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GEOLOGY AND ORE DEPOSITS OF A PART OF THE  
HANSONBURG MINING DISTRICT  
SOCORRO COUNTY, NEW MEXICO

By

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## INTRODUCTION

The purpose of this study is to supply geologic data to aid exploration for the barite-fluorite-galena ore bodies in the Hansonburg mining district, a mineralized area on the west face of the Oscura Mountains, 35 miles southeast of Socorro, New Mexico. Rock outcrops, prospect pits, and operating mines were briefly examined, typical sections of the bedrock were measured, and two mine areas were mapped with plane table and alidade. Geologic mapping was done intermittently from June 4 to June 30, 1952, with the assistance of Mr. Wayne Bundy. The writer is indebted to Messrs. Ben Scott, Manager, and T.B. Everhart, Mine Superintendent, Mex-Tex Mining Company, for full cooperation and assistance.

## LOCATION

The property of the Mex-Tex Company on which most of this work was done includes 50 claims on the north end of the Oscura Mountains at the east edge of the Jornada del Uerto. The property is 28 miles east of San Antonio by U.S. Highway 380, and four miles south of the highway. San Antonio is the nearest shipping point on the El Paso division of the Atchison, Topeka and Santa Fe Railroad. Bingham post office is on U. S. Highway 380 near its intersection with the mine road. Forty-six of the claims are directly along the mountain front in Sections 36 and 25, T. 5 S., R. 5 E., Sections 19, 30, and 31, T. 5 S., R. 6 E., and Section 6, T. 6 S., R. 6 E., Socorro County, New Mexico. Four claims are in Sections 33 and 34, T. 5 S., R. 5 E., in the north end of the Hansonburg Hills three miles west of the Oscura Mountains. Portales Mining Company property borders the Mex-Tex claims on the south. To the northeast is the property of the Hurlow Mining and Milling Company.

## PHYSICAL FEATURES

The Mex-Tex property extends north-south for about two miles along the west edge of the Oscura Mountains near their north end and east onto the eastern slope of the mountains. The Oscura range at its southern end is a broken, eastward tilted, fault block that dies out to the north in the northward-plunging Oscura anticline. East of the Oscura Mountains are valleys cut in the Abo redbeds. These valleys are bordered on the east by Chupadera Mesa. Nest of the Oscura Mountains is the wide, desolate, southward-sloping Jornada del Muerto, an intermontane alluvial plain. Isolated, north-south elongated fault-block ranges occur along the east side of the Jornada del Muerto south of Bingham. The Jornada del Muerto is at an average altitude of 5200 feet; the altitude of the highest point on the Mex-Tex property is about 6500 feet. Oscura Peak, at an altitude of 8732 feet, is near the south end of the range. Julian Arroyo is cut through the north end of the range on the Mex-Tex property and drains westward past the Julian tank of the Bursum Ranch onto the Jornada del Muerto.

A juniper-pinon forest covers the higher parts of the Oscura Mountains but only small scattered trees occur on the Mex-Tex property. Timber for mining purposes is available within a few miles. Precipitation averages about 11 inches a year, most of which falls during the summer. Mean annual temperature is about 56<sup>o</sup> F. Water for domestic and milling uses must be

developed by drilling wells on the property, or must be trucked from stock wells a few miles away. A well drilled about 800 feet into the Sandia formation at the foot of the range in the northwest corner of the property was dry. Wells drilled near the west edge of the mountains will probably not yield much water; farther east springs and wells yield somewhat larger quantities of water.

The more resistant limestones form cliffs and ledges throughout the area. Sandstone and shale beds, as well as thin-bedded limestones, weather to soil and rubble mantled slopes, in many places obscured by the talus from overlying massive limestones. At the foot of the range slope wash covers the bedrock. The single deep arroyo in the area is partly filled by a thick deposit of silt, sand, and gravel.

## HISTORY

The Hansonburg mining district was named by Jones (1904, p. 103) for a prospector, Hanson. Ore was first discovered in the district by Pat Higgins in 1872. Alcazar Copper Company, under the supervision of A. J. Borden, developed several prospects in the Hansonburg Hills and shipped one carload of copper ore in 1901, the year the company disbanded.

The copper in the Hansonburg Hills was briefly noted by Lindgren, Graton, and Gordon (1910, p. 203). They mentioned many lead ore prospect pits in the Pennsylvanian limestone.

T. P. Wootton (Johnston, 1928, p. 123-124), reporting on the Hansonburg lead mine in 1927, stated that the property of the Western Mineral Products Company then consisted of six claims, acquired in 1916, about two miles south of Julian tank, and south of the present rex-Tex claims. He regarded the ore of fluorite, barite, and galena as occurring as fissure fillings in the Magdalena limestone. Solution cavities were noted and no limestone replacement was seen. Wootton concluded that: Mineralization is much more apparent at the outcrop than in the mine tunnel \*\*\* the deposit appears to be surficial in character and it is unlikely that commercial bodies of either fluorspar or galena exist."

Lasky (1932) examined the area in some detail in 1929 and reported that about 15 cars of copper ore were shipped from the Hansonburg copper mine by 1917. The Rim Rock or Hansonburg lead mine had shipped several cars of lead concentrates in 1917, though neither mine was working in 1929. Lasky believed the deposits to be cavity-filling fissure veins and saw very little replacement of limestone by ore minerals.

Rothrock, Johnson, and Hahn (1946, p. 175-176) examined the Hansonburg area in 1943, and described the fluorspar deposits of the McCarthy lead mine (Hansonburg lead mine) which was owned by F. L. Blanchard of Roswell.

Clippinger (1949, p. 16-18) recorded the use of barite from this district in drilling muds, and the development of milling methods to separate barite and fluorite. The Portales Mining Company was working the Hansonburg lead mine (1949). Exploration by open cuts was in progress on the Mex-Tex and Royal Flush claims and several carloads of lead ore were shipped.

Within the last few years the Hurlow Lining and Milling Company erected a mill and is exploring an ore body near the mill. The Portales mine and the open pit Malachite-Julian mine of the Ilex Tex Company each have been trucking about 150 tons of ore daily to their respective mills at San Antonio. The Portales mill produces galena whereas the Mex-Tex mill produces barite, galena, and fluorite. South of the Portales mine Er. Barrett is developing outcrops of ore in the Council Spring limestone.

## GEOLOGY

A mile south of the mining district on the western fault-scarp face of the Sierra Oscura are exposed cliff-forming Pennsylvanian limestones that rest on Precambrian granite. To the south, Mississippian and older Paleozoic strata lie between the Pennsylvanian and the Precambrian rocks. These rocks are broken into several fault blocks by vertical northward-trending faults, the western side in most localities was downdropped, and the uplifted eastern blocks were tilted so that the strata dip to the east. Near the north end of the range and of the mining district the fault blocks merge into a northward-plunging anticline. North of the district the gray Pennsylvanian limestones are overlain and covered by the red sandstones and shales of the Permian Abo formation.

## STRATIGRAPHY

Precambrian, Pennsylvanian, Permian, mid Tertiary (?) and Quaternary rocks crop out in or near the mining district. The Precambrian is chiefly a pink muscovite quartz-leucogranite that intrudes small bodies of gray quartzite. The quartz-leucogranite or granite-greisen, as it is called by Johannsen, contains 29 percent quartz, 38 percent orthoclase and microcline, 30 percent oligoclase, and 3 percent muscovite. Pennsylvanian gray limestones, greenish sandstones, and shales overlie the beveled surface of the Precambrian rocks. Permian red sandstones and shales rest disconformably on the Pennsylvanian strata. Pennsylvanian and Permian beds are intruded by scattered sills and dikes of mid-Tertiary monzonite-diorite. Quaternary alluvium fills the valleys and blankets most of the surface of the Jornada del Muerto.

## PENNSYLVANIAN STRATA

Wilpolt and Wanek (1951) divided the beds of the Magdalena group in the area into the Sandia formation and the overlying Madera limestone. The term Magdalena is, in New Mexico, synonymous with Pennsylvanian, therefore is unnecessary but is a term in common use. These formational designations are readily recognized in the field as the breaks between the units are expressed topographically.

Thompson (1942) on the basis of fusulinids and by measuring and studying in detail about 150 sections subdivided the Pennsylvanian of New Mexico into fifteen formations. Use of Thompson's units in mile-to-the-inch mapping requires too much detailed faunal data. As mapping of the mine areas was on a large scale, Thompson's formations were more useful than the generalized units of the U. S. Geological Survey.

Units mapped in the area are the Bolander group of the Des Moines series; the Coane formation, the Adobe formation, the Council Spring limestone, the Burrego formation, and the Story formation of the Missouri series; and the Del Cuerto formation and Moya formation of the Virgil series.

Sandia formation. The lower part of the Pennsylvanian was mapped by and Wanek (1951) as the Sandia formation. In other areas a lower limestone member and an upper clastic member were recognized but only the clastic member is present in the north part of the Oscura Mountains. The clastic member consists of dark-gray sandy limestone; gray, green, and black carbonaceous shale; gray and olive-green sandstone; and a quartz conglomerate. The clastic member ranges from 15 to 41 feet in thickness in the northern part of Sierra Oscura.

Madera limestone. The Madera limestone lies conformably on the Sandia formation and is divided into a lower gray limestone member and an upper arkose-limestone member. The lower gray limestone member consists of cherty, medium to dark-gray limestones with a few interbeds of gray and green shale, sandstone, and conglomerate. The member is 375 feet thick in the northern Sierra Oscura but thickens southward. The limestones are resistant to erosion and form prominent cliffs.

The arkose-limestone member of the Madera consists of medium to light-gray limestone with interbeds of gray, black, and red shale, and green, brown, and gray arkosic sandstone. The base is said to be marked in Sierra Oscura (Wilpolt and Wanek, 1951) by the first clifflike ledges of green arkosic sandstone that contains fresh pink feldspar. The upper part of the member includes several massive cliff-forming limestone beds. This member ranges from 350 to 700 feet in thickness in Sierra Oscura.

The Bolander group (Thompson, 1942, p. 51) which contains Fusulina, and the Coane formation (1942, p. 60), which contains Triticites, are equivalent to the upper part of the lower gray limestone member of the Madera limestone. The upper arkose-limestone member of the Madera limestone is the approximate equivalent of the Adobe, Council Springs, Burrego, Story, Del Cuerto, and Moya formations. These strata are characterized by Triticites.

Bolander group. The Bolander group of the upper Des Moines series is the oldest subdivision that was mapped. These beds are gray to buff cherty limestones in the Oscura Mountains and are somewhat dissimilar to those at the type locality in the Mud Springs Mountains. The base of the Bolander group was not mapped.

Coane formation. The Coane formation is at the base of the Missouri series. The formation consists of gray to buff limestones with scattered chert nodules. The uppermost beds form a massive cliff 20 to 31 feet thick. The lower part of the cliff contains nodules and lenses of black chert. The formation ranges from 59 to 77 feet in thickness.

Adobe formation. The Adobe formation consists of non-cherty and cherty gray limestones, gray shales, and arkosic sandstones. At the base of the formation is a green fossiliferous arkosic sandstone that at places changes to an arkosic conglomerate. This arkose contains fresh angular pink feldspar grains. The formation contains several thin resistant limestone beds that form ledges. The interbedded sandstones and shales weather to debris covered slopes. Topographically the formation crops out as a broken slope between the thick limestone cliffs of the Coane formation and the Council Spring limestone. The Adobe formation is 45 to 50 feet thick.

Council Spring limestone. The Council Spring limestone is light-gray, coarse to fine-grained, massive, and usually forms a single cliff. The weathered faces of the cliff tend to break into vertical columns. The limestone is about 19 feet thick, forms the persistent and distinctive cliff along the mountain scarp just below the Julian-Malachite mine, the Portales mine, and along Julian Arroyo just south of the Royal Flush mine. Much of the ore being mined is in fractured zones in the Council Spring limestone.

Burrego formation. The formation is composed of massive to thin-bedded nodular limestones, gray to light-gray with some thin beds colored brown, orange, green, and purple in limited areas. Lenses of dark-gray shale, and brown sandstone occur in the lower part of the formation. The formation is 52 feet thick. Two distinctive thin beds of green to purple, crinoidal, fossiliferous, sandy limestone occur in the lower part of the formation. These limestone beds crop out as a series of partly-covered ledges above the cliff of Council Spring limestone. Much ore is found in the lower part of this formation.

Story formation. The Story formation is composed of two units: (1) a lower 20 feet of reddish-brown shale, arkosic and micaceous sandstone, and gray shale, (2) an upper 38 feet of light-gray, massive, fossiliferous limestone. The lower clastic unit forms a covered slope overlain by ledges and cliffs of the limestones. The upper unit consists of two thick massive beds of light-gray limestone separated by a thin irregular bed of nodular limestone.

Del Cuerto formation. The formation consists of irregularly bedded nodular gray limestone, red, green, and brown arkosic sandstone, limestone conglomerate, and gray and red shale. The formation is about 80 feet thick and crops out as scattered ledges on a covered slope partly buried by rubble from the overlying Moya limestones.

Moya formation. The formation consists of massive and irregularly bedded, to nodular light-gray limestone about 50 feet thick. The lower massive limestone forms a high cliff along Julian Arroyo in Sierra Oscura. Most of the dip-slopes in Sierra Oscura are capped by the Moya limestones.

Burton formation. The Burton formation, as described by Thompson (1942, p. 79), consists of red shales, purple arkosic sandstones and conglomerates, with interbedded nodular irregularly-bedded limestones. The formation is about 115 feet thick and is overlain by massive Permian limestones. Wilpolt and Anek (1951) consider all except the basal part of the Burton formation to be equivalent to the Bursum formation of lower Permian Wolfcamp age.

## PERMIAN STRATA

The clastic beds between the Moya limestones and the massive light-gray limestones that cap the Bursum formation are considered to be of Pennsylvanian age by Thompson and Permian by Wilpolt and Wanek. The upper part of the Bursum formation and the redbeds of the Abo formation are Permian.

Bursum formation. The formation consists of thick beds of dark purplish-red and green shale interbedded with thin beds of arkose, arkosic conglomerate, and gray limestone. Schwagerina and Triticites ventricosus were found in limestones in the middle of the formation. A thick, massive, light-gray limestone occurs at the top of the formation. and contains Wolfcamp fossils. The formation ranges from 90 to 250 feet in thickness, Wilpolt and Wanek (1951) mapped the lower part of the Bursum formation as an "Abo tongue" apparently on the basis that the Bursum formation is composed of red clastic beds typical of the Abo intertongued with gray Permian limestone beds that correlate with part of the Hueco formation in the Franklin Mountains. The Abo mapped below the Julian-Malachite mine is apparently an Abo tongue, and may be part of the Bursum formation.

Abo formation. The formation consists of dark-red shale, sandstone, arkose, and conglomerate. Continental origin is shown by mud cracks, current ripple marks, cross-bedding, plant imprints, and the lenticular character of the beds whereby most beds have a limited horizontal extent. The formation is about 750 feet thick and erodes to the reddish slopes and ledges that characterize the north end of Sierra Oscura.

#### MID-TERTIARY (?) IGNEOUS ROCKS

Several sills and dikes of monzonite and diorite are intruded into the Pennsylvanian strata of Sierra Oscura. These are believed by Wilpolt and Wanek (1951) to be of post-Datil (Eocene?) age and pre-Santa Fe age (upper Miocene-lower Pliocene) because in Cerro Colorado southeast of Carthage similar rocks intrude the Datil formation but do not intrude the Santa Fe formation.

A sill of hornblende sodalite diorite crops out on a low knoll east of the road to the Mex-Tex property and south of Highway 380. The diorite has an ophitic texture, weathered hornblende laths are set in a matrix of albite crystals. The Yeso (Permian) strata adjacent to the sill have been altered, and the outer edges of the sill are fine-grained albite. Small crystals of barite occur in the diorite.

#### QUATERNARY ALLUVIUM

Thick beds of silt, sand, and gravel partly fill the valleys in the area. White, sandy, calcareous clays, derived from the Pennsylvanian limestones, are present in many of the gullies. In the mountains pebbles and boulders are chiefly limestone; westward on the Jornada del Muerto red sands and silts derived from the Abo formation predominate.

#### STRUCTURE

Sierra Oscura is a tilted block-faulted range. The mountain front is marked by a steep west-facing fault-line escarpment, the east slope is a rolling, locally-dissected upland. The Oscura fault that borders the range on the west, strikes N. 15° E., and is concealed by alluvium except at a few places (not shown on the map). The throw of this fault decreases from south to north and dies out in the Oscura anticline. Another fault, about a mile

east of the Oscura fault, occurs near the base of the west-facing escarpment in the map area. Below the Julian-Malachite mine this fault has a throw of about 550 feet with the base of the Bursum formation dropped on the west opposite the Bolander group. This fault trends north-south but at intervals of about a mile is interrupted and progressively offset to the east or curves to the east before dying out in the southwest corner of Section 30. Minor faults and joints parallel or subparallel this en echelon fault zone. Throughout the Mex-Tex property there are two intersecting sets of joints. One set strikes from north to N. 20° W., and the other set strikes from north to N. 25° E.

## ORE DEPOSITS

Minerals. All the introduced minerals of the ore deposits are characterized by the large size and perfection of the crystals. Barite, quartz, fluorite, and galena are the principal minerals. Fluorite and galena cubes are as much as two inches across, and tabular crystals of barite six inches long are common. No massive fluorite or barite was seen. Quartz occurs as dense masses formed by silicification of limestone, as large crystals mixed with the ore minerals, and as drusy crystals coating the other minerals. The galena contains microscopic particles of chalcopyrite (Lasky, 1932, p. 68), as well as some silver. Oxidization products that occur in a few places are angle-site, cerussite, covellite, malachite, and azurite. Some of the fluorite crystals have a rough surface due to leaching. The ore from the Royal Flush mine contained 30 to 55 percent barite, 12 to 23 percent fluorite, about 5 percent galena, in a gangue of quartz and limestone according to Mr. Scott.

A banded structure is characteristic of the ore. Typically a band of gray silicified limestone one to four inches thick is bounded on both sides by a mesh of galena and aqua-colored fluorite cubes. Spaces between these bands are a few inches to several feet wide and are mostly filled by tabular barite crystals with a few galena and fluorite cubes. Jugs are lined in places by drusy masses of tiny quartz crystals. In places, as on the north side of the Julian-Malachite open cut, much coarsely-crystalline quartz is intergrown with the other minerals.

Structural control. Throughout the mining district there are two closely spaced sets of fractures and joints that are about 30 degrees apart, and strike within 25 degrees on either side of north. The largest faults, as well as tiny joints, parallel these two trends. Ore bodies are located in: (1) broad fracture zones where massive limestone beds are broken and shattered, (2) small hinge faults where much brecciation and sheeting of massive limestone beds occurred, (3) solution cavities. Widespread silicification of limestone has followed the favorable fractured zones, and a limonite-coated quartz fills many joints and small discontinuous fractures. Fault plane openings and other small fractures are filled by a brown, platy calcite. Dolomite and siderite<sup>o</sup> have also been reported as joint fillings.

No large scale replacement of limestone by barite, fluorite, or galena was observed. Even silicification did not extend more than a few inches beyond fractures or other open spaces. Lasky (1932, p. 68) suggested that silica deposited from solutions earlier than the solutions that deposited the ore minerals partly sealed off the wall rock and prevented replacement of the limestone by ore minerals.



The ore deposits at the Royal Flush and Julian-Malachite mines are in the massive Council Spring limestone and in the lower part of the Burrego formation. Outcrops of ore also occur in the upper massive limestones of the Coane formation, the upper massive limestones of the Story formation, and in the Moya formation. Massive beds of non-cherty limestone seem to be the most favorable hosts of ore as they are intensely broken and shattered along faults whereas less massive beds break cleanly or are folded.

Origin. The ore deposits are open-space fillings in fissures; fault breccia, and small caves. Any single deposit is a relatively small, discontinuous, elongate, irregularly-shaped body that pinches out abruptly along the strike into a silicified shear zone with only a trace of ore or to normal limestone that is neither mineralized nor fractured.

Solutions first deposited silica which, along fracture zones, partly replaced the wall rock and the sheets and blocks of brecciated limestone. Cavities were then lined with a crust of galena and fluorite and in open spaces that remained large barite crystals were deposited. The large size of the crystals suggests that dilute solutions acted over a long period of time at a relatively low temperature (Garrels and Dreyer, 1952, p. 363). The final stage was the deposition of tiny quartz crystals on the walls of vugs. In a few places descending cold solutions in relatively recent times leached the primary minerals and deposited a small amount of supergene products along solution channels or in the lower part of the ore bodies.

The source of the ore solutions is problematical. The intrusive sills and dikes of hornblende diorite that occur in Sierra Oscura contain small amounts of barite and the ore solutions may have come from the same parent magma. Dilute warm solutions could have traveled long distances before reaching open spaces where conditions were favorable for deposition.

Workable ore deposits of moderate size and value are present and the topography of the district favors exploration at a reasonable cost. The type of mineralization strongly suggests that no large-size bedded replacement deposits occur at depth. The lower part of the Pennsylvanian, however, is exposed only along the escarpment at mountain front so that possible bedded replacement ores in lower Madera limestone would be buried 500 to 1000 feet in most of the area. The lower Ladera limestone contains more chert than the upper arkose-limestone member but the members are otherwise physically similar. No thick or widespread shale beds are present to form impermeable barriers to solutions except for lenticular shales in the upper arkose-limestone member. Bedded ore deposits may occur in limestones beneath such thick shale beds. However, the weight of evidence points to sporadic, elongated, irregular, discontinuous ore bodies, such as the Royal Flush deposit, as the only type of deposit in the area.

## EXPLORATION

Prospect pits, trenches, shallow shafts, and adits that test the numerous ore outcrops in the district are the favored methods of exploration. Deeply buried deposits are probably present, but if they are similar to the known deposits they are of only moderate size and therefore difficult and costly to locate. Core drilling is expensive in the hard cherty Pennsylvanian

limestones and usually not much of the core is recovered. Geophysical and geochemical methods are costly and probably would not delineate the relatively small ore deposits with their slight sulfide-content. Surface exploration of exposed ore, of silicified zones, and of fractured zones along large faults is the most promising of favorable results.

The entire Pennsylvanian section is exposed in or near the Mex-Tex property and workable ore deposits are located in the Council Springs and Burrego limestones where these beds are broken along shear zones. Drill holes on the upthrown side of the larger faults drilled to these horizons should delimit ore bodies. Deeper tests would probably be highly speculative.

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