12

BARITE DEPOSITS OF SIERRA COUNTY, NEW MEXICO

strike, dip, and character of mineralization. Barite associated with fluorite, galena, and several sulphides of copper fills a fissure as much as 6 feet in width. Cavity filling and wall rock replacement is locally present.

The property was worked by two adits and two shafts. The upper adit is 60 feet in length and bears S. 10° E. into the hillside. It crosscuts the barite vein at a point 10 feet from the portal, where a 15-foot drift extends westward along the vein. A 5-foot chip sample taken across the vein in the drift contained 69.0 per cent $BaSO_4$, 11.0 per cent CaF_2, 12.5 per cent $CaCO_3$, 3.8 per cent SiO_2, and had a specific gravity of 3.85. Small lenses and stringers of barite penetrated both the hanging-wall and footwall rocks. About 40 feet from the portal, a 6-inch stringer of barite that parallels the main zone is cut by the adit. Beyond this stringer, the adit is in barren rock.

About 120 feet north and 70 feet below the upper adit, a second adit bears S. 8° W. for 145 feet. Two stopes and a raise extend from the lower adit at a point 75 feet from the portal where the adit cuts the vein. One stope, 20 feet long, 20 feet wide, and 10 feet high, extends northeast. The other stope, 30 by 20 by 8 feet, extends southeast. The raise, 6 by 6 feet in cross section, extends upward for 40 feet. These workings are in a brecciated zone along the dip of the same vein encountered in the upper adit. Cavity filling of crystalline barite, fluorspar, galena, and some chalcopyrite is present in the stope exposures. The ore in the crosscutting lower adit is generally more siliceous than that found in the upper adit. A composite sample collected from the stopes contained 70.0 per cent $BaSO_4$, 16.3 per cent CaF_2, and 9.0 per cent SiO_2. At the face of the adit, a 1-inch stringer of purple fluorspar is the only indication of mineralization.

Both shafts were inaccessible when the property was examined. One shaft was sunk 60 feet vertically at a point 80 feet west of the upper adit portal. The other shaft was sunk 40 feet at a point 200 feet S. 70° W. from the upper adit portal.

UNNAMED PROSPECT

An unidentified prospect (locality 3, fig. 12), possibly the Old Pitt, whose history is unknown, lies high on the north slope of Salinas Peak about one mile east-northeast from the Salinas mine. It is in the SE 1/4 sec. 36, T. 11 S., R. 4 E.

A mineralized zone in a brecciated fault trending N. 80° E. and dipping 45° N contains barite, the major gangue mineral. The fault lies between porphyry intrusives and dark gray limestone. The zone resembles the Salinas deposit in mineralization and attitude and may be an extension of it.

Workings include two exploratory adits, one of which is connected to a stope opening to the surface. The lower adit, driven 360 feet in a southerly direction, crosscuts the vein about 180 feet from the portal. The portal of the lower adit is nearly blocked by caving and hillside sloughing. The upper adit, 300 feet south-southeast from the portal of the lower adit, is 60 feet higher on the mountain slope and extends 120 feet S. 80° W. into the hillside. About 20 feet from the portal, an 8-foot-wide by 20-foot-long crosscut was driven northwesterly to explore an 8-inch vein. Mineralization exposed in the crosscut apparently follows a branch stringer parallel to the main fault zone. About 60 feet from the portal, a 15- by 15-foot stope extends southeastward in relatively barren rock. The adit terminates in two short drifts and a broad stope that opens to the surface. One 10-foot-wide drift extends 10 feet N. 45° W.; the other drift is 6 feet wide and extends 20 feet S. 75° E. A 6-foot sample chipped across the vein in the face of the 20-foot drift contained 38.8 per cent $BaSO_4$ and less than 1 per cent CaF_2.

The broad stope extends upward 90 feet to the surface along the 45° dip slope of the fault zone. It is 8 to 12 feet high and tapers upward from 40 to 10 feet in width. No production is known to have been made.

SECTION 9 PROSPECT

An unnamed prospect (locality 4, fig. 12) in the NE 1/4 sec. 9, T. 12 S., R. 4 E. is accessible only to 4-wheel drive vehicles. History and production of the property are unknown.

Mineralization occurs in dark gray, cherty limestone in a brecciated fault zone that strikes N. 10° E. and dips 85° E. A dense, iron-stained barite vein, 1.5 to 4.5 feet wide in the fault zone, crops out for 200 feet.

At the south end of the deposit, a small prospect pit exposes 18 inches of vein. About 30 feet north of the pit is a 50-foot-long trench, 4 feet wide and 2 to 3 feet deep. An 18-inch sample chipped across the vein at the southern end of the trench contained 82.1 per cent $BaSO_4$, 10.1 per cent SiO_2,

1.1 per cent CaF_2 and 1.1 per cent $CaCO_3$. About 20 feet from the north end of the trench, a 6-foot-diameter, 20-foot-deep pit, with a 10-foot-long north-trending drift in its bottom, was opened in the center of the outcrop. The drift penetrated a collapsed shaft, the original depth of which is unknown. The vein exposed in the 20-foot pit is 3 feet wide. Ninety feet farther north, an 80-foot-deep shaft, now inaccessible, was sunk on the vein where it is 4.5 feet wide at the surface. Alluvium covers the vein north of the shaft. Several tons of low-grade barite were stockpiled near the north shaft.

GEM GROUP

The Gem group of eight unpatented claims (locality 5, fig. 12) in secs. 4, 5, and 9, T. 13 S., R. 4 E. and sec. 32, T. 12 S., R. 4 E. is about 0.5 mile northeast from the mouth of Rhodes Canyon in the San Andres Mountains.

No barite has been sold from the property, which is owned by W. C. Hunter of Truth of Consequences.

Barite occurs with calcite and quartz deposited in a fault in granite. Galena and fluorspar also are sparingly present in the mineralized zone. The fault strikes northwest and has a steep dip westward. It can be traced through the eight claims, which lie end to end. Barite occurs sporadically along the fault as lenses having maximum dimensions of 30 feet long, 10 feet wide, and 5 feet deep.

Exploration workings consist of three small adits and four shallow surface cuts. Several small piles containing a few tons of ore each adjoin the exploratory workings. A composite grab sample from these stockpiles contained 21.2 per cent BaSO4, 20.3 per cent $CaCO_3$, and 0.4 per cent CaF_2.

LAVA GAP MINE

The Lava Gap mine (Baso Four) (locality 6, fig. 12), in the SW 1/4 sec. 30, T. 10 S., R. 5 E. is accessible only by 4-wheel-drive vehicles. Johnston (p. 121-123) located the property 3 miles N. 85° W. from Capitol Peak in the San Andres Mountains. This direction and distance were verified when the property was visited early in 1963.

In 1927, when Johnston examined the property, two claims end to end, Lava Gap Nos. 1 and 2, were owned by the Fluorspar Mines of America Corporation. These claims were filed by C. B. Hanson and N. C. Smith in February 1925. Six hundred tons of fluorspar were sold by the company in 1926, of which twenty-five tons were recorded under the name of the Lava Gap mine. In June 1943, the claims were relocated and renamed Baso Four Nos. 1 and 2 by Blanchard S. Hanson and associates of Truth or Consequences.

Little activity has taken place on the property since Johnston's visit. The following brief description is abstracted from his report.

The ore occurs as vein filling in massive, dark gray, cherty, fossiliferous limestone of Pennsylvanian age. A single fluorite and barite vein strikes N. 20° E. and is exposed by occasional openings for a distance of 3000 feet.

The main workings are near the north end of the southern claim. Here an open cut 4 to 5 feet wide and 300 feet long follows the ore. For 60 feet from the southern end, the vein consists of fluorite in a clay matrix and minor amounts of calcite and barite. Some replacement of the limestone on the east wall by fluorite, barite, and calcite has taken place. The vein in the northern part of the cut contains progressively more barite. Two pits on the vein at the northern end of the northern claim show 4 to 5 feet of iron-stained barite carrying some fluorspar and a little calcite. Some 500 feet south of the main workings, a 2- to 3-foot vein of barite in a clayey matrix is exposed.

A grab sample of several tons of hand-picked ore near the open cut contained 86.07 per cent CaF_2, 8.43 per cent $BaSO_4$, and 2.98 per cent $CaCO_3$

A 60-foot vertical shaft, inaccessible in 1963, was sunk midway in the open cut just described subsequent to Johnston's visit. No examination of the vein at depth was made.

SECTION 29 PROSPECT

An unnamed prospect (locality 6, fig. 12), whose history and production are uncertain, occurs in the SE 1/4 sec. 29, T. 10 S., R. 5 E. Purple and green fluorspar, with minor amounts of barite, fill a vein in brecciated limestone. The vein strikes N. 15° E. and dips 45° W. A grab sample of ore stockpiled near an open cut on the vein contained 60.5 per cent CaF_2, 14.0 per cent $BaSO_4$, 11.7 per cent SiO_2, and 7.6 per cent $CaCO_3$.

AMERICAN GROUP

The American group (locality 7, fig. 12) in sec. 11, T. 15 S., R. 3 E. could not be examined because it lies in an area of restricted travel on the White Sands Missile Range. Data contained herein are taken from a previous report by Clippinger.

Originally the property consisted of nine claims owned by the Fluorspar Corporation of America, Truth or Consequences. The claims covered most of the northwesterly trending local barite-fluorspar outcrop.

A broken, mineralized fault zone, 10 to 30 feet wide, trends N. 30° W. and dips steeply northeast in gray Madera (Pennsylvanian) Limestone. Barite occurs in lenses along the fault and in limestone bedding planes. Associated minerals include galena, calcite, quartz, and fluorite.

A 20-foot adit and a small trench constitute the main workings at the deposit. Barite content ranges from 6.09 per cent (from a small prospect cut) to 71.38 per cent (surface cut across fault zone).

SOCORRO COUNTY

There are seventeen known barite deposits in Socorro County (fig. 13). Of these, two are within the boundaries of the White Sands Missile Range. One of these, the Dewey deposit, was not found during the field investigation; information regarding it has been taken from earlier literature.

Total known barite production from the county is 34,868 tons, or 96.5 per cent of the New Mexico total, all from several different operations on the Mex-Tex property.

Nine of the deposits occur in limestone, four in volcanic rocks, and four in volcanic-limestone contact zones. Those deposits in limestone are in the Oscura Mountains, the low-lying hills immediately east of Socorro, and in the area near Riley. Those occurring in volcanic rocks are just north of Magdalena and west of Socorro. Those in limestone-volcanic contact zones are near Socorro.

In all instances, barite was deposited as filling in fissures and fractures. Varying amounts of fluorspar and quartz and minor amounts of calcite are associated with the barite. In some instances, galena and sphalerite are present in barite-fluorspar ores. Other minerals associated with barite in deposits in the county include vanadinite, oxides of copper, and ubiquitous pyrite. Many of the mining properties examined in Socorro County were prospected primarily for metallic ores, with barite constituting merely a gangue material.

Wall rock has been replaced by barite from minor to major degrees in most deposits. Cementation of brecciated fragments by barite is also common. No residual-type barite deposits were disclosed by the investigation.

HELEN GROUP

The Helen group mining camp (locality 1, fig. 13) in the SE 1/4 sec. 12, T. 2 N., R. 5 W. is just outside the Cibola National Forest. The property is reached by traveling 1.5 miles west from Magdalena on U.S. Highway 60, thence 27.5 miles north on State Highway 52 through Abbe Spring Canyon. An alternate route is a dim truck trail 7.4 miles running westward from Riley along the south bank of the Rio Salado arroyo.

Twenty-four unpatented, contiguous claims extend northward from the NE 1/4 sec. 12 through the E 1/2 sec. 1, T. 2 N., R. 5 W., through the E½ sec. 36, T. 3 N., R. 5 W., and into the SE 1/4 sec. 25, T. 3 N., R. 5 W. The claims were located in mid-1955 by Lewis Nicolls and associates of Albuquerque, who later formed Mine Rite, Inc. The group of claims covers several north-trending fault zones in limestone. Many truck trails lead to the several prospect workings scattered throughout the 2.5-mile-long area. No production has been reported.

The fault zones contain closely spaced, nearly parallel fissures filled with barite and chert. Vertical striations observed on exposed slickensides indicate little, if any, lateral movement along the faults. Much brecciation has occurred and, in places, barite has partly replaced breccia fragments.

Three fault zones are exposed in a 75-foot cliff face on the south bank of the Rio Salado. The easternmost fault demonstrates a 30-foot vertical displacement of the level limestone beds, the east block being downthrown. Barite cements small-to-large breccia fragments in a 6-foot-wide zone in the eastern fault. The middle fault is 200 feet westward. It has a vertical displacement of 6 feet, the west block being downthrown. Mineralization in the middle fault zone was not examined because the single exploration pit in the zone was filled with detritus. A third fault of unknown displace-

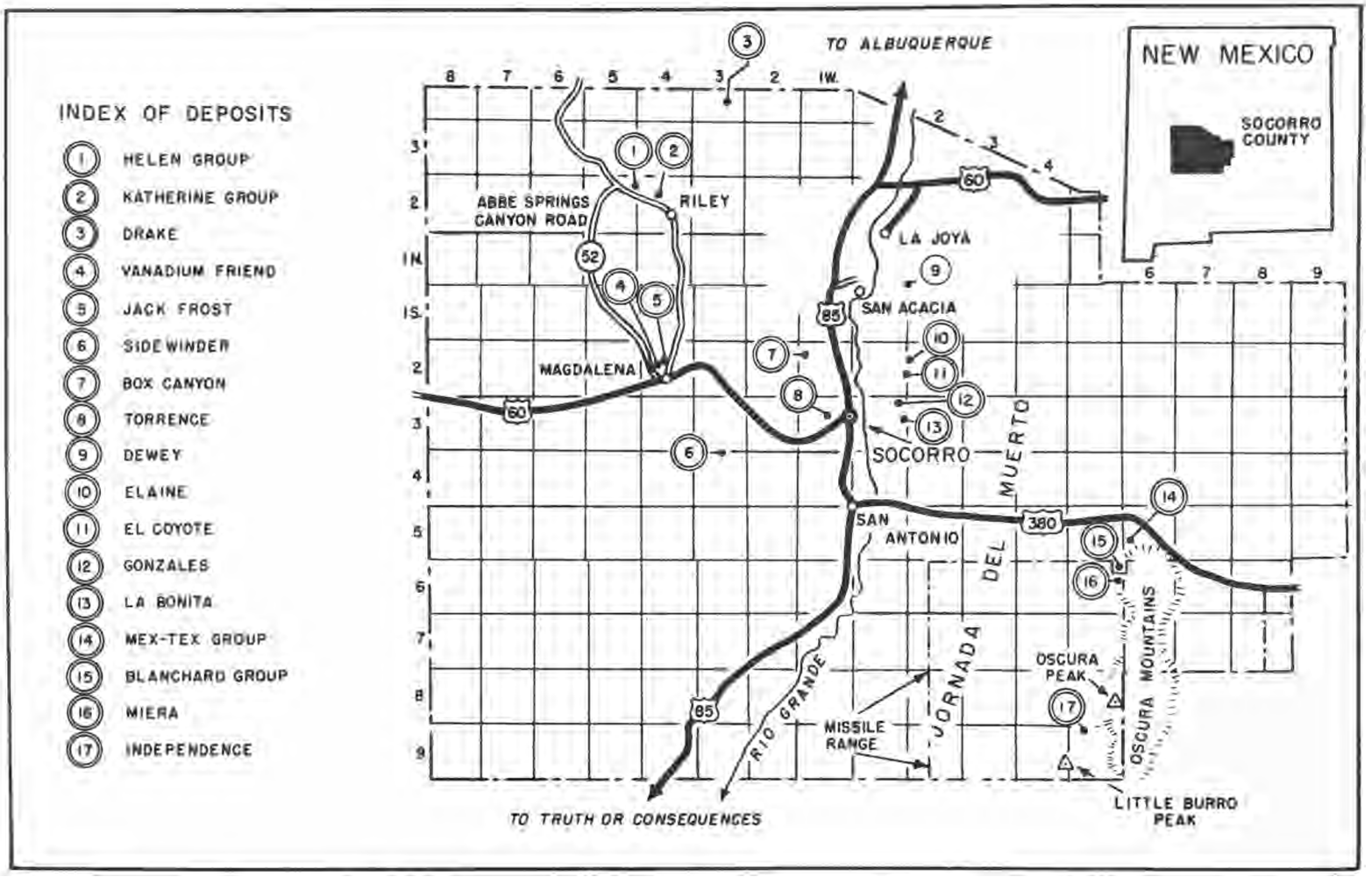

Figure 13

BARITE DEPOSITS OF SOCORRO COUNTY, NEW MEXICO

ment is exposed in the cliff face 100 feet west of the middle fault. All three fault zones can be traced southward from the top of the cliff, but very little barite is present in the upper parts of the zones.

Another fault zone is exposed at the foot of a limestone ridge 500 feet farther west, at a point where the river bends north. The zone was prospected on both sides of the wash by shallow exploration pits. A 10- to 12-foot siliceous breccia zone on the south bank contains barite-filled fractures, the largest of which is 2.5 feet wide. A chip sample, collected from the widest fracture, contained 41.0 per cent $BaSO_4$. On the north side of the stream bed, the same zone contains less barite.

This latter fault zone is also exposed in a debris-filled exploration shaft about 0.7 mile north. At this place, in a steep bank of a south-flowing arroyo, a zone of barite-filled fissures 1 inch to 1 foot wide extends for 100 feet. The zone begins to narrow at each end and finally disappears under sand overburden.

Minor stringers of barite and chert occur in other fault zones 1000 feet southeast, 800 feet south, and 0.5 mile north from the latter exposure. Fissures in these zones are highly silicic and contain little barite.

Metallurgical tests were made on a 350-pound sample collected from claim No. 5. Procedure and tests results are described under "Metallurgical Tests" at the end of this section.

KATHERINE GROUP

The Katherine group (locality 2, fig. 13) consists of four contiguous claims in the NE 1/4 sec. 8 and NW 1/4 sec. 9, T. 2 N., R. 4 W., about 3 miles east of the mining camp at the Helen group and on the north side of the Rio Salado arroyo. The claims were located in 1955 by Lewis Nicolls, Mine Rite, Inc., of Albuquerque. No production has been reported.

Massive aggregates of barite occur sporadically along a vertical limestone shear zone that trends N. 10° E. in the E 1/2 sec. 8. The zone consists of closely spaced, nearly parallel fissures and is exposed for 1000 feet in the bottom and sides of a steep-sided dry wash. The limestone host rock dips moderately southeastward. Ore is diluted by quartz and breccia fragments.

Several lenses of ore, enclosed by barren rock, are exposed along the shear zone. One lens is 50 feet long with a maximum width of 13 feet, but feathers into numerous minor fractures at both ends. Other smaller lenses range from 1 to 10 feet in width. A grab sample collected from rock piles near these silicic ore lenses contained 41.4 per cent $BaSO_4$.

A secondary parallel shear zone containing barite pockets occurs 75 feet east of the main mineralized zone. This secondary zone was not prospected or worked except for a single discovery pit in the SE 1/4 NE 1/4 sec. 8.

DRAKE PROSPECT

The Drake prospect (locality 3, fig. 13) in the center of sec. 23, T. 4 N., R. 3 W. is 10.5 miles northeast of Riley by dirt road.

The property is owned by the Atchison, Topeka, and Santa Fe Railway Company and leased to Donald Drake and Leonard Ross of Albuquerque.

High-grade barite occurs discontinuously, in small pockets and fissures, for 650 feet in a 60-foot-wide monzonite dike that intruded limestone country rock. The dike coincides with a fault zone that strikes N. 8° W. and dips 70° E.

Work at the prospect has consisted of stripping overburden from a 50- by 30-foot area and a 20-foot test pit. No ore has been marketed.

VANADIUM FRIEND PROSPECT

The Vanadium Friend prospect (locality 4, fig. 13) is 1.6 miles north of Magdalena in the sec. 21, T. 2 S., R. 4 W. The property is covered by one claim patented in 1898 by Charles W. Gatlin and sold to Mrs. Eula Bodenhimer, the present owner.

The property was explored primarily for vanadium, and no barite reportedly was sold. Barite occurs with silica as gangue material in a fissure vein along a brecciated fault zone in rhyolite. Its strike ranges from N. 35° W. to due north, and its dip is steeply eastward.

One timbered shaft 90 feet deep and one untimbered shaft of unknown depth constitute the major workings on the claim. A grab sample from selected material stacked near the timbered shaft contained 29.2 per cent $BaSO_4$ and 53.3 per cent SiO_2.

JACK FROST MINE

The Jack Frost mine (locality 5, fig. 13) in the NE 1/4 sec. 16, and N½ sec. 15, T. 2 S., R. 4 W. is in the North Magdalena mining district. It is reached by traveling north from Magdalena 1.7 miles on the Riley road and 0.5 mile west.

One lode claim in sec. 16, once known as the Virginia Lee, is currently under lease from the State of New Mexico by Clarence Barrett of Socorro. Mr. Barrett also has staked claims covering all of sec. 15. At one time, the property included eight claims (Jack Frost group) owned by A. Dugger and four claims (Night Hawk group) owned by P. B. Moore (Lasky, 1932).

Fissure veins in andesite exhibit a complex association of lead and zinc in gangue chiefly composed of barite, quartz, calcite, and minor amounts of iron oxide. Vanadinite crystals are locally present in some fractures. Mineralization is found in two vein systems. The main vein strikes N. 80° W. and dips 70° N. The western exposure of this vein is about 500 feet west of the east line of sec. 16. Two shallow pits were dug on the outcrop. About 200 feet eastward, the main shaft (locally known as the Dugger shaft) exposes the 3-foot-wide vein.

Farther east, the main vein splits into numerous stringers on which at least 10 pits or trenches and 4 shafts of unknown depth have been dug. Near the center of the N½ sec. 15, these stringers merge to form a secondary vein which strikes N. 50° W. and dips 70° NE. This second vein gently curves to N. 30° W. as it crosses the north boundary of sec. 15. It pinches out southward near the center of the section.

The main excavation in the deposit is the Dugger shaft, 140 feet deep with levels at 40, 75, 100, and 115 feet. Drift work totals 130 feet (Holmquist, 1946). A sample taken from the dump near the Dugger shaft contained 25.0 per cent $BaSO_4$, 23.7 per cent SiO_2, and 9.9 per cent $CaCO_3$. A hand-cobbed sample from about 200 tons of sorted rock in the NE 1/4 sec. 15 contained 47.2 per cent $BaSO_4$, 31.1 per cent SiO_2, and 6.3 per cent $CaCO_3$.

SIDEWINDER PROSPECT

The unpatented Sidewinder prospect (locality 6, fig. 13) in sec. 3, T. 4 S., R. 3 W. lies high on the east slope of Water Canyon in the Magdalena Mountains of Cibola National Forrest. To reach the property, travel 16 miles westward from Socorro on U.S. Highway 60, 6.5 miles southwest through Water Canyon, and then follow a trail for 0.7 mile from the end of the access road to reach the claim.

Originally, the Sidewinder claim was staked by Ben Brown in 1955. A posted claim notice indicates that the property is now owned by J. A. Campbell of Carlsbad. No production has been reported from the prospect.

Barite mineralization occurs in a 5-foot-wide brecciated shear zone in volcanic rocks. The zone strikes N. 45° W. and dips 60° to 70° NE. The vein is exposed in a 30-foot-long by 5-foot-wide by 4-foot-deep open cut. A chip sample taken across the 5-foot shear zone contained 52.4 per cent $BaSO_4$. Iron-oxide staining is evident throughout the shear zone. Alluvium mantle prevents tracing the vein beyond the limits of the open cut. A grab sample from ten tons of hand-sorted rock near the open cut contained 76.0 per cent $BaSO_4$. A hand-picked character sample contained 82.0 per cent $BaSO_4$ and had a specific gravity of 3.96.

BOX CANYON PROSPECT

The Box Canyon prospect (locality 7, fig. 13) is in the SW 1/4 sec. 6 and the NW 1/4 sec. 7, T. 2 S., R. 1 W. It is reached by traveling 7.2 miles north from Socorro on U.S. Highway 85, 2.4 miles west on a graveled road, and 2.6 miles southwest up a dry wash.

Two contiguous unpatented claims, Box Canyon Nos. 1 and 2, were located in 1959 by F. S. Phillips of Socorro. No production has been reported.

Mineralization occurs in a vein in a granite-limestone contact striking N. 35° W. and dipping 75° NE. Pale red, medium, crystalline barite is mixed with fluorspar, silicic gangue, and occasional wall rock fragments. Exposed parts of the mineral zone reach a maximum of 2.5 feet in width.

Three inaccessible inclined shafts near the top of a ridge at 6200 feet altitude constitute the main workings. Two of the shafts are 70 feet deep; the third is 25 feet deep. They are irregularly spaced along the 150 feet of vein outcrop. Overburden prevents tracing the vein beyond the 150-foot-long exposure. A 2-foot chip sample cut across the vein contained 45.3 per cent $BaSO_4$, and 11.2 per cent CaF_2.

TORRANCE MINE

The Torrance mine (locality 8, fig. 13) in sec. 9, T. 3 S., R. 1 W. is on the east slope of Socorro Mountain. It is reached by traveling west 3.5 miles from the campus of the New Mexico Institute of Mining and Technology, Socorro. Although it is in public domain, the abandoned mine lies within the U.S. Naval Ordnance Testing Area. The Torrance mine is adjoined on the south by the abandoned Merritt mine.

According to Gordon (Lindgren, Graton, and Gordon, 1910), the mine, when prospected in 1867, showed evidence of prior work (presumably by early Spaniards), but the type of operation is unknown. Operations had ceased at the mine many years prior to 1910 (Lindgren, Graton, and Gordon). The district had produced more than $750,000 in silver before its abandonment.

Barite and quartz, the gangue minerals, partly fill voids and show minimal replacement of andesite fragments in a brecciated shear zone that strikes north-south and dips 10° to 30° W in andesite host rock. The deposit, traceable at the surface for 250 feet, varies in width from a few inches to 4 feet. Depth of barite mineralization is indeterminate because of the shallow nature of old test pits dug along the outcrop and the inaccessibility of the caved mine workings.

To quote Gordon:

> The vein, which started in andesite or latite, terminated abruptly on reaching the clayey tuffs below. It is developed by an incline with five levels and two short tunnels. The disappearance of the ore was supposed to be due to faulting or slipping along the contact between the tuff and the , but efforts made to locate the extension of the vein were unsuccessful.

It is assumed that no barite was marketed, although several tons of barite rock have been piled on a dump at the property.

DEWEY MINE

Although the general location was known, an attempt during this investigation to find the workings of the Dewey mine was unsuccessful. The following excerpt is quoted from Johnston's work (p. 127-128):

> The Dewey shaft [locality 9, fig. 13] at the west end of the Dewey vein in the Joyita Hills is approximately 5 miles N. 82° E. from San Acacia, a station on the Atchison, Topeka & Santa Fe Railway.
>
> The country rock of the Dewey vein is chiefly coarse pegmatitic granite consisting of quartz and pink feldspar. The vein has a easterly course and is exposed for a distance of approximately 4,000 feet. Near the west end of the vein, the Dewey shaft attains a depth of 300 feet. It was in bad condition when visited, and an examination of the underground workings could not be made.
>
> An analysis of grab sample of the ore pile at the Dewey shaft, which is selected material and not an average of the vein, gave returns of 41.18 percent CaF_2, 1.78 percent $CaCO_3$, 11.78 percent $BaSO_4$, 7.94 percent PbS, 23.32 percent $Si0_2$, and 13.6 percent $A1_20_3+Fe_20_3$.
>
> West of the Dewey shaft the vein becomes more siliceous and is lost before it reaches the Magdalena limestone on the west side of the Joyita Hills. To the east it can be traced for 3,000 feet. A few prospect holes show the variable character of the vein material, in some places barite being the dominant mineral and in others fluorite. About 1,500 feet east of the Dewey shaft a shallow shaft on the vein shows 4 feet of fluorite, barite, chert, and a very small amount of galena. An analysis of the material mined from this shaft gave the following results: 12.16 percent CaF_2, 1.57 percent $CaCO_3$, 38.06 percent $BaSO_4$, 0.90 percent PbS, 34.65 percent SiO_2, and 12.52 percent $A1_20_3+Fe20_3$.

ELAINE GROUP

The Elaine group of seven contiguous unpatented claims (locality 10, fig. 13), Elaine Nos. 1-7 in secs. 12 and 13, T. 2 S., R. 1 E. and secs. 7 and 18, T. 2 S., R. 2 E., is in the Parrida mining district. It is reached by traveling 3 miles north from Socorro on U.S. Highway 85 to the hamlet of Escondida, 2.2 miles northeast to Pueblito, and 10 miles northeast on a dirt road from Pueblito along a low-lying ridge. Altitude of the property is 5450 feet.

E. H. Smallwood of San Antonio originally located the group in July 1958. A. B. Baca of Socorro is the present owner. No production has been reported.

Barite mineralization occurs in fracture zones along bedding planes in limestone. These bedding planes, dipping 25° W, rest on the west flank of an anticline whose axis trends N. 5° E.

Some wallrock replacement has occurred, but generally the ore minerals fill small fissures and contain wall,rock inclusions. Barite occurs as massive aggregates and platy crystals containing small interspersed crystals of fluorite and galena.

Three open cuts, spaced along 300 feet of outcrop, expose fracture zones in echelon alignment parallel to the strike of the bedding-plane axis. Each open cut is 100 feet long by 5 feet wide by 4 feet deep. Mineralized material in exposures tends to pinch out down the dip of the bedding plane. Alluvium fill prevents tracing barite mineralization beyond the limits of the three open cuts. Downslope from the open cuts, barite crops out in small stringers which disappear under alluvium fill or pinch out.

A sample chipped from the fracture zone in the northernmost open cut contained 84.4 per cent $BaSO_4$, 6.4 per cent CaF_2, 2.7 per cent SiO_2, and had a specific gravity of 4.17.

EL COYOTE DEPOSIT

The El Coyote deposit (locality 11, fig. 13) in the W 1/2 sec. 24, T. 2 S., R. 1 E. is reached by traveling 7.2 miles northeast from Escondida, a small village 3 miles north of Socorro on U.S. Highway 85. Altitude of the property is 5250 feet.

The group of five unpatented contiguous claims was located in early 1955 by John M. Gonzales and associates of Socorro. A small, undisclosed tonnage of barite was mined from a shallow bulldozer pit roughly 100 feet long by 50 feet wide and presumably sold.

Mineralization follows the bedding of a gently dipping limestone sequence. The main vein is 12 to 18 inches thick, strikes N. 60°-80° E. and dips 15° to 20° NW. It lies within a few feet of the surface along the northwest slope of a small rounded hill. Also, a 10- to 15-foot-wide, thin-bedded blanket deposit trends S. 70° W. for 200 feet from a shallow bulldozer pit but ends abruptly against a north-trending fault. A shallow open cut near the south end of the blanket deposit exposes a 10-foot-wide vein that may be within the fault zone. The vein contains both massive and platy crystalline barite. Prospect pits in limestone 400 feet northwest from the shallow bulldozer pit disclose barite on the side of a dry wash. This occurrence may be an extension of the blanket deposit opened by the bulldozer cut. Throughout the immediate area, thin stringers of barite occur in limestone bedding planes, vertical fissures and cracks, and as small pockets at shattered fissure intersections.

GONZALES DEPOSIT

The Gonzales deposit (locality 12, fig. 13) in the NE 1/4 sec. 2, T. 3 S., R. 1 E. is reached by traveling 3 miles north from Socorro on U.S. Highway 85 to Escondida, 2.2 miles east across the Rio Grande to Pueblito, 2.4 miles south along the river's east bank and then 4.4 miles eastward.

Two claims, Gonzales Nos. 1 and 2, were leased from the state in August 1942 by R. R. Jackson, Pete Innebichler and J. J. McPhaul. In early 1943, the property was subleased to the Humphreys Gold Corporation of Denver. The U.S. Bureau of Mines assisted the corporation in sampling the deposit in 1943. Assays of samples collected showed the following ranges, in per cent, of chief constituents: CaF_2, 15.0 to 16.7; SiO_2, 9.2 to 50.2; $BaSO_4$, 9.9 to 39.5. No production has been reported from the deposit.

According to Rothrock (Rothrock, Johnson, and Hahn), the deposit is in the faulted west flank of an anticline, the major axis of which strikes N. 6°-20° W. The fault is parallel to the axis and dips 70° W. The upthrown or east side is a pink, coarse-grained Precambrian granite block 1800 feet long with maxium width of 200 feet. Adjoining rocks include shales, sandstones, and limestones. The granite outcrop forms a prominent ridge along the footwall of the vein. The vein is traceable only where the granite is exposed. The vein ranges from 3 to 22 feet in width; two major ore shoots extend 240 and 280 feet laterally near the north end. Barite and fluorite crystals are intergrown, and the ore is diluted by microcrystalline quartz. About midway in the traceable outcrop of the deposit, a 160-foot adit bearing N. 30° W. follows an ore shoot within the vein. The vein ranges in width from 3 feet at the portal to 13 feet at the face. A 13-foot chip sample across the face contained 59.2 per cent $BaSO_4$ and 17.3 per cent CaF_2. About 400 feet northward from the adit portal, a 50-foot-long by 4- to 5-foot-wide and 3- to 4-foot-deep open cut exposes ore material throughout its length. Here the vein strikes N. 27° W. and dips 80° W. Northward from the open cut, three 15- to 20-foot shafts, three short, shallow crosscuts, and one shallow trench along the vein expose vein material along 450 feet of outcrop. The northernmost working is a 15-foot shaft. At this exposure, barite is coarse, platy, and interlocking. The vein bends slightly north here, strik-

ing N. 6° W., and is 5 to 6 feet wide. A grab sample collected near the north shaft contained 38.2 per cent $BaSO_4$ and 41.8 per cent CaF_2.

Southward for 1000 feet from the adit portal, the vein, exposed on the surface or in occasional cuts, does not exceed 18 inches in width and pinches out at the southern end of the granite ridge.

Metallurgical tests were conducted on an 80-pound sample of ore from the Gonzales deposit. Procedure and results are discussed under *Metallurgical Tests*.

LA BONITA DEPOSIT

The La Bonita deposit (locality 13, fig. 13) in the NW 1/4 sec. 12, T. 3 S., R. 1 E. is 1.4 miles south and east over a dim truck road from the Gonzales deposit.

Claims covering the deposit, originally called Tienaja (Rothrock, Johnson, and Hahn), were relocated by Pete Innebichier and associates early in the 1940's and leased to the Humphreys Gold Corporation. Sampling of the deposit was done in June 1943 by the lessee and the U.S. Geological Survey.

Rothrock (Rothrock, Johnson, and Hahn) reported that two normal faults cut strata of limestone, sandstone, and shale. These faults, about 700 feet apart, trend N. 25° W. and dip 60° to 65° SW but deviate locally. They are cut by transverse faults that offset veins 5 to 25 feet. Short narrow lenses, or shoots, of fluorspar and barite occur for 1100 feet along both faults.

Only three of the lenses are significant. Two were sampled and assayed, with results as follows: One shoot is 100 feet long and has an average width of 1.7 feet. A 1.6-foot-wide sample contained 48.9 per cent $BaSO_4$, 23.6 per cent CaF_2 and 19.3 per cent SiO_2. A 2-foot-wide sample contained 11.9 per cent $BaSO_4$, 32.2 per cent CaF_2, and 29.9 per cent SiO_2. A second shoot is 150 feet long and averages 2.5 feet in width. A 1.9-foot and a 2.3-foot sample contained, in per cent, respectively, 24.5 $BaSO_4$, 14.1 CaF_2, and 36.6 SiO_2 and 5.6 $BaSO_4$, 32.7 CaF_2, and 30.5 SiO_2. A third shoot, 85 feet long and averaging 2 feet wide, was not sampled.

Vein material is of three types: (1) medium- to coarse-grained fluorite, anhedral quartz, and white barite plates in dense veins frozen to footballs; (2) similar to the first type, but veins are 4 inches thick or less and contain less gangue; and (3) interlocking crystals of purple fluorite, white barite, and quartz in crevices and voids in breccia fault gouge and transverse faults. Silification is not so prominent as it is at the Gonzales deposit.

MEX-TEX MINE

The Mex-Tex mine (locality 14, fig. 13) is 30 airline miles east of San Antonio, New Mexico, in secs. 25, 33, 34, and 36, T. 5 S., R. 5 E., secs. 19, 30, 31, T. 5 S., R. 6 E., and sec. 6, T. 6 S., R. 6 E. Section 6 was withdrawn by the Federal government in the early 1950's as part of the White Sands Missile Range. The property embraces fifty unpatented claims that border the Blanchard group on the south and the Hurlow Mining and Milling Company property on the northeast. It extends for 2 miles north and south along the west escarpment of the Oscura Mountains. To reach the group, travel 30.8 miles east from San Antonio on U.S. Highway 380 to the Bingham Post Office, turn south on a gravel road, and travel 5.2 miles south, bearing left at each road fork.

Three distinct claim groups comprise the Mex-Tex property. One, the Dixie group, was located on the north and west slopes of the mountain range in December 1947 by Ralph J. Bar and Frank Kay. No barite was marketed from this group of claims.

A second group, Royal Flush Nos. 1 and 2, was located in December 1947 by Charles W. Eakes et al. In February 1949, Royal Flush Nos. 3 and 4 were added. These four claims were sold to Ben B. Scott, who later organized the Scott Mineral Company of Alpine, Texas. Two or three carloads of lead ore were shipped to the El Paso smelter (Clippinger). In late 1949, the Royal Flush group was sold by Scott to Erwin and Bishop of Houston.

The third group of thirty claims, the Mex-Tex, was originally owned by A. R. Hickey and associates of Artesia, New Mexico, who operated under the name Mex-Tex Mining Company. Work done by this concern consisted of road building and excavating a few open cuts.

Erwin and Bishop purchased the Mex-Tex group in early 1950 and added it to their Royal Flush claims. Erwin and Bishop retained the name, Mex-Tex Mining Company, and completed the construction of a 200-ton-a-day barite mill near San Antonio in 1950. From late 1950 through 1958, the company produced 34,056 tons of barite.

The Atomic Mineral Corporation purchased the Mex-Tex property in July 1959, Galbar, Inc., of Carlsbad (Lee Downey, president and general manager) operating it. In 1959 and 1960, the company produced 812 tons of barite.

Ore was deposited in hydrothermal veins in faults, breccia and sheeted zones, and at an illite shale horizon of the Burrego Formation (Pennsylvanian), which overlies the massive Council Spring Limestone (Pennsylvanian) (Kopicki, 1962). These veins, minable only locally, extend for several miles north and south along the Oscura Mountains front.

Banded, crustiform, and vuggy textures and coarse crystals are common throughout scattered ore shoots, indicative of dilute solution deposition under low pressures. Barite shows three forms of deposition: (1) earthy and granular in fractures and interstices between crystals, (2) laminated and crusted where deposited parallel to bedding planes, and (3) bladed crystals as much as 12 inches across in radiating fans in solution cavities. Coloration ranges from white to tan, depending on impurities. In many places, fluorite lines veins of barite and also is closely intergrown with barite crystals (Kopicki, 1962).

Description of Workings

The many pits, adits, shafts, and stopes are briefly described according to site numbers shown in Figure 14. Many of the excavations are fully or partly filled with debris, and some have been intentionally caved for safety reasons. At certain places on the property, alluvial cover or caved workings prevent accurate geological descriptions. It is difficult to correlate vein exposures because of postmineral faulting. Unless otherwise noted, all excavating was done in ore material.

Site No. 1 is an adit 27 feet long by 10 feet wide by 12 feet high, bearing N. 25° E. The face is gobbed within 4 feet of the back. Altitude at this site is 6475 feet.

Site No. 2 is known as the "upper" Mex-Tex workings. It is an adit-stope, 50 feet wide by 18 feet high by 350 feet long, that bears southeast and contains numerous ore pillars for roof support. Figure 15 shows the entrance of the workings and the caving nature of the ground. All the work was done in ore containing little or no waste. A 140-foot drill hole in the downthrown (west) side of the fault and east of the adit cut 12 feet of ore in the bottom.

Site No. 3 is known as the Byrd tunnel and open pit. The open pit is 100 feet long and averages 50 feet in width. A 100-foot-long by 25-foot-wide by 20-foot-high adit bears S. 34° E. from the northeast corner of the open pit. A fault slickenside forms the northeast wall of the adit, and the face is covered with debris to the roof.

Site No. 4, known as the Snake Pit, is a partly caved open pit 400 feet long by 50 feet wide that trends northward. A 100-foot-long by 40-foot-wide adit bears S. 38° E. from the pit. It is caved and inaccessible.

Site No. 5 is a 25-foot-long sidehill cut that narrows from a 50-foot width to 15 feet at the southeast end. A 9- by 9- by 45-foot adit bears S. 80° E. from the southeast end of the cut and shows barite and galena in cherty limestone bedding planes. Figure 16 is a photograph of the adit portal showing a thrust fault between chalky limestone and cherty limestone that contains barite-galena stringers. Elevation here is 6100 feet.

Site No. 6 is an open cut, 100 feet long by 15 feet wide, bearing N. 50° E. The open cut has a 25-foot-high face at the northeast end from which a 5- by 6- by 32-foot-long adit was driven. A few feet inside the portal, the adit turns north and bears N. 5° E.

Site No. 7 is a sidehill open pit 200 feet long in a north-south trend. The floor of the pit exposes a 10-foot-wide zone of barite stringers in limestone along the long axis of the pit.

Site No. 8 is an open cut, 12 feet wide by 63 feet long, bearing N. 32° E. At the northeast end, in a 16-foot-high face, a 12- by 12- by 45-foot-long adit bears N. 45° E. Excellent crystal arrays are exposed in the adit.

Site No. 9 is a trench 120 feet long by 20 feet wide and up to 4 feet deep, bearing N. 60° E.

Site No. 10 is an open cut, 90 feet long by 12 feet wide, bearing westward to a 20-foot-high face. Along the north side of the open cut, drill holes reportedly penetrated barite-lead ore 20 feet below the floor.

Site No. 11 is a bulldozer cut, 150 feet by 135 feet, that exposes barite in the bottom: A prospect pit a few feet west of the cut is barren. Altitude at this site is 5900 feet.

Site No. 12 is an inaccessible 6- by 6- by 40-foot shaft, the collar of which is surrounded by an iron-stained barite dump.

Site No. 13 is a small, shallow bulldozer cut disclosing barite in shattered limestone.

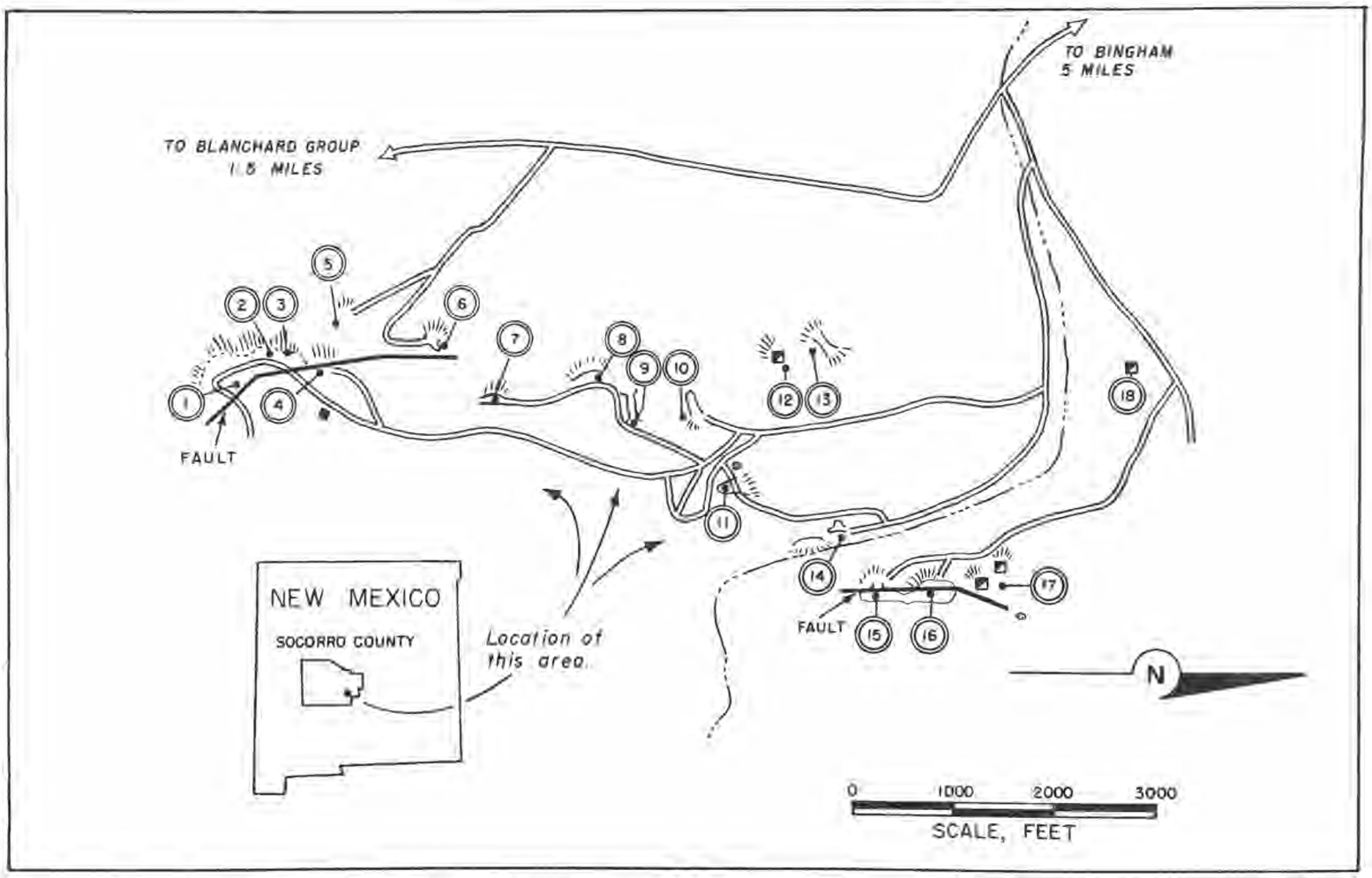

Figure 14

SITES OF WORKINGS AND MAJOR FAULTS, MEX-TEX BARITE PROPERTY, SOCORRO, NEW MEXICO

Figure 15

VIEW LOOKING EAST AT SITE No. 2 (FIGURE 14) SHOWING UPPER MEX-TEX WORKINGS, CAVING ACTION AND THRUST FAULT (DASHED)

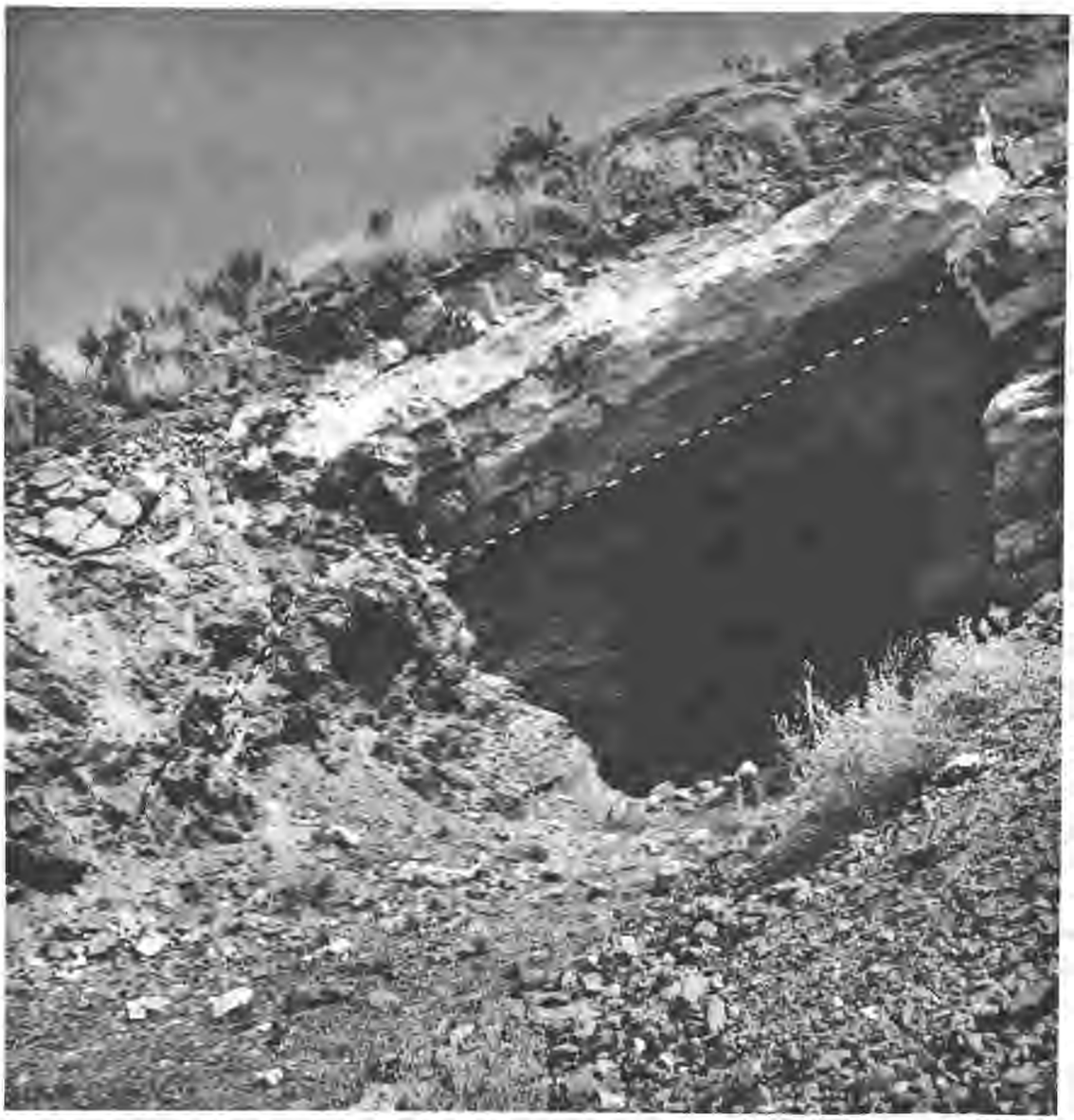

Figure 16

VIEW LOOKING EAST AT PORTAL ENTRANCE OF SITE No. 5 (FIGURE 14), LOWER MEX-TEX WORKINGS, SHOWING DRAG IN A FAULT BETWEEN CHALKY LIMESTONE AND CHERTY LIMESTONE (DASHED)

Site No. 14 is an open cut 90 feet long by 15 feet wide, bearing S. 18° W. From a 25-foot-high face at the south end, a 12- by 12- by 45-foot adit extends from the open cut into the hillside. A 50-foot-long by 30-foot-wide by 2-foot-high stope, called the Downey stope, roughly parallels the open cut. Entrance to the stope is made through a 15-foot-high by 20-foot-wide by 6- to 8-foot-long opening that extends westward from the open cut at a point 10 feet from the south face. Most of the excavation was made in ore. About 75 feet southeast of the open cut, a bulldozer open pit, 50 by 40 feet in plan, exposes low-grade ore on the hillside. Altitude at this site is 5700 feet.

Site No. 15 is known as the South Pit of the Royal Flush workings. An open cut, 100 feet long by 30 feet wide, bears east into the hillside and ends at a 20-foot-high face. A 14-foot-wide by 12-foot-high by 240-foot-long adit bears S. 3° W. from the east end of the open cut. The adit was stoped out along each wall with 6- to 8-foot high stopes that increased the over-all adit width to as much as 40

feet throughout much of its length. On the opposite (north) side of the east face of the open cut, a 12-foot-high by 30-foot-wide tunnel extends northward for 200 feet to connect with the south end of Site No. 16. Four large ore pillars, evenly spaced throughout the length, were left for roof support. About midway in the tunnel, the width increases to 50 feet for a short distance. Figure 17 is a photograph looking north from the center of the east end of the open cut. One of the roof-supporting ore pillars is shown at the portal. The west wall of the tunnel is a fault plane shown by a dashed line.

Site No. 16, known as the North Pit of the Royal Flush workings, is an open pit along the hillside extending north-south. It is about 400 feet long, 30 to 40 feet wide, and up to 20 feet high along the east or uphill side. The east side contains many undercut stopes that extend beyond the face of the pit for 15 to 20 feet. A waste-filled shaft is near the west edge of the pit. The tunnel that runs north from Site No. 15 connects with the south end of the open pit.

Figure 17

VIEW LOOKING NORTH AT SITE No. 15 (FIGURE 14) **NORTHERN MEX-TEX WORKINGS, SHOWING PORTAL TO CONNECTING TUNNEL TO SITE** No. 16. **DASHED LINE IS A FAULT. AN ORE PILLAR IS EXPOSED NEAR THE ENTRANCE**

Site No. 17 is an inaccessible 6- by 12- by 50-foot shaft. About 50 feet southeast is a second, inaccessible shallow shaft containing a westward-trending stub drift in the bottom. Approximately 75 feet northeast from the deeper shaft, a prospect pit and several shallow trenches expose barite mineralization and a fault that begins an eastward trend at this point.

Site No. 18 is an inaccessible 5- by 7- by 50-foot shaft sunk on a barite-galena outcrop.

Bench-scale flotation tests were made on a representative 200-pound sample from the Downey stope to determine grade and recovery of barite and fluorspar products. Procedures and results of the tests are described under *Metallurgical Tests*.

BLANCHARD GROUP

The Blanchard group of claims (locality 15, fig. 13) in sec. 1, T. 6 S., R. 5 E. is 6 miles south of Bingham, a post office—general store 30.8 miles from San Antonio on U.S. Highway 380. In the past, the property has been known as the Hansonburg lead mine, McCarthy mine, Portales mine, and Oscura mine. It lies high on the west slope of the Sierra Oscura Range overlooking the Jornada del Muerto, a broad desert area.

The property comprises sixteen claims owned by Mrs. Ora W. Blanchard and associates of Bingham. It is not currently leased, but previous lessees have extracted large tonnages of lead. The mine at present attracts mineral specimen collectors. No barite has been marketed. Lasky reported that prospecting activity began as early as 1872 in the vicinity of the mine, but no active mining took place until the interval from 1895 to 1917. Several lots of copper ore were shipped from a nearby copper mine, and several cars of lead concentrates were marketed from the Blanchard property, known at that time as Hansonburg copper and Hansonburg lead mines, respectively. The property was inactive from 1917 to 1933. Intermittent exploration mining was done by lessees from 1938 to 1960. In 1938, Louis and Halstead shipped a small, unknown amount of lead-silver ore; in 1939, Globe Mining Company shipped 9 tons of lead-silver ore; in 1947 and 1948, Portales Mining Company milled 5700 tons of lead ore, recovering 239,150 pounds of lead; in 1950, the same company processed and marketed 14,377 tons of lead ore. This represents the last reported production. In 1948, the Portales Mining Company built a mill about one mile east of San Antonio and hauled ore to it by truck. The mill burned down in 1954. Greer and Hoag of Dallas rebuilt the mill in 1956 but did not market any ore. The Sunshine Mining Company conducted exploratory drilling, drifting, crosscutting, and raising from November 1958 to June 1960, but no ore was marketed.

According to Lasky, mineralization occurs chiefly as cavity filling in faulted zones in limestone. Some replacement of limestone wall rock by silica and dolomite has occurred, but very little wall rock has been replaced by ore minerals. Fluorite, one of the major minerals, occurs as medium cubes, white to pale green to purple in color, and is intergrown with barite. In some places, barite is present as medium-to-coarse, platy crystals standing alone. Many cavities are found which contain arrays of various minerals, including fluorite, barite, galena, argentite, selenite, quartz, and anglesite. Other minerals present are chalcopyrite, covellite, chalcocite, limonite, tennantite, enargite and calcite. Mineralization along a particular vein is discontinuous, and ore is limited to pockets scattered throughout the vertical north-striking vein system. The mine has been worked through six adits containing cross drifts, raises, and winzes. Total lineal footage excavated is approximately 2300. Parts of earlier tunneling work have been backfilled with muck and, in some instances, ore. A 40- by 50- by 15-foot stope exposes several vugs containing splendid crystals.

Ore-dressing research was done on a 100-pound sample taken from the feed belt at the dry-concentration mill located on the premises. Procedure and results of the research are described under *Metallurgical Tests*.

MIERA PROSPECT

The Miera prospect (locality 16, fig. 13) in the E1/2 sec. 12, T. 6 S., R. 5 E. is within the boundary of the White Sands Missile Range. It is reached by traveling 7 miles south from Bingham, a post office—general store 30.8 miles east from San Antonio on U.S. Highway 380. A steep mountain trail continues 0.5 mile from the end of the road to the property.

Two unpatented claims, Sixty-Six and Santa Rita, were located respectively in December 1939 and October 1941 by Mr. J. Miera. No production has been reported.

Barite occurs with quartz and minor fluorspar in a fault zone in limestone that strikes north-south and dip steeply east. Some wall rock replacement has occurred, but generally the vein fissures are filled with massive siliceous rock.

A 20- by 30- by 10-foot open cut on the Sixty-Six claim exposes 4 feet of ore containing wall rock inclusions. The vein is traceable for 200 feet northward from the open cut before it narrows, splits, and finally disappears. It is not traceable south from the open cut. A 4-foot chip sample from the vein in the open cut contained 58.4 per cent $BaSO_4$, 3.4 per cent CaF_2, 27.0 per cent SiO_2, and 2.8 per cent Pb.

A single, small prospect pit on the Santa Rita claim exposes 1-inch stringers. These stringers are discontinuous and are not traceable beyond the prospect pit. A small sample taken from the best visible material in the pit contained 48.6 per cent $BaSO_4$, 40.0 per cent SiO_2, and 7.1 per cent CaF_2.

INDEPENDENCE MINE

Sparse barite occurs as part of the gangue constituent at the Independence mine (locality 17, fig. 13) in secs. 5 and 6, T. 9 S., R. 5 E. The property, consisting of six patented claims, yielded a few tons of lead-zinc ore in sporadic mining attempts from 1905 to early in the 1950's when it was withdrawn by the Federal government as part of the White Sands Missile Range. A sample cut across one of the major ore shoots contained 7.0 per cent $BaSO_4$.

METALLURGICAL TESTS

Metallurgical investigations were conducted on ore samples from four mines in Socorro County. The samples had disparate mineral compositions and presented diverse beneficiation problems. The minerals to be recovered were lead, barite, and fluorspar. Concentration of the fluorspar where applicable was made by the lignin-fluoride method. Barite was successfully floated using sodium cetyl sulfate as a collector. Bloom, McKinney, and Evans (1963) describe in greater detail the lignin-fluoride method for recovering fluorspar and the froth flotation for barite using sodium cetyl sulfate as a collector. The sample containing lead was beneficiated by a combination wet-tabling-and-flotation method.

The ores treated were designated numbers 1 to 4 and were obtained from the Blanchard group, Helen group, Gonzales group, and Mex-Tex group, respectively. Partial compositions of the ores and the results of the concentration efforts are summarized in Table 2.

TABLE 2. RESULTS OF BENEFICIATION TESTS

MATERIAL	SAMPLE NUMBERS 1	2	3	4
Ore				
Weight of sample (pounds)	100	350	80	200
Analysis (per cent)				
$BaSO_4$	9.3	29.8	46.2	58.8
CaF_2	9.5	0.6	32.8	11.8
Pb	3.95	—	—	—
SiO_2	—	—	—	19.3
$CaCO_3$	14.3	19.6	0.3	9.1
Barite concentrate				
analysis (per cent)	86.4	94.9	89.6	96.8
recovery (per cent)	58.5	83.9	81.5	73.4
specific gravity	4.3	4.3	4.4	4.4
Fluorspar concentrate				
analysis (per cent)	95.8	—	98.6	98.9
recovery (per cent)	53.7	—	69.1	77.9
Lead concentrate				
analysis (per cent)	57.9	—	—	—
recovery (per cent)	70.2	—	—	—

The reagent requirements for the optimum test made on each sample are given in Table 3.

TABLE 3. REAGENT REQUIREMENTS FOR FLOTATION

REAGENTS (ALSO pH AND PARTICLE SIZE)	SAMPLE NUMBERS 1	2	3	4
Barite flotation				
Calcium lignin sulfonate (pounds a ton)	2.0	1.0	—	—
Sodium hexametaphosphate (pounds a ton)	—	0.5	—	—
Sodium hydroxide (pounds a ton)	—	—	2.0	—
Soda ash (pounds a ton)	6.0	—	2.0	—
Oleic acid (pounds a ton)	1.28	—	1.12	—
Sodium fluoride (pounds a ton)	4.0	—	—	—
Sodium cetyl sulfate (pounds a ton)	—	1.0	—	1.5
pH rougher flotation	10.3	8.4	9.8	8.6
Particle size (mesh)	—100	—100	—100	—200
Fluorspar flotation				
Calcium lignin sulfonate (pounds a ton)	14.0	—	9.2	6.2
Sodium fluoride (pounds a ton)	8.0	—	4.0	4.0
Soda ash (pounds a ton)	8.0	—	2.0	—
Oleic acid (pounds a ton)	1.28	—	0.48	0.24
pH rougher flotation	9.7	—	9.4	8.6
Particle size (mesh)	—100	—	—100	—200
Lead flotation				
Soda ash (pounds a ton)	4.0	—	—	—
Sodium sulfide (pounds a ton)	2.0	—	—	—
Potassium amyl xanthate (pounds a ton)	0.8	—	—	—
Methyl isobutyl carbinol (pounds a ton)	0.24	—	—	—
pH rougher flotation	8.0	—	—	—
Particle size (mesh)	—100			

Sample No. 1 was treated by a combination wet-tabling and flotation. The ore was dry-ground to pass 20 mesh and then deslimed at about 20 microns. Tabling of the deslimed product yielded a lead concentrate, a barite-lead product, a barite-fluorspar-calcite middling, and a tailing consisting of quartz, fluorspar, and calcite. Flotation of all the products except the lead concentrate was then undertaken to obtain further separation and recovery of the lead, barite, and fluorspar.

Sample No. 2 was beneficiated successfully by selective flotation to obtain a marketable grade of barite product from an ore having a high calcite content. Calcium lignin sulfonate and sodium hexametaphosphate was used to disperse the pulp and depress the gangue, and sodium cetyl sulfate was used as the barite collector. The best results obtained are shown in Table 2.

TORRANCE COUNTY

Two known vein deposits of barite occur near the extreme northwest corner of Torrance County near the Santa Fe county line (fig. 3). About 50 tons of crude barite are stockpiled at one of the properties, but none has been sold from the county.

TINA DEPOSIT

The Tina deposit (locality 3, fig. 3) is in the SW 1/4 sec. 5, T. 9 N., R. 7 E. It is reached by traveling 3.5 miles south and 1.2 miles west from the village of Barton, 25 miles east of Albuquerque on U.S. Highway 66. Average altitude of the deposit is 7000 feet.

The property, owned by W. S. Fluitt, is leased by John Giannini and associates of Albuquerque. Leased acreage is unknown.

Coarsely crystalline barite occurs with fluorite and a minor amount of galena in a vein along a fracture zone in limestone. Near the west end of the deposit, the vein strikes S. 75° E. and dips 75° to 80° SW. Coarse, platy crystalline, clear to faint green or amber barite constitutes the ore. Fluorite with minor amounts of galena has filled most of the voids caused by random orientation of

barite crystals. Gangue material consists of barren limestone fragments and finely crystalline to drusy quartz.

The western part of the vein has been explored by a 22-foot shaft and a 10-foot drift at the bottom extending eastward. A short drift near the surface also connects the shaft with a 30-foot-long by 8-foot-wide by 20-foot-deep open cut extending eastward along the mineralized fracture zone. The best grade of barite occurs near the north footwall contact where the ore breaks cleanly from relatively smooth gouge material. Near the hanging wall contact, irregular and incomplete replacement of limestone by barite has occurred, partly due to outward-extending cross fractures. Here the ore is diluted by wall rock fragments. The vein exposed in the shaft is 1.5 feet wide at the surface increasing to 3 feet at a point 15 feet from the surface. A sample chipped across the 2-foot vein at the face of the 10-foot drift contained 49.2 per cent $BaSO_4$, 20.7 per cent CaF_2, 2.88 per cent Pb, and 0.6 per cent $CaCO_3$. A second chip sample taken across a 3.5-foot width of vein at the bottom of the east face of the open cut contained 49.0 per cent $BaSO_4$, 18.2 per cent CaF_2, 2.16 per cent Pb, and 1.0 per cent $CaCO_3$. More dilution by limestone occurs adjacent to the hanging wall, where each of the above samples was collected, than near the uñsampled footwall.

About 800 feet eastward, a 10-foot prospect pit exposes a 1.5-foot vein of barite, possibly a continuation of the vein in the western working or a branch vein therefrom. However, correlation of these veins is uncertain because of alluvial fill between the exposures. At the 10-foot pit, the vein strikes N. 75° E., dips steeply southeast, and contains no visible fluorite or galena. An 18-foot shaft, now inaccessible, was sunk in a 4-foot brecciated zone 400 feet east of the 10-foot pit and in line with the same vein. The brecciated rock contains barite with minor amounts of fluorite and galena.

No production has been reported from this property; however, a stockpile of approximately 50 tons of hand-sorted barite was noted when the property was examined in late 1958.

SHOCKLEY DEPOSIT

The Shockley deposit (locality 2, fig. 3) in the NW 1/4 sec. 5, T. 9 N., R. 7 E. is 2.9 miles south and 1.1 miles east of Barton, a town 25 miles east of Albuquerque on U.S. Highway 66.

Guy W. Tooker, an agent for a Houston oil company, optioned the property in 1956 or 1957 and completed exploratory work consisting of three long cuts and one shaft.

This work disclosed a nearly vertical mineralized fracture zone in limestone striking N. 80° W. Barite is traceable for 1500 feet by exposures in numerous pits and bulldozer cuts. The vein pinches out at the east end of the outcrop and disappears under alluvium at the west end. It reaches a maximum width of about 4 feet near the midpoint of the exposed outcrop. Barite, where exposed, exhibits nodular and granular texture in weathered limestone (westernmost exposure) ranging through translucent, coarsely platy crystalline texture (center exposure) to medium crystalline and massixe texture (easternmost exposure). Wherever the barite is medium to coarsely crystalline, pale green and white fluorite and minor amounts of galena were deposited in void spaces formed by random orientation of barite plates. Occasional inclusions of limestone wall rock are found in the hanging (south) wall.

Exploration work from west to east along the vein consists of the following: A crosscutting bulldozer trench about 50 feet long exposes about 8 to 12 inches of granular barite at the western end. One hundred feet eastward, a 25-foot-deep shaft with a 10-foot east-trending stub drift at its bottom exposes 4 feet of vein at the drift face. Fifty feet farther east, a relatively new shaft, now inaccessible, was sunk in the middle of a 100-foot-long by 10-foot-deep crosscutting bulldozer trench. Three to four feet of coarsely crystalline barite is exposed in the trench. One hundred feet east of the shaft, a 12-foot-deep crosscut bulldozer trench failed to reach bedrock. About 500 feet east of the 12-foot-deep trench, a 70-foot-long by 10-foot-deep trench was cut along the strike, which is nearly due east at this exposure. Mineralization here consists of small stringers of medium crystalline to massive barite in a fractured zone. Along the next 800 feet eastward, three equally spaced shallow pits expose barite stringers similar to those found in the 70-foot-long trench.

The new shaft, over which stands a 30-foot steel headframe, was badly caved and collapsed at its collar. The shaft was sunk in the center of the 10-foot-deep bulldozer trench, and surface waters were channeled into the shaft, causing its collapse. Therefore, vertical extent of the mineral zone is unknown.

The older 25-foot shaft was accessible. A 4-foot chip sample taken across the top of the face of the 10-foot drift in the bottom contained 90.5 per cent $BaSO_4$, 2.5 per cent CaF_2, and 0.33 per cent Pb. Here the barite is very coarsely crystalline and free of impurities.

MISCELLANEOUS OCCURRENCES

In addition to the deposits described in this report, barite has been reported elsewhere in New Mexico either as a minor gangue constituent in deposits of other minerals or as a major constituent in deposits for which only meager information was obtained during this and previous investigations. These barite occurrences are mentioned in the following descriptions.

BERNALILLO COUNTY

A vein up to 2.5 feet wide contains barite as part of granite breccia cementing material at the Galena King mine in the Tijeras Canyon district (Ladoo, 1927).

DONA ANA COUNTY

A deposit of barite is reported near the summit of the Organ Mountains (no other available data) (Talmage and Wootton).

GRANT COUNTY

Abundant, well-formed barite crystals occur at the Black Hawk mine (Northrop, 1942). Although the mine was completely caved when visited, good barite crystals were seen on the dump.

Barite occurs as a minor gangue constituent at the Aztec, Langston, and Arizona (copper oxide) mines about one mile southwest of Pinos Altos.

LUNA COUNTY

Chrysocolla is associated with barite in the upper part of the vein at a copper deposit in the north part of the Old Hadley district (Jicha, 1954).

Barite occurs sparingly in the Old Dude vein in the Macho district (Jicha).

OTERO COUNTY

It has been reported that A. L. Austin of Alamogordo partly developed a barite deposit 10 feet wide by 300 feet long near the Warnock lead mine, Sacramento Mountains. No other information is available (Talmage and Wootton).

SANDOVAL COUNTY

Dark, tabular barite crystals are reported at the Sefrina copper oxide deposit, 2.5 miles southwest of Gallina (Lindgren, Graton, and Gordon).

SAN JUAN COUNTY

Barite is reported to occur as concretions and veins in the Kirtland and Nacimiento formations (Bauer, 1916).

SIERRA COUNTY

A small amount of barite occurs as gangue material at the Harding, Esperanza, Nakaye, and other fluorspar mines in the Sierra Caballo Mountains (Talmage and Wootton).

Barite is part of the gangue material at the "Great Master" lode in the northern part of the Black Range district (Harley, 1934).

Barite is a gangue constituent at the old Southwestern Land and Coal Company's holdings south of Palomas Gap on the east flank of the Sierra Caballo Mountains (Harley).

Between Palomas Gap and Derry, along the west face of the Sierra Caballo Mountains, barite occurs as gangue material in many copper veins (Harley), particularly where the veins are in limestone host rock.

Barite is a minor gangue mineral in red-bed copper deposits (Permian) along the eastern slopes of most of the mountain ranges in Sierra County (Harley).

SOCORRO COUNTY

Barite is a gangue constituent at the Ellis Canyon prospect near the head of Ellis Canyon on the east side of the Magdalena Mountains (Lasky).

Barite is part of cementing material for veins in breccia zones in the Council Rocks district, Socorro County (Lasky).

Crystalline galena occurs in a gangue of fluorspar and barite at the Bachelder—Everheart prospect 7 road miles south-southeast from La Joya (Lasky).

Barite is included as a gangue constituent at the Valle Vista mine, half a mile south at the mouth of Good Fortune Creek within the White Sands Missile Range (Lasky).

Barite is an abundant gangue mineral at a lead prospect 3 miles north of the Chupadero mine and 1 mile west of Ojo de la Parida (Lasky).

VALENCIA COUNTY

A 10-foot vein of barite bearing N. 70° W. is reported to have been prospected for silver in the Zuni Mountains many years ago (Lindgren, Graton, and Gordon). Several previous investigators have failed to locate this vein. Most of them believe that the vein is part of the Mirabal fluorspar mine in secs. 7 and 8, T. 11 N., R. 12 W., currently owned by the Aluminum Company of America.

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