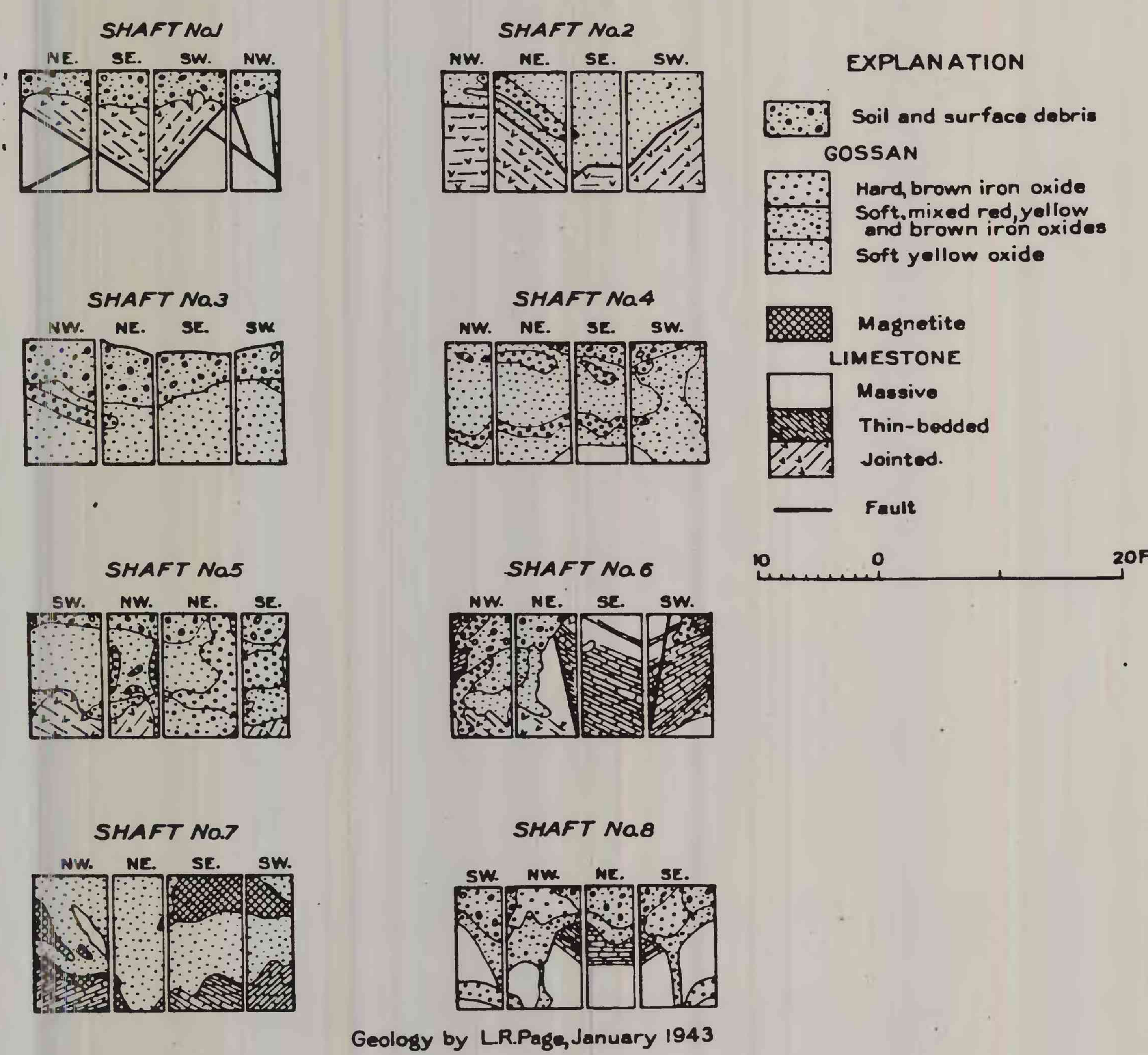
43-86

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

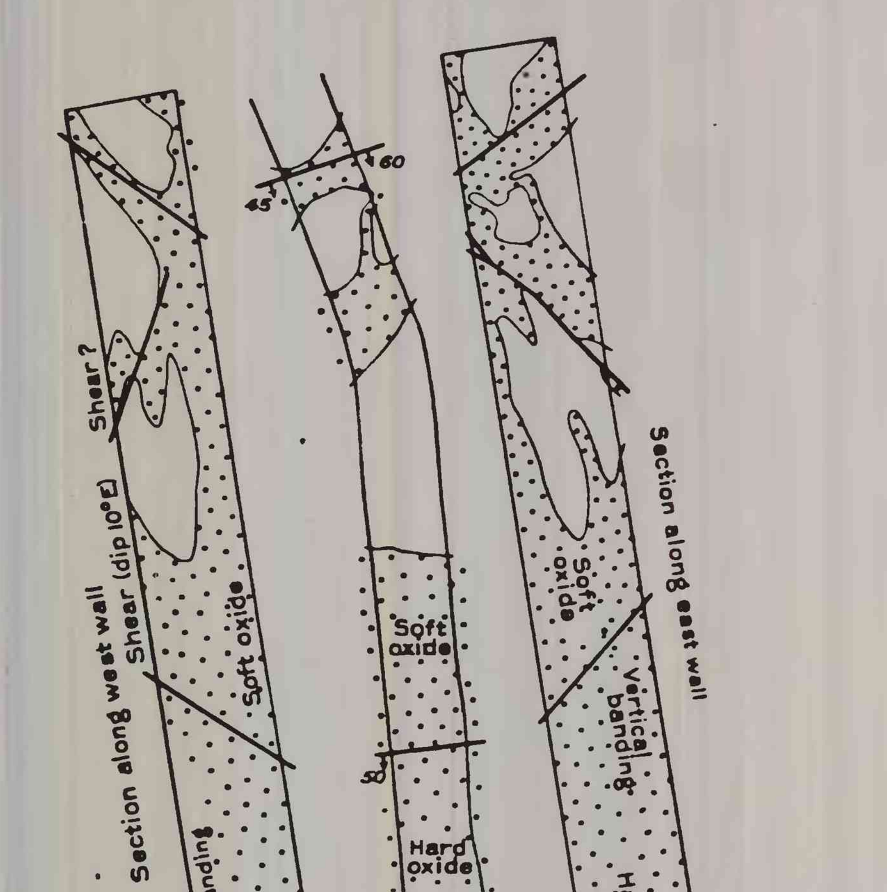
SHEET I

STRATEGIC MINERALS INVESTIGATIONS
PRELIMINARY MAP



Geology by L.R.Page, January 1943

SECTIONS OF SHAFTS



Geology by A.R.Kinkel and L.R.Page
March 1943

PLAN AND SECTIONS, 22-FOOT LEVEL

MEEK-HOGAN TIN PROSPECT, KERN COUNTY, CALIFORNIA

By Lincoln R. Page

Introduction

The Meek-Hogan tin prospect is located about 6 miles northeast of Gorman, Calif. It is on La Liebre ranch in section 25, T. 9 N., R. 18 W., just north of the Kern - Los Angeles County line. The workings are at an altitude of approximately 3900 feet, on the south side of the Tehachapi Mountains.

Cassiterite, the only tin mineral, occurs in limonitic gossan and in recrystallized limestone associated with magnetite, quartz, and minor amounts of chalcopyrite, pyrite, arsenopyrite, galena, cuprite, malachite, and secondary zinc minerals. Epidote, garnet, tourmaline, and phlogopite are the common gangue minerals that accompany the cassiterite in limestone. The ore deposit lies 250 to 500 feet northwest of the contact of limestone and gray, fine- to medium-grained granite. As the mineralization was largely controlled by bedding, and to a minor extent by fractures, the shape of the ore deposit is very irregular. Bulldozer trenches have exposed the gossan body for a length of 350 feet and a width of 25 to 75 feet. Two inclined shafts and crosscuts have explored the deposit to a depth of 20 feet, and 10 shafts, each 10 feet deep, have in part outlined the mineralized zone.

Cassiterite was discovered in the spring of 1942 by Mr. Willard Mallery, of Redondo Beach, Calif., in soil samples taken on the slope below the old Meek iron prospect. In July Mr. Dana Hogan, Mallery's financial backer, brought this to the attention of the Geological Survey, and a preliminary examination was made for the Survey by Dwight M. Lemmon and Paul C. Bateman in September 1942. The property was examined in late November by L. R. Page of the Geological Survey, while the initial bulldozing operations were in progress. In January and February Page returned to the property and, assisted by Lloyd C. Pray and Robert H. Porter, made a plane-table map of the deposit. Mr. Mallery and Mr. Hogan greatly assisted in the work by making available all information obtained about the property.

Development

At the time of discovery, the Meek-Hogan ore body was exposed by one 10-foot shaft (Meek shaft) and a few small trenches that had been made in prospecting for iron ore. In November an area 350 feet long and 250 feet wide was explored by means of bulldozer trenches. The first bulldozer trenches crosscut the ore body and cleaned the surface to bedrock. Later bulldozing smeared debris over the ore body so that at the time the deposit was mapped contacts were poorly exposed. In all, some 1,500 feet of bulldozer trenches have been made across and along the deposit. In addition 9 prospect shafts, each 10 feet in depth, were put down; two of them are completely outside the tin-bearing area. Another shaft, inclined 65° in a S. 35° E. direction, was sunk 45 feet. From the bottom of this shaft a crosscut was driven 18 feet in a S. 15° E. direction, and a drift starting 22 feet below the collar of the shaft was driven along the contact (N. 45° E.) for 8 feet, thence 70 feet north to cross the mineralized zone. A second inclined shaft, 210 feet N. 75° E. of the latter shaft, was made after the prospect had been mapped. This shaft is inclined 78° in a S. 15° E. direction and is reported to have penetrated limestone to a depth of 50 feet. A crosscut, 22 feet long, was driven to the southeast, but according to the owners no gossan or cassiterite ore was found.

Geology

The rocks in which the tin occurs are limestone and hornfels that have been intruded by granite. The general strike is east-west, and the dip of the limestone beds is about 45° N.

Limestone.—The limestone is well exposed and forms most of the outcrops. No attempt was made to distinguish all varieties on the map, but the very coarsely crystalline and brecciated parts are indicated by separate patterns. Most of the limestone is fine- to medium-grained gray, buff, white, or pink and shows various degrees of recrystallization. Limestone designated on the map as fine- to medium-grained rarely has grains larger than 1/4 inch across. That classed as coarse-grained has an average grain size of 3/8 inch and is usually gray. The brecciated limestones are pink to buff and consist of recemented fragments of various sizes. These breccias are probably localized along fault zones. South of the area mapped very wide exposures of the brecciated limestone apparently mark the trace of a major fault.

Hornfels and tactite.—Interbedded with the limestone are thin layers of greenish-gray hornfels composed of epidote, zoisite, garnet, and quartz. Near the Meek-Hogan ore body, the hornfels layers are fine-grained, highly fractured, and very poorly exposed. The soil derived from them, however, is quite distinctive in color and texture and it is therefore possible to map areas of these rocks with reasonable accuracy. Near the 1100-foot contour on the map the hornfels is much coarser grained and contains appreciably more garnet. This variety is more resistant to weathering than the normal fine-grained hornfels.

Small bodies of massive magnetite-epidote tactite occur in the gossan and also in isolated spots in the adjacent limestone. To date little if any cassiterite has been found in these massive magnetite bodies, either by assays or concentration tests.

Granite.—The actual contact of granite and limestone is not exposed, but it can be located within a space of about 10 feet by means of float. The minimum width of granite outcrop is 75 feet and it is probable that a fault, approximately parallel to the contact, limits its maximum width to about 100 feet.

The granite is gray, fine- to medium-grained, with irregular streaks of coarse-grained pegmatitic material scattered through it. These pegmatitic areas merge into a rock of the finer matrix. Both the finer grained and the coarse pegmatitic material contain graphic intergrowths of quartz and perthite or anti-perthite. Dark minerals are not abundant, but hornblende and biotite were observed.

Mineral associations.—The tin ore (cassiterite) is found to some extent as veinlets and irregular pockets of cassiterite-tourmaline, cassiterite-phlogopite, and cassiterite-epidote rock that replace massive limestone and hornfels. Mainly, however, the cassiterite occurs in a limonitic gossan which has accumulated as a result of the weathering of tin-bearing material that may in part have been tactite but in all likelihood originally contained cassiterite associated with iron, copper, and zinc sulfides. The mineralized zone is 250 feet northwest of the nearest outcrop of granite. It is irregular in form. Its indicated length is about 350 feet and its width ranges from 25 to 75 feet. In general it strikes east-west and appears to dip north, parallel to the bedding of the limestone.

Faulting.—The Meek-Hogan deposit lies between two branches of the Garlock fault and near their intersection with the San Andreas fault. In the area mapped in detail, however, no large faults were definitely recognized, though brecciated zones and abrupt changes in attitude of the rocks suggest their presence. Three faults are shown on the map, but their extents are not known and their traces on the surface have not been projected beyond actual exposures. In the cross sections, the positions of these faults, projected, are shown to indicate possible complications in exploration of the ore body. In addition, it is probable that the contact between limestone and hornfels north of shaft No. 8 is a fault that forms the eastern limit of the ore body.

The fault best exposed in the area is observed in shaft No. 2. It strikes N. 65° E. and dips 40°-45° SE. It is apparently a zone rather than a single plane, for the hornfels exposed in trenches is strongly crumpled and sheared. Insufficient information is available to permit the determination of the total offset of this fault, though in the underground workings one cassiterite-bearing veinlet has been offset 6 feet down the dip along one of these planes. (During the early work on the property, this fault was mistaken for the footwall of the ore body and the inclined shaft was turned away from the ore.)

Another fault that may be expected to affect the ore body was noted at shaft No. 6. It strikes N. 60° E. and dips 70° SE. If this fault extends eastward it would explain the wide outcrop of gossan as well as some of the irregularities of the gossan contact.

Tin deposits

There are two possible sources of tin ore on the Meek-Hogan property. Most of the cassiterite occurs in a body of limonitic material which has an areal extent of approximately 16,000 square feet. This body has been prospected to a depth of 20 feet and, though its shape is irregular, it can reasonably be expected to continue to a greater depth. It is expected, however, that the mineralized rock will change in character with depth and that the limonite will give way to sulfides. The nature of the unweathered ore is unknown, but the body in limestone (shaft No. 8) suggests that the chief gangue minerals will be calcite, epidote, garnet, tourmaline, phlogopite, magnetite, and sulfides.

The second source of ore is in the debris, which has accumulated on the surface as the result of weathering. On top and to the south of the oxidized deposit this debris contains appreciable quantities of cassiterite. In all, an area of 32,000 square feet located just below the deposit and above the road may yield placer tin. This debris in places is more than 6 feet thick, and its average thickness may be 3 feet over the entire area.

Mineralogy.—Cassiterite, the only tin mineral, occurs in dark brown to black grains, and crystals up to 1/2 inch in diameter. In general the grains are very small and cannot be readily seen because they are obscured by iron oxides. In the high-grade areas nodular masses of cassiterite, some measuring inches across, appear to have been originally one single crystal or grain, but during the oxidation of the deposit they were fractured to such a degree that they are now angular fragments, less than 1/4 inch in size, cemented by iron oxides. Some of the coarsest individual crystals observed were found in nodular masses of epidote and cassiterite in recrystallized limestone on the southwest wall of shaft No. 8. These were as much as 1/4 inch in diameter. Nodular masses of cherty iron oxide and cassiterite, up to 5 feet in diameter, are scattered throughout the entire body. Some of these are over 50 percent cassiterite. Such nodules are numerous enough to be an important factor in any ore produced on the property. Near the breast of the crosscut, on the 22-foot level, a 1- to 3-inch vein of cassiterite and phlogopite cuts highly stained massive limestone. Other narrow veins and pockets of cassiterite with greenish black tourmaline occur in the gossan along this crosscut and the inclined shaft.

In thin section, the cassiterite shows remarkably perfect zoning and often appears as euhedral twinned crystals. It is associated with magnetite, pyrite, epidote, calcite, and garnet. The iron oxides that make up much of the ore are later than these minerals and are accompanied by secondary cherty silica. Concentrates of samples, cut for assay, show occasional fragments of chalcopyrite, arsenopyrite, and galena. It seems probable that these minerals will be found in more abundance in the unoxidized portions of the deposits.

The iron oxides of the oxidized portions of the deposits are light to dark yellow, brown, red, and purplish-red. Soft and friable, as well as clinkery varieties are present. These varieties appear to contain slightly more cassiterite, perhaps because a fresh surface is more readily found. Tests by panning show that all varieties of the oxide contain cassiterite.

Where samples have been cut across the magnetite-epidote tactite masses in the gossan, little cassiterite could be found either by panning or by table and magnetic separations.

Size and grade.—On the map, the Meek-Hogan ore body is shown as a continuous, highly irregular body 350 feet in length and from 25 to 75 feet in width; however, the exact distribution of cassiterite within this area is unknown. Exposures are not continuous and it is possible that the two ends of the body are not connected at the surface. It appears probable, however, that such a connection exists at no great depth below the surface. Careful trenching of the surface is needed to determine the exact boundaries of the eastern half of the gossan ore body.

The structure of the limestones governs the shape of the oxidized portion of the deposit, and although there are many local irregularities, the mineralized rock in general parallels the bedding, striking approximately east and dipping about 45° N. In the drift on the 22-foot level, the contact of the gossan strikes N. 35° E. and dips 30° NW., but the small high-grade cassiterite-phlogopite vein at the north end of this level strikes east and dips 25° N. In shafts No. 4 and No. 6 the dip of the gossan contact is about 45° NW. but local irregularities, as shown in the vertical sections of shafts No. 5 and No. 7 are not unusual.

The maximum areal extent of the oxidized zone is outlined on the map. Stippling shows actual outcrops. The area exposed is 16,000 square feet and it seems reasonable to assume that the weathered material will extend to a depth of 20 feet (the deepest workings) over a considerable part of the area; but there is no reason to suppose that the mineralized rock will not continue to greater depths. If the body persists to a depth of 20 feet, it contains at least 32,000 tons of cassiterite-bearing rock.

The distribution of cassiterite in the oxidized material is very erratic. Assays show variations from high to low grade. The assays of characteristic samples taken by Page show wide variation in the quantity of tin that occurs in the different types of gangue material involved. From these and from other assay data made available to the Geological Survey by Messrs. Hogan and Mallery and by the Bureau of Mines, United States Department of the Interior,1/ it is evident that the ultimate value of this deposit as a source of tin will depend to a considerable extent upon the number of high-grade veinlets and pockets of ore that are encountered. As such the occasional high assay cannot be ignored in computing the overall grade of the deposit.

1/ Some sampling was done on the property by R. H. Bedford, of the Bureau of Mines, in December, and in March the inclined shaft and crosscut were sampled by Bedford and Spangler Ricker.

MEEK—HOGAN TIN PROSPECT, KERN COUNTY, CALIFORNIA