The Rose Creek Tungsten Mine, Pershing County, Nevada

by

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Illustrations

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Abstract

The Rose Creek tungsten mine is 11 miles southwest of Winnemucca, Nev. in the north end of the East Range. No tungsten ore has been produced from the property, but if high prices continue to prevail the mine will probably be brought into production.

The rocks in the area are interbedded argillite, quartzite, and limestone of Triassic age, which have been folded into northwest- and north-trending folds and ~~are~~ overthrust by dolomite. ~~completely faulted. Dolomite has been thrust over the folds, and~~ These rocks ~~they~~ have been intruded by granite, granodiorite, and many dikes, and have been completely faulted. ~~The effects of contact metamorphism are noticeable over a wide area. Near~~ intrusive contacts the sedimentary rocks have been metamorphosed to hornfels and tactite. ~~calcareous argillite were completely recrystallized to tactite.~~ The ~~tungsten~~ scheelite deposits occur in the tactite and in quartz veins which cut the other rocks.

The ~~ore~~ tactite bed in the Rose Creek Mine ~~is~~ has been ~~developed~~ explored in the workings ~~along the strike~~ for 400 feet along the strike and 200 feet down dip. It is as much as 4 feet thick ~~and~~ but? averages about 2 feet throughout the workings.

The ore reserves are estimated to be about 6,000 tons containing about 1.5 percent WO_3. ~~[If the minimum minable thickness is assumed to be 1.5 feet and the portions of the bed containing less than 1 percent WO_3 are being mined and the~~ If only the thicker and richer portions of the bed are mined, the reserves are estimated to be about 4,000 tons of 1.7 % ore.

~~are disregarded~~, the reserves are estimated to be 4,000 tons containing ~~about 1.7 percent WO_3.~~ Losses in mining may reduce ~~this figure~~ these estimates by about 10 percent, but ~~These~~ reserves may be increased by finding ore east and west of the present workings, and in depth. ~~Furthermore,~~ and by ~~other beds may be mineralized and of commercial grade~~ finding other mineralized beds. Scheelite was also found in quartz veins and in granite in the canyon south of the Rose Creek mine and in tactite near the Rose Creek ranch, but ~~since~~ these occurrences have not been explored ~~it is not known whether they contain commercial ore bodies~~. Thorough exploration of the surface in the area by ultraviolet light ~~is suggested~~ may reveal the presence of other ore bodies.

New page

~~The Rose Creek tungsten mine, Pershing County, Nevada~~

Introduction

The Rose Creek mine, in ~~section~~ 6, T. 34 N., R. 37 E., is 11 miles southwest of Winnemucca, in the northeastern part of the East Range (fig. 1). The nearest shipping point is Rose Creek, a station 3 miles north of the mine on the Southern Pacific ~~R. R.~~ Railroad and U. S. Highway No. 40. Dirt roads ~~which will permit heavy hauling except during the winter months~~ that lead from Rose Creek station to the mine.

Fig. 1. Index map of Nevada showing location of the Rose Creek mine.

There has been intermittent activity ~~in~~ mining in the northern part of the East Range since the 1860's. The Sierra district, 7 miles south of Rose Creek, has yielded ore containing gold, silver, copper, and lead. Quartz veins in the two canyons south of Rose Creek and near the Rose Creek mine probably attracted attention in the early days of mining, but were never worked. The Rose Creek mine was first located for copper and gold, but until 1936 when tungsten was discovered by Ed Christierson and George Howe, ~~in 1936 the~~ no exploratory work was done. The property was sold to the U. S. Vanadium Corporation in December 1937, and considerable development work has been done since then. ~~Ore~~ Ore from the Rose Creek mine will be treated in a mill ~~to~~ being constructed by the U.S. Vanadium Corp. on another tungsten property in the Osgood Range, 20 miles ~~east~~ northeast of Winnemucca.

Field work in the Rose Creek area ~~began~~ was begun by the Geol. Survey in 1939 under the direction of H. G. Ferguson, as part of the areal mapping of the Sonoma Range quadrangle. Work was continued at intervals during the field seasons of ~~in~~ 1940 and 1941.

The mine area (pl. 2) and underground workings were mapped by the ~~water~~ writer ~~assisted by~~ with the assistance of A. E. Granger and Manning W. Cox. H. G. Ferguson and S. W. Muller mapped part of the area shown on plate 1 and gave valuable advice during field work.

Clarence Hall, engineer for the U. S. Vanadium Corp., aided field work in many ways and kindly gave permission to publish the ~~analyses~~ assays of the ore.

cannot see if complete analyses would be given

T. B. Nolan and Ward Smith visited the party in the field and made valuable suggestions in the preparation of the manuscript. The writer is also indebted to F. C. Calkins for critical reading of the manuscript.

Geology

~~General statement~~

The East Range is a rugged northward-trending range in the central part of the Great Basin. The northern part of the range at the Rose Creek Mine is about 6 miles wide; it rises abruptly from alluvial fan slopes at an altitude of about 4,700 feet, ~~and~~ Lang Syne Peak, its highest point in this area, is 7,430 feet above sea level.

The northern part of the range is composed of complexly folded and faulted Triassic sedimentary rocks ~~which~~ that have been intruded by small bodies of igneous rock. The sedimentary rocks ~~comprise~~ are dolomite, limestone, argillite, and quartzite. The igneous rocks include granite, diorite, and granodiorite and diorite porphyry, lamprophyre, and diabase dikes. Near intrusive bodies the ~~sedimentary rocks~~ argillite ~~have~~ has been metamorphosed to hornfels and tactite, and the dolomite, limestone and quartzite are recrystallized. The ~~tungsten deposits~~ scheelite occurs in the tactite and in quartz veins which cut the other rocks.

all or only ~~the~~ argillite? See p 12

Could B speak of the ~~[illegible]~~ deposit in 43 veins?

The sedimentary rocks comprise two units: Dolomite, probably the oldest rock exposed in the area, forms ~~the upper plate of~~ an overthrust sheet. Interbedded argillite, quartzite, and limestone form the ~~lower~~ plate below the thrust. Interbedded (ls) members near the bottom + top of this unit ~~and~~ ~~interbedded~~ ~~another~~ limestone ~~top~~ ~~are~~ ~~not mapped~~ shown separately on the map, plate 1.

Substitute first ¶ p. 8

Sedimentary rocks

Substitute

The sedimentary rocks have been grouped into three units on figures 2 and 3: dolomite, forming the upper plate of an overthrust sheet, is the oldest rock exposed in the area; the lower plate includes a lower unit of interbedded argillite, slate, and quartzite, and an upper unit of limestone. These rocks are probably all of Triassic age, but since they have not yielded diagnostic fossils their specific age is not known.

Dolomite

The dolomite is exposed in several Klippen 1/ south and southeast of the mine; the largest is a half-mile long and a thousand feet wide. Most of the Klippen are downfaulted by normal faults and have thus been preserved from erosion. The dolomite has a maximum thickness of about 200 feet. It is massive to thick-bedded and its colors range from light to dark gray. In most places it is silicified and cut by networks of small quartz veins. No fossils have been found in the dolomite, but it may be correlative with a similar middle Triassic dolomite of the Sonoma Range, seven miles to the east.

1/ A Klippe is an outlier of an overthrust plate or sheet.

Plate 1. Preliminary geologic and map section of the Rose Creek area, Pershing County, Nevada.

Argillite, quartzite, and limestone

The sedimentary rocks below the thrust fault are

~~The older of the two units of the lower plate is composed~~ largely ~~of~~ interbedded argillite, ~~and~~ quartzite and limestone. Argillite predominates in the lower part ~~of the unit~~, but near the Rose Creek Ranch several impure limestone beds are intercalated with the argillite. The middle part ~~of the unit~~ is composed ~~on~~ of interbedded brown quartzite, ~~and~~ argillite, and black slaty argillite. ~~forms the upper part of the unit~~. The thickness of these beds ~~the unit~~ was not accurately measured but may be as much as 3,000 feet. The argillite has been altered to hornfels over much of the area mapped. Some of the beds, such as the tactite ore bed in the Rose Creek mine, which were originally calcareous argillite, have been entirely recrystallized near intrusives, and are now largely composed of silicates.

The upper part of the lower plate is composed of interbedded limestone and slate. The limestone has been mapped separately on plate 1.

~~has been eroded~~ its total thickness is not known. It is thin to medium-bedded and contains thin layers of shaly limestone; for the most part the ~~limestone~~ it is light to dark gray in color, but it has been bleached white locally along faults. According to S. W. M. Muller fossils collected

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Muller, S. W. M., Personal communication.

from the limestone indicate that its age is [redacted] Triassic.

Igneous rocks

The intrusive igneous rocks shown on plates 2 and 3 are stock-like bodies which commonly cut ~~sharply~~ across bedding. They are composed mainly of granite, granodiorite, and diorite. Many varieties of dike rocks which cut the granitic and sedimentary rocks are found in the area.

The intrusives east and southeast of the Rose Creek mine are granite with a ~~thin~~ narrow granodiorite border. The granite is medium-grained and contains pink orthoclase crystals. The bordering granodiorite is generally only a few feet wide; it is fine- to medium-grained and dark gray in color. A ~~well developed~~ joint system striking N. 10°-20° W. and dipping steeply ~~southwest~~ ~~cuts~~ is well developed in these intrusives. Many of the joints contain thin quartz and quartz-feldspar veins.

The intrusive ~~southeast~~ southwest of the Rose Creek ~~ranch~~ mine is composed chiefly of granodiorite and diorite. It ranges from fine- to medium-grained ~~and [illegible] to medium-grained~~ and from light gray to dark gray in color.

Plate 2. Preliminary geologic map and section of the Rose Creek mine and vicinity.

Is this going to be a more final map?

The dike rocks are of ~~comprise~~ many different lithologic ~~rock~~ types. Granite and grano-diorite dikes ~~and offshoots~~ cut the metamorphic rocks ~~sediments~~ adjacent to intrusives. Small pegmatite and aplite dikes, ranging from a fraction of an inch to a foot wide, follow joints in the intrusives and some extend a short distance into the sediments.

Many ~~dikes~~, including lamprophyre, diorite porphyry, and diabase ~~dikes~~ were noted throughout the area; but since they do not crop out prominently and only a few of them were mapped, ~~they are grouped as~~ basic dikes on ~~plate 2~~.

In the mine workings (see pl. 3) lamprophyre and diabase dikes ~~make up 30 percent of the volume of rock cut by the drift~~ have broken and displaced the ore bed. The lamprophyres fill irregular fractures which have no uniform ~~systematic~~ strike and dip. Most of the diabase dikes trend north and northeast ~~for the most part~~ and dip steeply. They were intruded after the tungsten metallization ~~[illegible]~~.

The age of the intrusive rocks is not definitely known. They cut Triassic rocks and are therefore Triassic or younger. The diabase dikes were ~~[illegible]~~ intruded later than the other igneous rocks, since they cut the granite and the other ~~[illegible]~~ dikes. In nearby areas similar diabase dikes are found to be feeders of basalt flows of Tertiary (?) age.[1]

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[1] Roberts, Ralph J., Quicksilver deposits of the Battle Creek district, Humboldt County, Nev.: U.S. Geol. Survey Bull. 922-A, p. 7, 1940.

insert on 11 — near center of page

11a

Locally the lamprophyres contain scheelite near their contacts with the ore bed and were evidently intruded prior to the close of tungsten mineralization.

Contact Metamorphism

The effects of the granite and granodiorite intrusions are noticeable throughout most of the area shown on ~~figure~~ plate 2. Contact metamorphism was naturally more intense at the borders of the intrusive masses. Commonly the wall rocks ~~were~~ are feldspathized for a few feet from the contacts, and they were recrystallized as much as a mile away from the contacts.

Limestone and quartzite beds were the least affected; their mineral composition was changed only slightly, but their grain size became coarser. In places tremolite nodules were formed in the limestone, and ~~its~~ the color of the limestone was changed from gray to white.

The argillite has been altered to hornfels over a wide area. The hornfels is a ~~tough~~ gray, green, or brown rock, composed chiefly of quartz, mica, epidote, and actinolite, and is commonly minutely fractured.

Calcareous argillite beds, such as the ore bed is the Rose Creek Mine, were entirely changed to tactite for hundreds of feet away from the contact. The tactite consists ~~of~~ largely of diopside, actinolite, epidote, quartz and calcite in varying proportions. Small quantities of scheelite and sulphides are present in some places.

Structure

The rocks of the Rose Creek area are complexly folded and faulted.

Typist: don't even start a new section this near the bottom of a page

Because of poor exposures in many places the details have not been worked out and the contacts are generalized.

¶

~~The Rose Creek Mine block~~, t ~~(2)~~ ~~The~~ Dips in the area ~~northeast~~ of the Valley fault suggest ~~that~~ ~~the structure~~ ~~Rose Creek Mine block~~, bounded by the Valley and Hall faults, is an anticline is anticlinal. ~~with syncline pitching northwest on its west flank. The block southeast of the Hall fault is partly covered by the largest Klippe, but dips in the lower plate rock indicate that the structure is anticlinal. The block~~ area southeast of the Valley and Peaks faults is a syncline pitching southeast. The granodiorite intrusive appears to have been emplaced along the axis of the syncline.

Faults. —

~~13a~~

¶

The overthrust fault at the base of the dolomite strikes east and the dips gently north~~erly~~.

The actual thrust plane ~~was not seen~~ is not exposed but its location is fairly certain in most places. The rocks near the thrust plane, both above and below, are fractured and brecciated. The direction of thrusting appears to have been

to the southwest or west. Overthrusts in the Sonoma Range, 7 miles to the east, also appear to have moved westward. The overthrust fault has been broken by many normal faults, and because of subsequent erosion small klippen have been isolated west and south of the largest klippe.

The normal faults may be divided into two systems, a younger system striking northwest, and an older system striking north to northeast. The amount of displacement along them ranges from a few feet to several hundred feet, but accurate measurements cannot be made on most of them. The downthrown block is commonly on the southwest side of the northwest fault system and may be on either side of the northerly system. None of the small faults that displace the ore layer in the workings, have a throw greater than 10 feet. Some of the diabase and lamprophyre dikes follow faults.

Ore Deposits

The scheelite-bearing tactite bed explored in the Rose Creek Mine workings is the only ore body of commercial size and grade thus far discovered in the area. The bed is similar in occurrence and general mineralogy to the scheelite-bearing beds mined in the Nevada-Massachusetts Mine in the Eugene Range 17 miles to the southwest.

Plate 3. Geologic map and section of the workings, Rose Creek mine.

Kerr, P. F., Tungsten deposits near Mill City, Nevada: Univ. of Nevada Bull., Vol. ~~XXVIII~~ 28, No. 2, p. 21, 1934.

Claims have been located on tactite near the grano-diorite contact at the Rose Creek Ranch, but only a few grains of sch~~u~~elite have been found ~~in the rock.~~ ~~The~~ quartz and quartz-feldspar veins and granite in the canyon east of Rose Creek contain scattered sch~~u~~elite ~~grains~~ crystals, but further exploration will be needed to prove whether the ore bodies ~~are~~ contain of commercial size.

Mineralogy

The tactite, formed from alteration of calcareous argillite, is composed chiefly of diopside, actinolite, quartz, calcite, epidote, and zoisite; in addition, it contains small amounts of apatite, sphe~~r~~ne, sch~~u~~elite, pyrite, moly~~b~~denite, sphalerite, arsenopyrite, and chal~~c~~opyrite. The relative proportions of ~~the silicates~~ these minerals are variable, but commonly diopside, actinolite, and quartz predominate. The sulphid~~i~~s occur in small quartz ~~v~~eins and are disseminated throughout the tactite and adjacent rock. Pyrite, the most abundant sulphide, is widespread; chalcopyrite ~~[illegible]~~ ~~is common but~~ the others are present only locally.

The sch~~u~~elite ~~occurs in~~ forms subhedral to euhedral grains, and is commonly disseminated throughout the tactite, but locally the grains follow cracks or occur in small quartz veinlets. The sch~~u~~elite ranges in size from crystals too small to be seen with the unaided eye to crystals ~~1/4~~ a fourth of an inch in length. Under the ultra violet lamp its fluorescence color ranges from bluish white to yellow; commonly the yellow color is most pronounced on the borders of the crystals, but some crystals fluoresce yellow throughout. Presumably the yellow color is due to a small amount of molybd~~enum~~ in the sch~~u~~elite. It is reported that concentrates of the ore contain about ~~1½~~ 1.5 percent of molybden~~um~~, but part of this comes from moly~~b~~denite that is locally present.

The ore is reported to contain as much as ~~1½~~ 1.5 percent copper and ~~$5 a ton in gold.~~ 0.14 ounce gold a ton.

Origin

Size and Grade

The ore body in the Rose Creek mine ~~is~~ has been developed for a length of 400 feet and for a distance of 200 feet down dip (a vertical distance of 110 feet). The ore bed is as much as 4 feet thick in the underground workings, but ~~and~~ averages about 2 feet. ~~in thickness~~ ~~the bed~~ it contains as much as 5 percent WO_3, but ~~and~~ averages about 1.5 percent. Its average thickness in the surface workings appears to be about ~~2.5~~ 2½ feet and the average grade about 1 percent WO_3.

Origin

The ~~tungsten~~ deposits in ~~the~~ Rose Creek area were formed by hydrothermal solutions, probably related in origin ~~to~~ the granite rocks. The schelite was ~~localized~~ formed by reaction between the tungsten-bearing solutions and calcareous beds near intrusive contacts and was localized in and near fractures.

~~Mine Workings~~

Ore bed in the mine workings

The ore bed in the workings strikes east~~erly~~ward and dips 30-45° north~~erly~~ward, but locally the strike is northeast. The bed has many minor warps caused by folding. It parallels the bedding of the enclosing ~~hanging~~ argillite, and is lenticular, thinning and swelling along the strike and down dip.

Surface Workings

The ore bed was first explored in shallow surface workings (see Pl. 3) which extend along its strike ~~the surface~~ for 500 feet. In these workings the ore bed averages about 2½ feet in thickness. It pinches completely in ~~the~~ raise No. 1, which connect~~ing~~s with the underground workings, but elsewhere its outcrop width ranges from ~~a foot~~ 1 to 9 feet. The sample cuts in the trenches were made parallel to the slope of the hill, ~~and~~ ~~since the ore bed dips into the hill the outcrop width is greater than the true thickness.~~

~~the lengths as shown on the map are somewhat~~

~~of the hill~~

~~not necessarily~~ might be 10°

But since the bed dips into the hill at an acute angle the lengths of the sample cuts as shown on the map are somewhat greater than the true thickness of the bed.

The surface ore is oxidized; the sulphides have been altered to limonitic iron oxides and the silicates to clay minerals. The altered rock is commonly stained with copper carbonates and silicates and is porous. The depth of oxidation is shallow, extending from 3 to about 10 feet, and is greatest where the rock is fractured.

Three lamprophyre dikes were ~~mapped~~ noted in surface cuts, but there are probably many more between the cuts judging from float seen on the slopes.

A parallel ore bed was cut in the long trench at the southwestern end of the surface workings; ~~the~~ whose outcrop width ~~of this bed~~ is 10 feet, ~~but~~ its the grade is low, but Further exploration of this bed appears to be warranted.

Underground Workings

The underground workings consist of an adit-drift which follows the ore bed for 400 feet, ~~a~~ an inclined winze following the ore down dip, ~~and~~ 3 raises, and a crosscut. ~~An~~ adit was being driven at a lower level to intersect the winze in October 1941.

The ore bed is exposed at the portal and in a pit north east of the portal. In the pit ~~the ore ends against a fault, and~~ the bed ends against a fault. although the contact is not exposed, ~~it~~ the bed will probably run into ~~the~~ a diabase dike ~~exposed in the open cut~~. East of the pit The ore bed may continue beyond the dike to the northeast but its extension has not been found as yet.

northeast?

what the fet or the contact

~~In~~ the adit the ore bed ~~is first~~ was cut 30 feet from the portal in the roof. Beyond this point it is displaced by several faults of small displacement and ~~passes out of~~ was not followed by the drift. It ~~is~~ was encountered again in the crosscut at the head of the inclined winze.

The bed is split into two parts separated by barren rock where it enters first encountered in the West drift. This apparently is due to an original irregularity in bedding of the calcareous argillite from which the bed was formed. In raise No. 1 the ore bed thins, and pinches completely near the surface. It also thins between raise No. 2 and raise No. 3, and is cut out by faults and two dikes at the 4-foot winze. When the ore bed is found again at the south crosscut it is 30 inches thick; it was explored upward in a short raise, but ~~was~~ is cut out by a lamprophyre dike 10 feet above the drift, and ~~is cut off~~ west of the crosscut by a diabase dike. Ore was found in the northwest drift, but it is of low ~~in~~ grade. Ore probably continues beyond the diabase dike in the face, although but its position on the other side of the ~~diabase~~ dike is ~~uncertain~~ not known.

The ~~main~~ inclined winze follows the ore down dip for ~~120~~ 170 feet. In the upper part the ore is of high grade, assaying as high 5.07 percent WO_3, but between the lamprophyre and diabase dike, it is thinner and for the most part ~~is~~ low in grade. The layer below the diabase dike has not been assayed but ~~is estimated~~ it appears also

at a distance of 170 ~~one hundred and seventy~~

to be low in grade, ~~170~~ 6 feet down dip below the top of the winze the ore is only 6 inches wide and is cut off by a fault. Below this level it may be present again but short drill holes into the roof and floor did not ~~locate~~ penetrate the bed.

The Lower adit is in dike rock and argillite to the ~~present~~ face. The ore layer, if present, may be cut before the adit intersects the bottom of the winze or it may be necessary to run a crosscut to the south in the block between the lower adit and the winze. The faults which displace the ore ~~layer~~ bed on the ~~surface and~~ upper adit level near the winze crosscut will probably cause a similar displacement in the bed on the Lower adit level.

Reserves

Although little ore can be considered to be blocked out in the workings, sufficient exploration has been done to allow fairly accurate estimation of reserves. The ore bed has been proved to be continuous throughout the workings with the exception of areas where it is cut out by dikes. On the drift level dikes occupy about 30 percent of the distance from the portal to the face, and in the winze about 20 percent as far as the ore extends. Because of poor exposures on the surface between trenches it is impossible to estimate the relative percentage of dikes and argillite, but it is ~~assumed to be~~ probably about the same order as in the ~~drift~~ underground workings.

Using ~~two~~ 2 feet as the average thickness of the ore body, and subtracting 30 percent for the volume of dike rock, about 6,000 tons of ore may be present in the block between the portal and present face. Assays indicate that the average grade will be about ~~1½~~ 1.5 percent WO_3.

In actual mining, however, it may be found that only the richer and thicker portions of the ore bed can be profitably mined. If 18 inches is assumed to be the minimum stoping thickness, ~~and 1 percent WO_3 the minimum grade that can be mined~~, the reserves may be about 4,000 tons. By disregarding the portions of the bed containing less than 1 percent WO_3, the average grade will be about 1.7% WO_3.

In addition, there may be some faulted blocks and ~~blocks~~ segments of the bed isolated by dikes which cannot be profitably mined. It is difficult to estimate these losses in advance of mining, but they may reduce the tonnage by 10 percent or more.

The reserves may be increased considerably by finding ore east and west of the present workings, and at depth. Other scheelite-bearing beds may be discovered near the workings; surface trenching and prospecting by ultraviolet light is desirable.

Why cut on twelve? Because it is the thing?

Tungsten prospects near Rose Creek

Scheelite-bearing quartz and quartz-feldspar veins were noted at three other localities in the Rose Creek area (see pl. 1). ~~[illegible]~~ These occurrences have not been explored, and it is not known whether any bodies of commercial size and grade are present.

~~Prospects near Rose Creek~~

O'Leary claims Frank R. O'Leary and M. W. Tyler have located claims in Sec. 25, T. 34 N., R. 36 E., on tactite exposed in the stream bed east of the Rose Creek Ranch. A few crystals of schelite were seen in the rock, but the grade appears to be too low to be of commercial value.

Canyon south of the Rose Creek Mine. In the canyon south of the Rose Creek Mine two occurrences of schelite were found by prospecting with the ultraviolet lamp. No. 1 (see pl. 1) is in granite near the granite - limestone contact and ~~the other~~ No. 2 is in quartz and quartz-feldspar veins which cut the granite on the west wall of the canyon. ~~The~~

The schelite-bearing quartz and quartz-feldspar veins ~~in the canyon south of Rose Creek~~ range from a fraction of an inch to more than 6 inches wide but do not average more than 2 inches. The veins are spaced 6 inches to ~~two~~ 2 feet apart and follow a joint system which strikes N. 10°-20° W. in the granite. In the veins examined, schelite crystals are erratically distributed throughout the quartz, and the veins do not appear to be of commercial size and grade. In places the granite adjacent to the veins contains sparse schelite crystals.