Geology of the Crescent Peak Area, Clark County, Nevada

by
N. L. Archbold and Jay W. Santos

June 26, 1962

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Core in core shack
see Mr. Schilling
Sample Library #3

Introduction

The Crescent Peak area is in Clark County, Nevada about 12 miles west from the town of Searchlight and 5 miles east of the California state line. Crescent Peak itself is a crescent-shaped ridge of altered granite with a radius of about half a mile. The main area of interest coincides with Crescent Peak and has been mined for Turquoise for many years. In more recent years, it has received attention as an area that might yield a porphyry copper deposit. Bear Creek Mining Company drilled three holes in 1954, and local residents report that both Utah Construction and American Smelting and Refining have shown some interest in the area since 1954.

Crescent Peak was first visited for Homestake in January of 1962 by E. N. Pennebaker, Breck Parker and N. L. Archbold. Subsequently, in March, 1962, Pennebaker and Archbold spent several days outlining the favorable ground on the basis of chalcopyrite boxworks in the leached outcrops. The results of this work were submitted by Pennebaker in a report dated April 16, 1962.

As a result of Pennebaker's recommendations, Homestake located 19 lode mining claims (the Tina Group) in the vicinity of Crescent Peak and initiated negotiations for the leasing of patented claims in the area of interest. A map showing all known claims is appended to this report as plate 1.

Contents

Illustrations

This report concerns the general geology of the Crescent Peak area and is intended as a supplement to Pennebaker's earlier report. The field work for this report was done by N. L. Archbold and Jay W. Santos between May 29 and June 13, 1962. Samples for assay were collected along a measured traverse in an effort to relate metal values to types of alteration and favorable leached outcrops. General geology and alteration were mapped on air photos at a scale of 1:12000.

Summary

Crescent Peak is a strongly fractured and altered zone in a granitic intrusion. Strong alteration is present over an area of about three-quarters of a square mile. Argillic and coarse-grained sericitic alteration occur within a central core about 1500 feet across. This core is surround by a zone of fine-grained quartz & sericite (± potash feldspar) alteration and an overlapping zone impregnated with quartz ("quartz flood" alteration). This outer zone is 1000 to 2000 feet wide.

Leached outcrops show the former presence of copper in a band, about 500 feet wide, between the inner and outer zones of alteration. Evidence for the former presence of copper is also found in a tongue of ground that roughly follows the eastern ridge of Crescent Peak.

Highest values for copper in the leached outcrops occur within the central core of alteration rather than in the peripheral zone of alteration or the area designated as

favorable on the basis of leached outcrop studies. This central zone is the only zone that has been tested by drilling.

Leached outcrop and alteration studies show that the area outside the central zone of alteration is more favorable for the occurrence of a porphyry copper ore deposit. It is recommended that this outer area be tested with three or four drill holes with a total footage of 3000 feet.

General Geology

Petrology.---Crescent Peak occupies a zone of fractured and altered granite within a broad area of relatively fresh granite (plate 2). Several textural varieties of granite are present, but contacts between these varieties are gradational and there is no evidence to indicate large scale multiple intrusions of granite in the immediate area of Crescent Peak. The bulk of the intrusive is medium to coarse-grained granitoid rock composed mainly of quartz and potash feldspar with minor amounts of sodic plagioclase and muscovite; locally biotite is abundant. Two other textural varieties of granite make up smaller proportions of the intrusive; one of these is a porphyritic rock with euhedral phenocrysts that tend to be aligned and impart a lineation to the granite. In the altered granite, the feldspar phenocrysts show local cataclastic effects caused presumably by the same forces that caused the fracturing of the granite. The other textural variety consists of very coarse grained, nearly

pegmatitic, granite with feldspar crystals up to several cm. across; this pegmatitic granite is mineralogically similar to the medium to coarse-grained rock which constitutes the bulk of the intrusive. The age of the granite is unknown; suggested ages have been Precambrian or Tertiary, but these suggested ages lack factual support.

The granite contains lenses of mica pegmatite and coarse-grained, white feldspar rock. Milky quartz veins up to a foot or more thick occur throughout the granite. The mica pegmatite, coarse feldspar rock and quartz veins are probably late phases of the granite itself. Quartz veins and feldspar rock occur in both the fresh granite and in the altered zone; however, no mica pegmatites have been noted within the altered zone.

Dike-like bodies of diorite (?) cut the granite in several places. The diorite was intruded before the main alteration of the granite because diorite is altered where it occurs within the altered zone and fresh outside this zone. The diorite may be a late phase of the granite or may be an offshoot from a later, underlying intrusive.

Structure.---Numerous xenolithic inclusions and strong fracturing and faulting are the outstanding structural features of the granite. Fresh lenses of gneiss and schist up to 1000 feet long occur in the fresh granite. Within the altered zone, the inclusions are in the form of altered, brecciated fragments generally a few feet or less in diameter. Both foliated metamorphic rocks and fragments of dense, fine-grained, quartzitic rock occur as inclusions within the altered zone. The numerous inclusions in and around Crescent Peak indicate that the

intrusive has not undergone deep erosion in this area. The increased number and size of the inclusions to the east of Crescent Peak (plate 2) indicate a nearness to the contact between the granite and the foliated metamorphics; however, the actual contact was not observed in the area of mapping.

Crescent Peak is strongly fractured and faulted. Closely spaced fracturing is mainly confined to the area of altered granite but faults and major fractures occur in the fresh granite. Closely spaced sets of minor fractures in three or more directions are characteristic of the altered granite zone. Because of their great abundance and apparent random distribution, no effort has been made to map these fractures. More prominent fractures and shear zones within the altered area show one set with a northwesterly trend and another set with an easterly to northeasterly trend. These two trends parallel the major directions of faulting.

Many faults are present in the Crescent Peak area (plate 2). The zone of altered granite appears to be a major center of faulting, but individual faults are difficult to trace because of the altered nature of the rock and because marker features showing offset are generally absent. Any of the following features may indicate the presence of a fault: (1) slickensides or mullions, (2) brecciated zones recemented by silica, and iron or manganese oxides, (3) fault gouge. There is little doubt that some faults, shown on plate 2 in the altered zone, are more extensive than drawn; moreover, other faults are likely present that were missed in mapping because they lacked expression on the surface.

Fracturing and faulting are believed to have begun before,

and to have continued during and perhaps after, the period of alteration and mineralization.

Fracturing and faulting localize alteration and massive iron oxide. On the other hand, turquoise and massive iron oxide are slickensided along some faults, and brecciated quartz veins occur within some faults.

Alteration

The altered rock in Crescent Peak is considered to have had a hypogene origin because it is within the major zone of fracturing and faulting and because the surrounding granite is relatively fresh. Four distinct types of altered granite have been observed; these have been named for their dominant mineral components and are referred to as (1) silica flood, (2) fine-grained quartz & sericite ($\pm$ potash feldspar), (3) argillic, and (4) coarse sericite. The general distribution of the types is shown on plate 3.

In the first type of alteration, gray quartz impregnates the rock and corrodes the feldspar grains without causing appreciable alteration of the unattacked parts of feldspar grains. This type of alteration is herein referred to as "silica flood." Silica flood alteration occurs in the higher, more peripheral parts of the altered zone, particularly in the western part, and is generally absent from the central part of the altered zone.

The second type of alteration consists of a fine-grained mixture of quartz and sericite, with or without potash feldspar, replacing the coarser grained original feldspars of the granite and corroding the margins of quartz grains. Rock

with this type alteration is generally light colored with gray, unreplaced quartz grains in a fine-grained but obviously crystalline matrix. Fine-grained quartz & sericite (± potash feldspar) alteration covers the same general area as the silica flood alteration but is somewhat more extensive on the eastern side of Crescent Peak. Where both types of alteration occur along the same fracture, the fine-grained quartz & sericite (± potash feldspar) alteration occupies a zone closer to the fracture. Alteration herein designated as fine-grained quartz & sericite (± potash feldspar) appears to be the type that is reportedly associated with ore in the Bagdad, Ajo, Ray, San Manuel, and Miami districts in Arizona.

In the third type of alteration (argillic), the original feldspar is replaced by clay minerals which impart an earthy luster and light color to the hand specimen. Microscopic examination shows that the clay minerals are associated with lesser sericite, chlorite, quartz, and potash feldspar. Argillic alteration is largely confined to the central part of Crescent Peak, but is also associated with the zone of diorite intrusions on the east side of the peak (plates 2 & 3).

Coarse-grained sericite or muscovite forms the fourth type of alteration, and also occurs in the central part of Crescent Peak and partially overlaps or is surrounded by the zone of argillic alteration (plate 3). Within the zone of coarse sericite alteration, the granite is cut by numerous irregular discontinuous veinlets of milky quartz. These vein-

lets occur sparsely throughout much of the altered granite, but are appreciably more abundant in the zone of coarse sericite alteration.

Bounding the main area of alteration, on the north and east side of Crescent Peak, there is an 800 foot wide halo of weak alteration (not shown on plates 2 and 3). In this halo, the granite is altered one-half inch on either side of small fractures. No significant traces of copper mineralization were found within this halo, but the area would merit a closer examination if detailed mapping were undertaken in the area.

The most favorable area, as defined by Pennebaker from his leached outcrop observations, tends to occur outside the central zones of argillic and coarse sericite alteration. A branch of favorable ground also extends to the east and roughly follows the ridge on the east part of Crescent Peak (plate 3).

About one-half mile south of Crescent Peak, in section 35, T.28S. R.61E., altered granite occurs within a wedge-shaped fault block 3000 feet long and 1500 feet across at its widest point (plate 2). Chalcopyrite boxworks and traces of copper oxides were noted at one place in this area, and it would merit closer examination when an active exploration project is undertaken at Crescent Peak. At least one valid unpatented claim (Ridge claim) is in this area.

Mineralization

Crescent Peak has long been known as a turquoise mining area, and one or two-man mining operations have been carried out since before 1900. Active turquoise mining has effectively stopped in the area except for occasional week-end "rock-hounds". Turquoise is closely associated with quartz veinlets in the argillic and coarse sericitic zones of alteration. Most mining was from adits and open cuts; however, one incline in the southwest corner of section 26 was sunk to a reported depth of 180 feet.

Numerous gold prospects occur around the base of Crescent Peak. The gold is associated with quartz veins, disseminated pyrite, or fault zones. Two prospects are currently active. On the Loneman claims, gold is found in the gouge of a northerly trending fault, with values reportedly as high as $15.00 per ton. On the Tiger Lily claim, an exploration incline has been sunk in fresh granite that contains numerous quartz veinlets with pyrite. Dump material contains only 0.005 oz. of gold per ton. No ore has been shipped from the Loneman or the Tiger Lily. Other gold prospects are currently inactive and none have a recorded production of more than a few thousand dollars.

Pegmatites around Crescent Peak have been prospected for mica, rare earths, and beryllium but no work has progressed beyond the prospecting stage.

Evidence for porphyry copper type mineralization is largely indirect, the presence of chalcopyrite boxworks in the

leached outcrops being the best indication. A few flakes of fresh molybdenite have been observed in the altered granite of Crescent Peak and minor copper oxide stains occur in two places. Gravels cemented with iron oxide contain about 0.05% copper, presumably the result of leaching and redeposition from the granite. Samples of fresh granite containing disseminated pyrite were collected on the dumps of the Tiger Lily and Golden Eagle inclines with the following results:

Tiger Lily: Au = .005 oz.
Ag = .10 oz.
Cu = .02%
Mo = Trace

Golden Eagle: Au = .04 oz.
Ag = .15 oz.
Cu = .06%
Mo = Trace

Inasmuch as these samples are outside the main area of alteration and favorable leached outcrops, they have little bearing on the evaluation of Crescent Peak as a porphyry copper prospect; however, they indicate that a porphyry copper deposit in the area might contain significant by-product values in gold and silver.

One sample of massive iron oxide from a fault on the eastern ridge of Crescent Peak yielded 0.03% Cu, 0.05% Pb, 0.10% Zn, 0.01 oz. Au, 0.1 oz. Ag and a trace of Mo. This indicates that some of the faults may be strongly mineralized at depths below the zone of oxidation.

Samples for assay were collected along a 3400 foot traverse (shown on plates 2 and 3), and the assay data are shown on figure 1. Highest copper-molybdenum values occur in the central

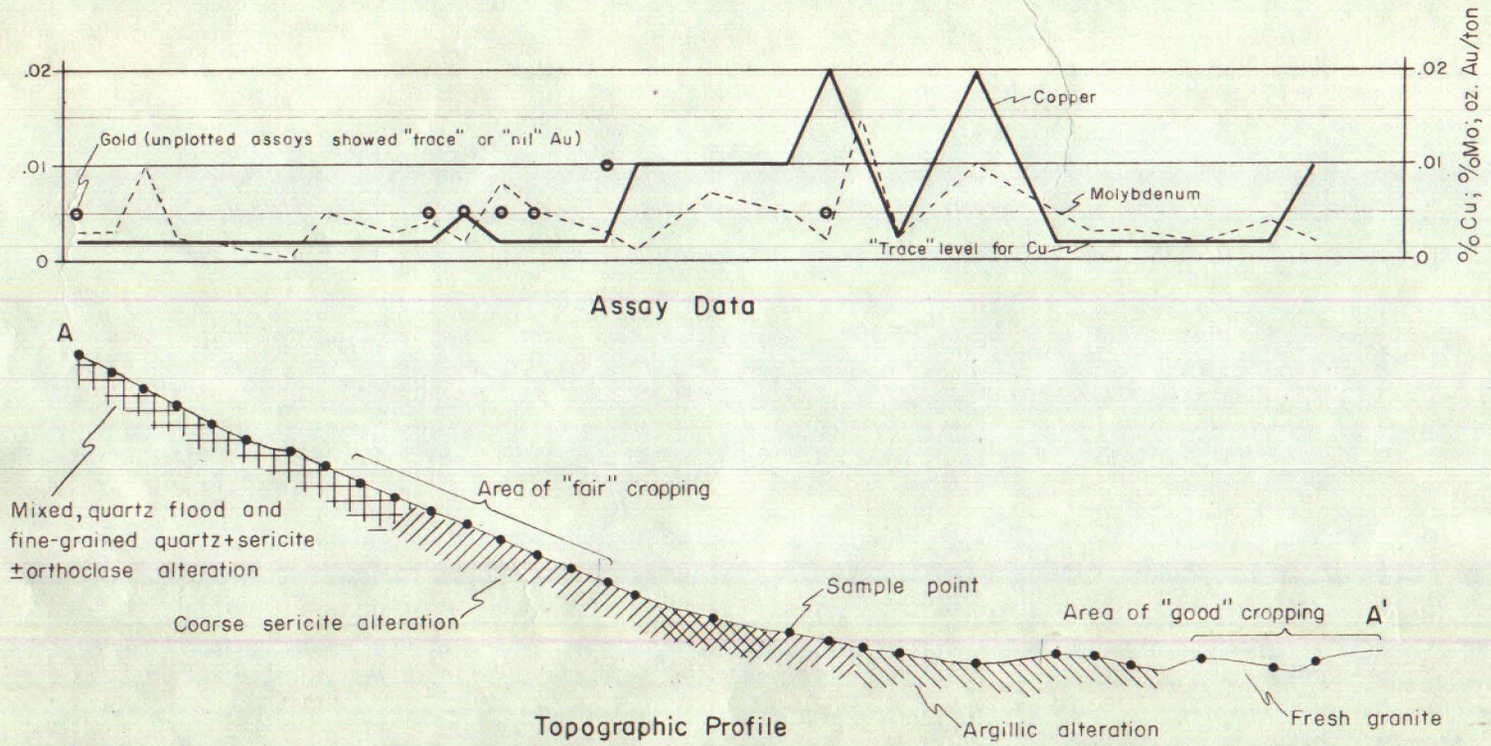

Figure 1.- Topographic profile down south side of Crescent Peak showing alteration types and related assay values.

zones of argillic and coarse sericitic alteration; copper-molybdenum values are lower in the zone of fine-grained quartz & sericite (± potash feldspar) alteration and in the area of favorable leached outcrop. The higher copper-molybdenum values may result from incomplete leaching in the central zone, caused either by the impervious nature of the altered rock or the lack of sufficient pyrite in the unweathered rock to cause complete leaching. Gold values along the traverse are higher in the more favorable ground outside the central zone of alteration.

Conclusions and Recommendations

The country rock at Crescent Peak is granite and is slightly more acidic than the granodiorite or quartz monzonite in which porphyry copper deposits are commonly found; however, the leached outcrop studies, the nature of alteration, and the structural setting indicate that Crescent Peak is favorable for the occurrence of a porphyry copper deposit. The most favorable areas lie just outside the combined zones of argillic and coarse sericitic alteration and along the eastern ridge of Crescent Peak.

Previous drilling has tested only the central zone of argillic and coarse sericitic alteration. The three previous drill holes are shown on plate 3. No assay data are presently available for these drill holes but the results were apparently discouraging. The southern hole was drilled vertically to a depth of 136 feet; the central hole was drilled vertically to a depth 372 feet; and the northern hole was drilled 403 feet,

N 27°W at an angle of 16° below the horizontal.

It is recommended that four vertical exploratory holes be drilled at the approximate locations shown on plate 3. The holes should be cored from the surface to a depth of about 750 feet; the total drilling is thus estimated at 3000 feet.

R 61 E

Plate I

T 28 S

HOMESTAKE MINING COMPANY

PROPERTY MAP
of the
CRESCENT PEAK AREA

CLARK COUNTY NEVADA

500 0 1000 2000 ft

EXPLANATION

- Homestake — location held
- Homestake — lease held, patented
- Portenier — patented
- Corio, J D — South Peak, patented; Wolcott, N E — Corona, patented
- Thacke - Kirkman — Tiger Lily Group
- Harrington, J F — Loneman Group
- Martin - Drummond — Golden Eagle
- Caduco or out of area

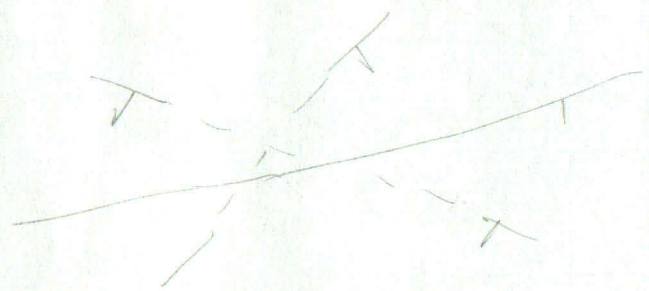

Plate I

Plate 2

R 61 E

T 28 S

HOMESTAKE MINING COMPANY

GEOLOGIC MAP of the CRESCENT PEAK AREA

CLARK COUNTY, NEVADA

500 0 1000 2000ft

EXPLANATION

- 738½ Granite
- 739 Basic intrusive rocks
- 740 Metamorphic rocks
- 736 Cemented gravel
- 735½ Alluvium
- Area with many small xenoliths
- 737 Altered granite
- Fault (? - inferred fault)
- 744 Quartz veins and pegmatites
- Fracture (closely spaced in shear zones)

well

27 26 25 34 35

Plate 2

Plate 3

R61E

T28S

HOMESTAKE MINING COMPANY

ALTERATION MAP of the CRESCENT PEAK AREA

CLARK COUNTY, NEVADA

500 0 1000 2000 ft

EXPLANATION

- Argillic alteration
- Coarse sericite alteration
- Silica "flood" alteration
- Fine-grained quartz + sericite ± potash feldspar alteration
- Pennebaker's area of good cropping
- Pennebaker's area of fair cropping
- Previous drill hole
- Proposed drill hole

Plate 3