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MANGANESE DEPOSITS IN THE LITTLE FLORIDA MOUNTAINS LUNA COUNTY, NEW MEXICO

A PRELIMINARY REPORT

BY
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By S. G. Lasky

ABSTRACT

Manganese deposits in the Little Florida Mountains, near Deming, Luna County, in southwestern New Mexico, lie along fault fissures that cut fanglomerates derived from underlying deformed Miocene (?) volcanic rocks. The ore minerals include manganite, psilomelane, pyrolusite, and wad, which were derived from original manganiferous calcite, largely black calcite. The ore is difficult to concentrate.

Up to 1939 the district had produced about 16,600 tons, largely concentrates, which averaged about 46 percent of manganese, 3.5 percent of iron, 5.5 percent of silica, and 0.02 or 0.03 percent of phosphorus. This is about two-thirds of the total production of manganese ore of metallurgical grade from New Mexico, and nearly all of it came from one mine. Exploration to May 1939 had resulted in the blocking out of about 75,000 tons of crude ore, from which 15,000 to 25,000 tons of concentrates can be derived. It is estimated that the district is capable of producing 150,000 to 250,000 tons of concentrates containing 40 percent or more of manganese.

INTRODUCTION

The manganese deposits in the Little Florida Mountains are interesting for two reasons: (1) Though actual production has been small, the deposits had yielded about two-thirds of the manganese ore of metallurgical grade mined in New Mexico up to 1939; (2) these deposits constitute one of the best and deepest explored examples of a type widespread in the Tertiary volcanic region of the Southwest.

The Little Florida Mountains form a small desert range 10 miles southeast of Deming, Luna County, in southwestern New Mexico. (See fig. 4.) The southern transcontinental highway, U. S. 80, lies less than a mile north of the range, and

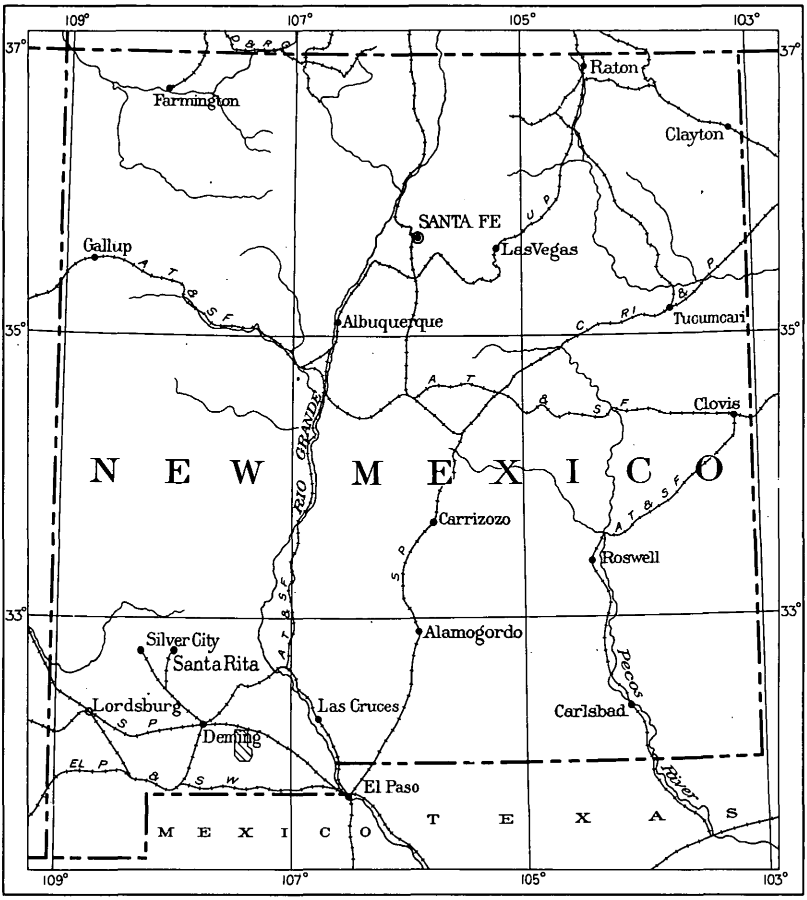


Figure 4.—Index map of New Mexico showing location of Little Florida Mountains.

numerous roads extend from it into the mineralized area. (See pl. 9.) Deming itself, and Carne and Miesse sidings, 6 to 8 miles north of the mines and on the main line of the Southern Pacific Railroad, have been used as shipping points.

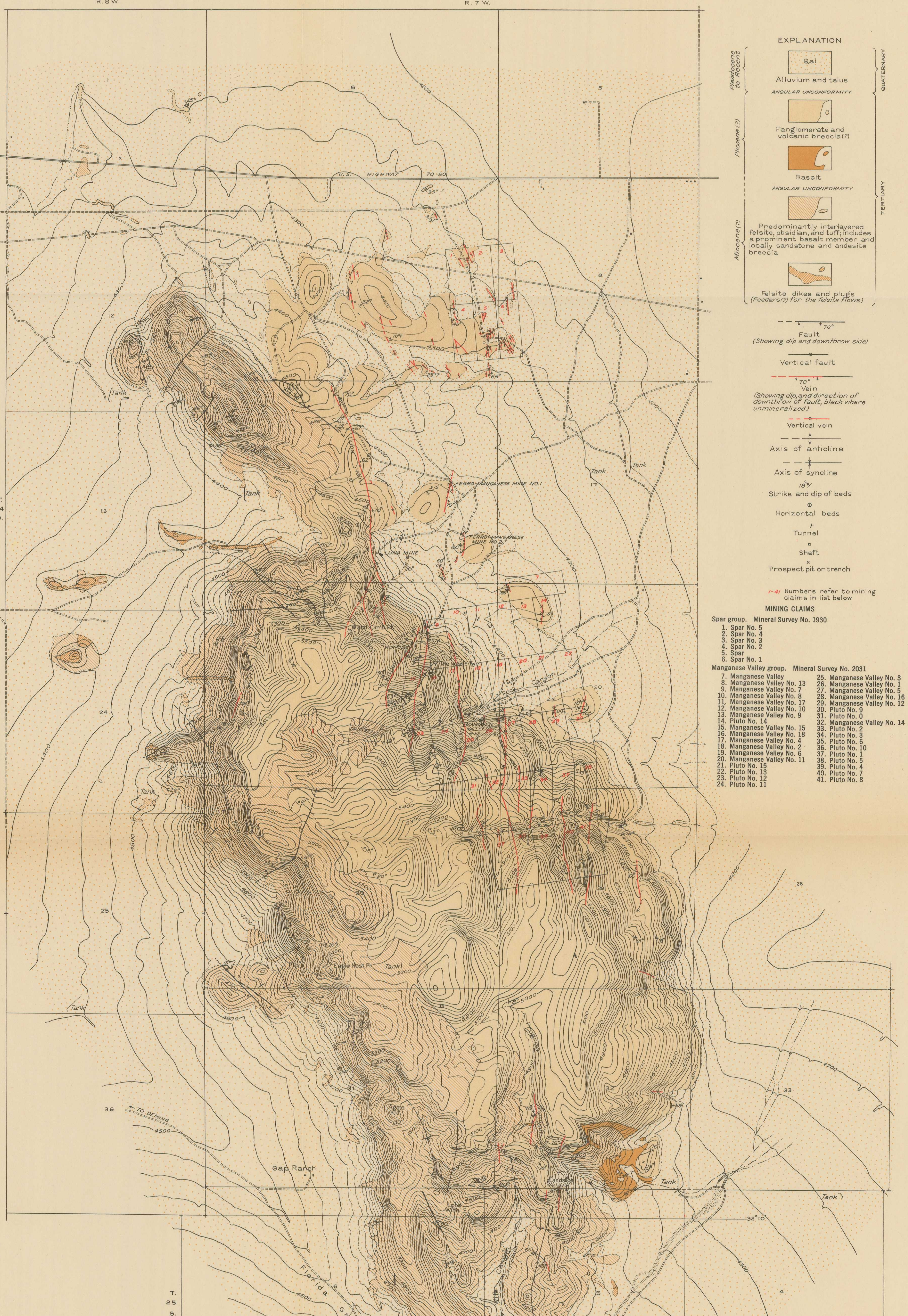
The first recorded claims on the manganese deposits were located in September 1918, and these became the nucleus of what now constitutes the property of the Manganese Valley mine. (See pl. 9.) A little ore was shipped from these claims in 1918 and 1920. In 1923 E. H. West, of Deming, leased the property and shortly thereafter erected a mill. The ore was treated by hand-sorting, screening, and jigging, but on the whole the milling operations were unsuccessful because of the difficulty of concentrating the ore by gravity methods. West suspended operations in 1931, and, except for assessment work, the mine remained idle until 1937. Four miners and a foreman were at work in the spring of 1939. To the beginning of 1939 the Manganese Valley mine had produced about 16,000 tons of hand-sorted ore and concentrates, which constitutes about 95 percent of the total production from the district.[1] The table below gives a partial record of shipments from the mine.

1/ Annual volumes of Mineral Resources of the United States.

Partial record of shipments from Manganese Valley mine, Little Florida Mountains, N. Mex.[1]

Year	Dry tons	Mn (percent)	SiO_2 (percent)	Fe (percent)	P (percent)	Price paid per unit	Gross value	Net value received	Buyer
1920	90	49.33	2.10	1.59	0.011	$0.70	$3,120	---	E. C. Humphreys & Co., Chicago.
1923	65	46.70	4.44	----	---	.55	1,677	$ 1,043	Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
1924	503	42.35	7.21	1.01	---	.684	14,564	8,399	National Paint & Manganese Co., Lynchburg, Va. Columbia Steel Co. Torrance, Calif. (1 car).
1925	1,022	48.57	3.20	----	---	.598	29,660	19,385	Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
1926	1,130	45.75	4.17	----	---	.586	30,314	18,889	Do.
1927	1,760	45.33	5.06	----	---	.587	46,828	29,077	Do.
1928	2,578	47.28	5.21	----	---	.596	72,721	46,999	Do.
1929	1,961	45.75	7.93	----	---	.586	52,431	32,953	Do.
1930	1,329	45.88[2]	5.48[2]	3.46[2]	---	.531	32,029	19,757	Do.
1931	1,032	44.45	5.04	----	---	.473	21,698	11,465	Do.
1937 1938	856	43.32	4.76	5.67	.031	.352	13,044	10,476	Colorado Fuel & Iron Co., Pueblo, Colo.
Total	12,326	45.84	5.41	3.59	.029	$ .556	$318,086	$198,442	

1/ Concentrates or hand-sorted ore. Compiled from settlement sheets lent by J. L. Houghland.
2/ Average for total of 2,085 tons shipped during year (Mineral Resources U. S., 1930, pp. 308-309).



Topography by T. P. Thayer

Geology by S.G. Lasky, assisted by T.P. Thayer

TOPOGRAPHIC AND GENERALIZED GEOLOGIC MAP OF LITTLE FLORIDA MOUNTAINS, N. MEX.

Scale 1/24000

1 Mile 0 1 Mile

Contour interval 25 feet
Datum is mean sea level

1940

The Little Florida Mountains were surveyed by the Geological Survey in the spring of 1939, under funds allotted by the Federal Emergency Administration of Public Works for the investigation of deposits containing minerals of strategic importance. J. L. Houghland and E. A. Stone, of the Manganese Valley mine, contributed much valuable information, and C. F. Schaber, at one time in charge of operations at the Luna mine, furnished some data on conditions below water level at that

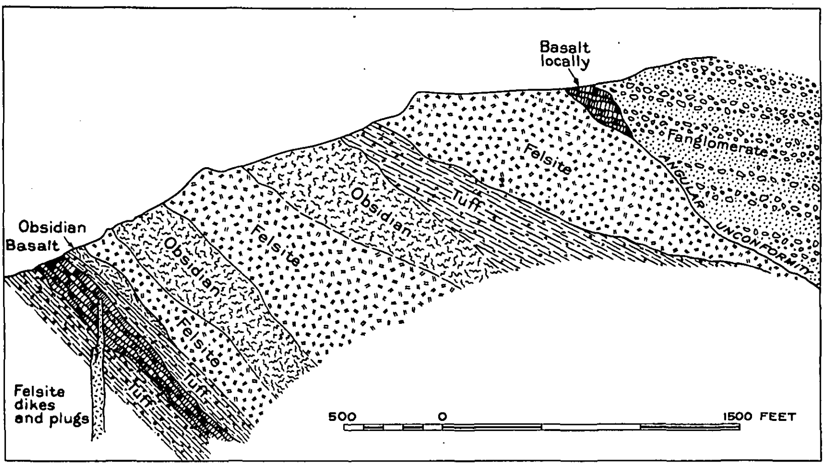


Figure 5.--Sketch showing common stratigraphic relations of rocks of Little Florida Mountains, N. Mex.

mine. Mike Quarrel, foreman at both mines, assisted wholeheartedly wherever possible, and E. B. Killion, owner of the Killion workings, was helpful in many ways.

GEOLOGY

For the purpose of this report, the rocks of the Little Florida Mountains may be separated into two main groups, whose distribution is shown on plate 9. The oldest exposed rocks consist of a series of interbedded flows, tuffs, and breccias (see fig. 5) of Miocene (?) age, about 3,000 feet thick, in which the several members are separated from one another by erosional unconformities. Dikes and plugs of felsite that may have been the feeders for some of the flows cut these rocks.

An extensive massive deposit composed largely of felsite fragments from the Miocene (?) volcanics rests upon the volcanic rocks with an angular unconformity. The deposit appears to be primarily of sedimentary origin and is the host-rock for the manganese deposits. At least 1,000 feet of this formation seems to be present. Large parts of it are composed of rounded to angular fragments, ranging from boulders as much as 4 feet in diameter down to the finest dust, that are both rudely assorted and rudely layered. There is no sorting within the individual layers and no orientation of the pebbles, and the material seems to be a typical fanglomerate, similar in structure to material in the alluvial fans that flank the present mountains. Were it not for the tilted attitude of the layers, there would be difficulty in places of differentiating them from the valley fill that surrounds the range. In another large part of the formation the fragments are all angular and are cemented with what appears to be fine-grained sandstone or grit, which generally is only abundant enough to fill interstices between the fragments. Vague bedding is common in this part of the formation, but only here and there is it sufficiently distinct to permit good measurements of attitude. Still other parts of the formation consist of an aggregate of angular fragments that resembles volcanic breccia. The different facies locally are interbedded with one another, and locally each contains well-bedded layers of sandstone. The formation as a whole is well-indurated and is generally dark red-brown. At one place in the southern part of the range some basalt lies between this formation and the underlying volcanic rocks.

Except principally for a few folds in the Miocene (?) volcanics, all the formations dip eastward. (See pl. 9.)

Numerous faults cut the formations. A few strike northeast or northwest, but the general trend is northward. Many of them are grouped in the north and east-central parts of the range, and the fault zones now contain manganese deposits. The maximum stratigraphic throw recognizable is 200 feet. In these zones the footwalls of some vein fissures show many steeply pitching grooves, as much as 3 feet across and a foot or more deep, that suggest movement nearly parallel to the dips of the fissures. Several periods of movement can be recognized from the vein structure, the latest movement being older than the manganese deposits.

MANGANESE DEPOSITS

Essentially all the veins crop out in the fanglomerate (see pl. 9), and all the mine workings are in it. (See pls. 10 and 11.) Typically, each vein has an almost perfect footwall, slickensided and grooved and composed of silicified fault breccia (jasperoid) presumably formed by the first opening of the vein fissures. (See fig. 6.) Where the vein is composed of several members or strands, each may have a similar footwall. At many places the jasperoid forms a low cropping, 2 feet or less high, so that it is possible to trace veins that on the whole have inconspicuous outcrops. Where this kind of cropping is absent or where the fanglomerate is as resistant to weathering as the jasperoid, the veins are best traceable by means of a low jasperoid scarp, locally manganese-stained or slickensided; elsewhere it is locally possible to trace them by means of meager float or by low inconspicuous hollows.

The ore consists of manganite, psilomelane, pyrolusite, and wad that (1) fill cracks in a shattered hanging wall (see fig. 6), (2) replace an abundant post-jasperoid but pre-mineral gouge and breccia, and (3) replace the finer-grained part of the fanglomerate wallrock, as well as some of the coarse fragments. The cracks in the shattered hanging wall

Figure 6.--View of Manganese Valley vein near portal of south drift of upper level. Shows typical well-developed footwall, usual band of post-manganese gouge and breccia above it, and stringers of manganese oxides cutting shattered hanging wall. a, Jasperoid footwall; b, post-manganese gouge and breccia; c, shattered fanglomerate; d, veinlets of manganese oxides; e, rubble; f, stope opening. From a photograph.

are commonly filled with crystalline manganite, which in the aggregate, may constitute as much as a third of the ore minerals. Much of the ore for which the term "pudding ore" is used consists of fragments of rock, each commonly with a crust of hard psilomelane and each partly replaced by manganese oxide, in a matrix of soft clayey material composed largely of wad and pyrolusite. (See figs. 7 and 8.) A noteworthy amount of this material is a brown wad having an amazingly low specific

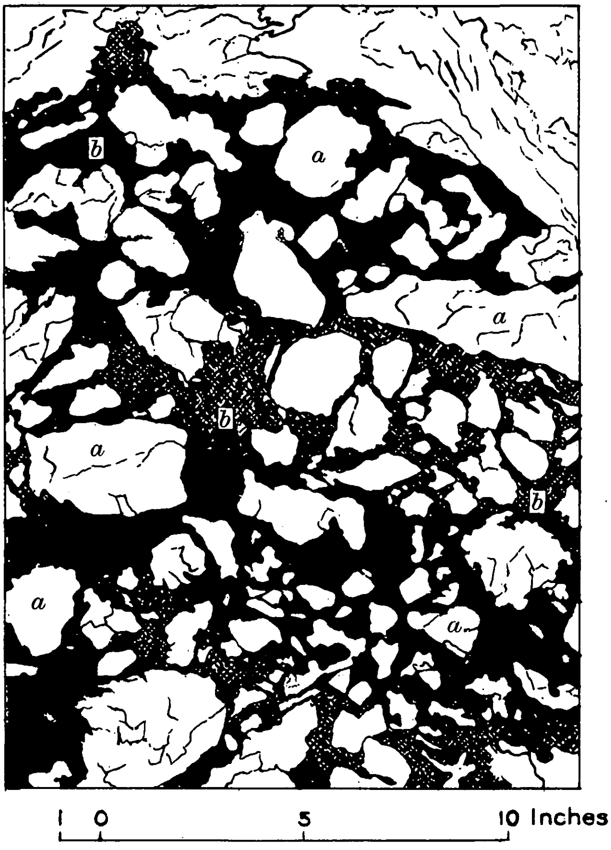


Figure 7.--"Pudding ore" in Luna mine showing rock fragments in matrix of manganese oxides. a, Rock fragment; b, manganese oxides. From a photograph.

gravity. The miners estimate that a ton of "pudding ore" contains 14 to 18 cubic feet. The "pudding ore" seems to indicate in part replacement of earlier gouge and breccia and in part replacement of fanglomerate wallrock. It has been the experience in the district that efficient concentration of this ore by gravity methods is difficult, largely because so much of it is soft and clayey and readily forms slimes. Plates 10 and 11 show the general distribution of the "pudding ore" along

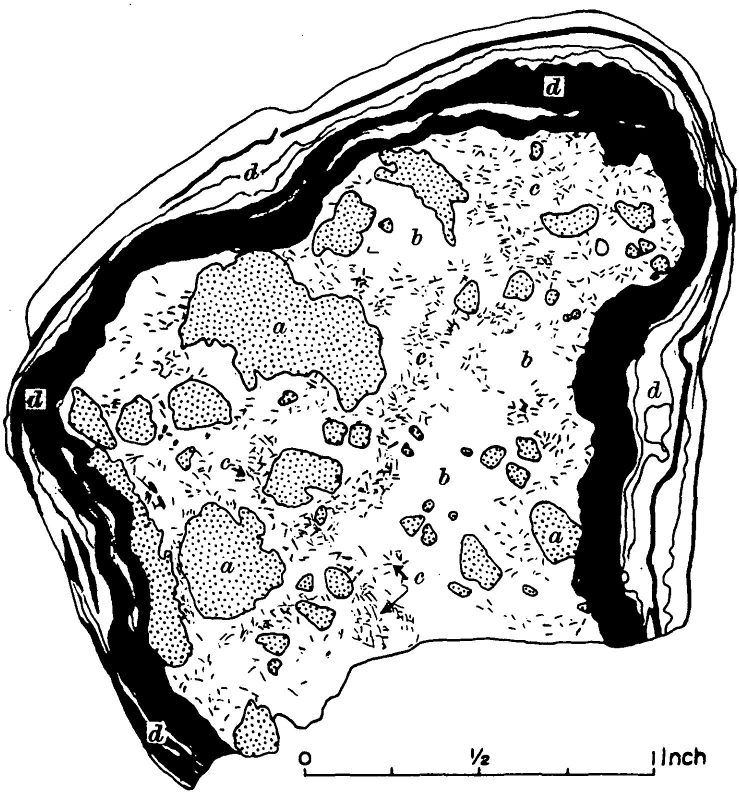


Figure 8.--Polished specimen of "pudding ore." Shows coating of psilomelane and nature of core of fragments. a, Fragments of fault breccia or fanglomerate; b, finely divided rock matter partly impregnated with manganese oxides; c, crystals of barite; d, banded psilomelane. From a photograph.

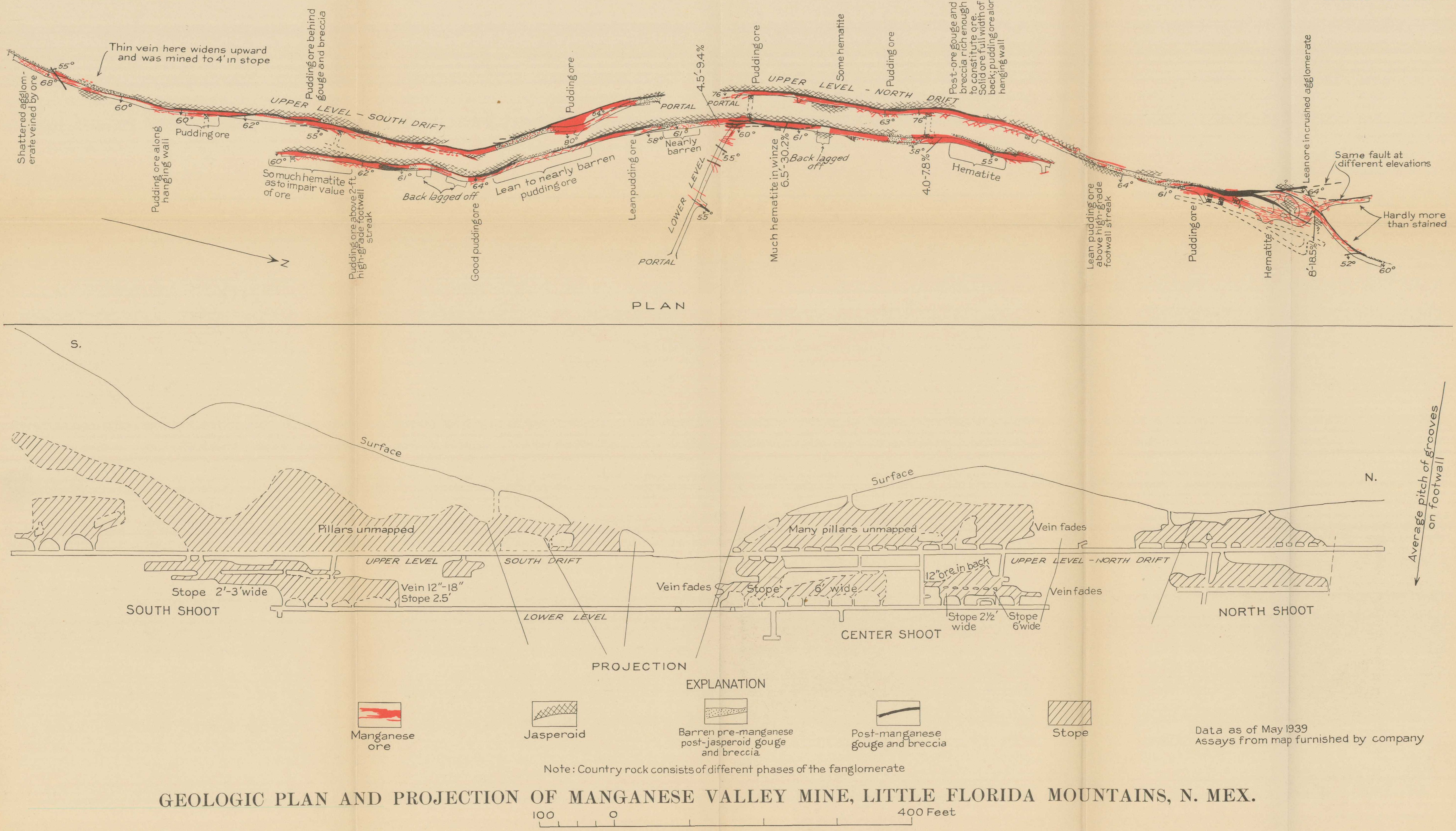
the two principal veins explored. Here and there the manganese oxides are accompanied by some botryoidal hematite, which locally is so abundant as to reduce the value of the ore.

Barite is widely distributed in small amounts, particularly in the pre-ore gouge and breccia. At places it is moderately abundant, but at no place where it is abundant is it so intimately associated with the manganese oxides as to lower the value of the ore. Black calcite and some associated white calcite--all manganese- and iron-bearing--are present here and there. Some has been partly leached, leaving a residue of manganese and iron oxides, and some is partly replaced by manganese oxides. Though some of the calcite, both white and black, is later than the bulk of the manganese oxides, some of it, such as that shown in figure 9, is earlier and represents the original vein filling from which the oxides were derived. The distribution of calcite along the productive veins suggests that the present shoots of oxides occupy roughly the positions of the original calcite shoots. No sulphides have been recognized.

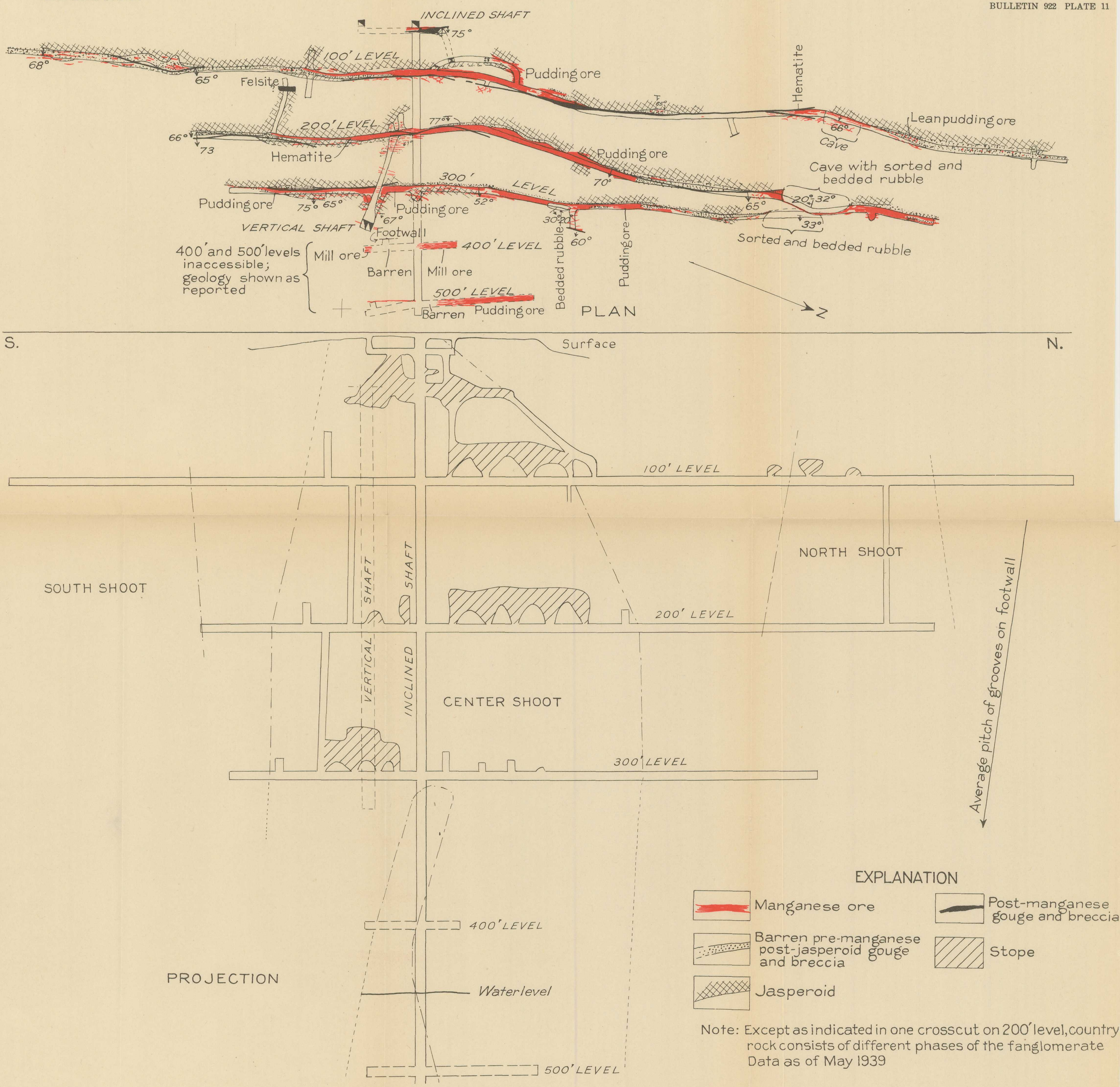
As exposed at the two mines where considerable work has been done, the ore forms definite shoots that pitch roughly parallel to the deep grooves along the footwall and thus presumably parallel to the direction of movement along the fissure. (See pls. 10 and 11.) Layers of post-ore gouge and breccia are conspicuous and commonly lie along the footwall of the vein, between the ore and the jasperoid footwall. Locally this gouge and breccia contain enough fragments of ore to be minable. At the Manganese Valley mine (see pl. 10) the layers of post-ore gouge and breccia appear to coincide with the position of the ore shoots, as though the fault fissures are long-established zones of weakness. Such features are likely to constitute a district habit and may be expected in other veins of the district.

Some idea of the size, continuity, and distribution of the ore shoots may be inferred from plates 10 and 11. None of the shoots has yet been completely explored, but at least some are large enough to yield 60,000 tons or more of crude ore.

Figure 9.--Polished specimen of vein matter showing intergrowth of quartz and calcite. a, Quartz; b, lamellar black calcite; c, coarsely crystalline black calcite; d, late white calcite. From a photograph.



GEOLOGIC PLAN AND PROJECTION OF MANGANESE VALLEY MINE, LITTLE FLORIDA MOUNTAINS, N. MEX.



GEOLOGIC PLAN AND PROJECTION OF LUNA MINE, LITTLE FLORIDA MOUNTAINS, N. MEX.

50 0 250 Feet

The average manganese content of the two principal veins is estimated at 15 to 20 percent. The average silica content may be inferred from the table on page 58. E. A. Stone,[2] of the Manganese Valley mine, reports that the material shipped contained 1.2 to 12.6 percent of iron and 0.01 to 0.05 percent of phosphorus. Minute amounts of copper, lead, and zinc, as well as several ounces of silver to the ton, are commonly present. The French Battery Co. [3] reported that material sent to them by E. H. West for testing contained an average of 0.03 percent of arsenic.

RESERVES

As the Luna and Manganese Valley mines are the only ones that have been explored to any appreciable degree, estimates of proved and probable reserves must be largely estimates of the reserves at these two mines. As explored to May 1939, the Luna and Manganese Valley mines have reserves estimated at about 75,000 tons of crude ore. This amount represents between 15,000 and 25,000 tons of concentrate containing 40 percent or more of manganese, the tonnage and grade of the concentrate depending upon the efficiency of the method of beneficiation. Concentration tests by metallurgists of the Federal Bureau of Mines have been described by DeVaney and Coghill.[4]

At the Manganese Valley mine two-thirds of the explored length of the vein contains minable ore (see pl. 10), and at the Luna mine nearly half of the explored length contains minable ore (see pl. 11). Thus for the two mines somewhat more than half of the vein length on the average is occupied by ore, and if this average should hold for the Manganese

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2/ Personal communication.
3/ West, E. H., personal communication to D. F. Hewett, U. S. Geological Survey.
4/ Dean, R. S., and others, Manganese, its occurrence, milling, and metallurgy, pt. 1: U. S. Bur. Mines Inf. Circ. 6768, pp. 75-78, 1934.

Valley mine below the 1939 workings, each additional hundred feet of depth would yield about 50,000 tons of crude ore. If the ore should continue to water level, as it does at the Luna mine, the Manganese Valley mine would contain from 200,000 to 250,000 tons of crude ore in addition to what is now in sight. This estimated quantity would make the total reserves of the two mines, and thus of the district in its present state of exploration, about 300,000 tons.

In the present state of explorations the amount of ore that may be present in other veins is beyond the realm of calculation, but at least other veins are known to contain ore similar to that at the Luna and Manganese Valley mines, and some of this ore has been shipped. Among these other veins is that on the Manganese Valley No. 13 claim (see pl. 9), where a 325-foot tunnel for most of its length has exposed ore of a kind and grade similar to that at the Luna and Manganese Valley mines (see fig. 10). It is presumed that further exploration was stopped because experience at the Luna and Manganese Valley mines had shown that concentration of the ore would be difficult.

A second important factor in evaluating the potential productive capacity of the district is the depth to which ore may extend below water level. Without presenting a detailed discussion in this preliminary report, it may be said that the physiographic and structural history of the range suggests that ore should extend below water level, and at the Luna mine it is known to extend at least 50 feet below it. (See pl. 11.) Along some veins elsewhere in this general region

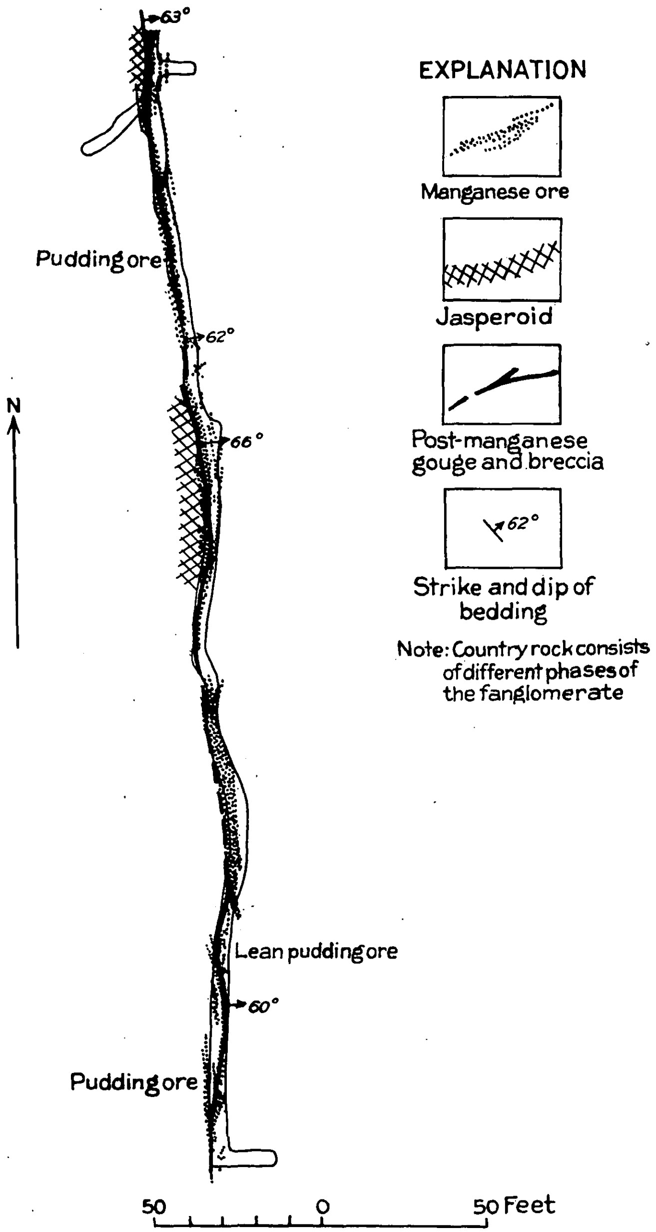

Figure 10.--Geologic plan of tunnel on Manganese Valley No. 13 claim.

strong oxidation, such as produced the manganese ores of the Little Florida Mountains, is known to have extended from 450[5] to as much as 1,600 feet[6] below the general water table.

Should ore extend for any appreciable depth below water level, the potential reserves of the district may be increased to a significant degree. In view of this possibility and the meager exploration on the many other veins of the district, it is reasonable to estimate that the district is susceptible of yielding ultimately from 750,000 to 1,000,000 tons of crude ore, from which might be derived 150,000 to 250,000 tons of concentrate containing 40 percent or more of manganese, the actual amount depending to some degree on the method of concentration.

MINES

Manganese Valley mine

The Manganese Valley holdings include 30 patented claims that cover the outcrops of several veins. (See pl. 9.) The principal workings are on the Manganese Valley vein, which has been explored for a strike length of about 2,000 feet and to a depth of 400 feet below the highest point on the outcrop in the vicinity of the workings. (See pl. 10.) More than 1,300 feet of the explored length contains minable ore, distributed in three main shoots. Available records indicate that a total of 15,854 tons of ore and concentrate had been shipped from this mine to 1939. (See pp. 57 and 58.)

The best ore, and the chief material that has been mined, lies along the footwall of the vein and forms a veinlike layer cutting the soft and wad-cemented ore. It is composed largely

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5/ Lasky, S. G., Geology and ore deposits of the Bayard area, Central mining district, New Mexico: U. S. Geol. Survey Bull. 870, p. 100 and pl. 15, 1936.

6/ Lasky, S. G., Geology and ore deposits of the Lordsburg mining district, Hidalgo County, New Mexico: U. S. Geol. Survey Bull. 885, p. 41 and pl. 13 (oversheet), 1938.

of fine-grained steely manganite and seems to represent a late reconstitution of earlier-formed ore. This band contains an average of 28 percent of manganese (see fig. 11), which is perhaps 10 percent more than the average grade of the vein as a whole. Its maximum observed width is 4 feet, but parts as wide as 12 feet are said to have been stoped. Some ore was hand-sorted in the stopes, and the reject was stored in the stopes for future milling.

Production costs at the Manganese Valley mine during the principal years of operation were about $7.50 per ton. Transportation costs on material shipped averaged $10.50 a ton, including $0.75 a ton haulage from the mine to the railroad.[7]

Luna mine

The Luna vein is traceable on the surface for somewhat more than a mile and is one of the longest in the district. (See pl. 9.) The first recorded claims on it were located in March 1923. The vein was explored to a depth of 500 feet, and a little stoping was done before the mine was shut down in May 1930. (See pl. 11.) Shipments were made in 1928, 1929, and 1930 and totaled 394 tons, of which 372 tons contained an average of 40 percent of manganese.[8] Part of this was hand-sorted ore and part was concentrate from a mill built at the mine in 1929. The shaft was sunk to the 500-foot level primarily for water for the mill, and operations on that level were stopped when it appeared that the amount of water encountered might exceed the pump capacity.[9]

The distribution of the shoots is indicated on plate 11. Workings below the 300-foot level were inaccessible at the time of examination, but the ore in general is said to have

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7/ U. S. Bur. Mines Mineral Resources, 1928, pt. 1, pp. 216-218, 1931.
8/ Records of the U. S. Bur. Mines.
9/ Schaber, C. F., personal communication.

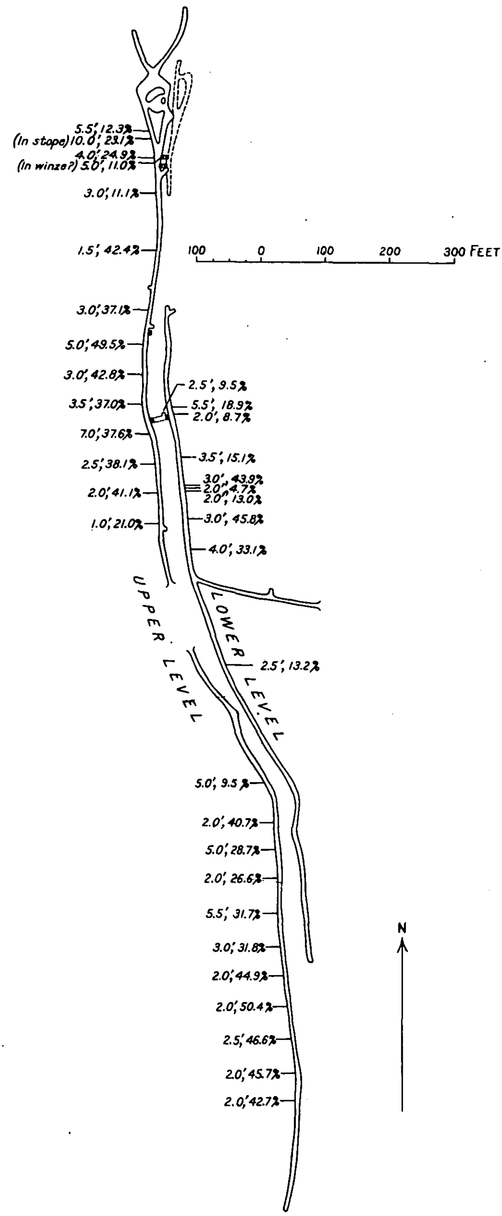

Figure 11.--Assay map of high-grade footwall streak in Manganese Valley mine.

been similar to that on the upper levels. The dump material that appears to have come from the lower levels corroborates this statement. Between the 100-foot and 300-foot levels there seems to be a tendency for the psilomelane content of the ore to become less and for the soft ore, particularly wad, to increase, but on the 500-foot level psilomelane again appears to be abundant.

Although there is no persistent high-grade streak in the Luna mine, the grade of ore on the average is similar to that at the Manganese Valley mine.