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Bureau of Mines
Report of Investigations 4681

INVESTIGATION OF NEVADA SCHEELITE, INC., DEPOSIT MINERAL COUNTY, NEV.

BY ROBERT W. GEEHAN AND RUSSELL R. TRENGOVE

United States Department of the Interior — April 1950

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UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary
BUREAU OF MINES
James Boyd, Director

April 1950

INVESTIGATION OF NEVADA SCHEELITE, INC., DEPOSIT MINERAL COUNTY, NEV.

by

Robert W. Geehan[1] and Russell R. Trengove[1]

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ILLUSTRATIONS

1/ Mining engineer, Bureau of Mines, Reno, Nev.

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INTRODUCTION AND SUMMARY

The Bureau of Mines developed, by core drilling, the property of Nevada Scheelite, Inc., from October 5, 1943, to February 24, 1944. Claims of the corporation are near Rawhide in the northern portion of Mineral County, Nev. The purpose of the work was to determine possible reserves in the lateral and vertical extensions of a tactite zone which was being mined for scheelite. Production from this zone to January 1, 1944, was said to be 64,500 tons, with a recovery of 50,618 units of tungsten trioxide.

The development work was done by the Bureau of Mines in cooperation with the U. S. Geological Survey and comprised a study of the geology, mapping the areas, and exploring the deposit by diamond drilling, trenching and sampling. Eleven holes were drilled for a total footage of 2,365 feet of holes.

ACKNOWLEDGMENTS

This paper describes the project work on the Nevada Scheelite deposit in Mineral County, Nev. The work was under the direct supervision of Robert W. Geehan, George H. Holmes, Jr., and John Price, Bureau of Mines engineers.

Acknowledgment is due to A. C. Rice, acting supervising engineer of the Rare and Precious Metals Station, Reno, Nev., where the samples were analyzed.

Acknowledgment is also due to Konrad Krauskopf and Robert Stopper of the U. S. Geological Survey for cooperation in planning the drilling program and to Robert Stopper for advice on all geological problems encountered during the project.

Acknowledgment is made to Arthur Mills for cooperation in arranging to supply water for the drills, and to H. N. Hammond[2] for assistance in connection with the underground drilling.

This report was prepared under the supervision of A. C. Johnson, chief, Reno Branch, former Mining Division.

LOCATION AND PHYSICAL FEATURES

Nevada Scheelite mine and camp are in secs. 1 and 12, T. 13 N., R. 32 E., Mount Diablo base line and meridian, on the east flank of the Sand Springs Mountains, near the southern end of the range, and about 5 miles east of Rawhide, Mineral County, Nev. (See fig. 1.)

The mill was at Deadhorse Well, 9-1/2 miles south of the mine. Schurz and Fallon, Nev., the two nearest supply points, are served by branch lines of the Southern Pacific Railroad and by bus and truck lines. Two fair dirt

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[2] Mine superintendent, Nevada Scheelite, Inc.

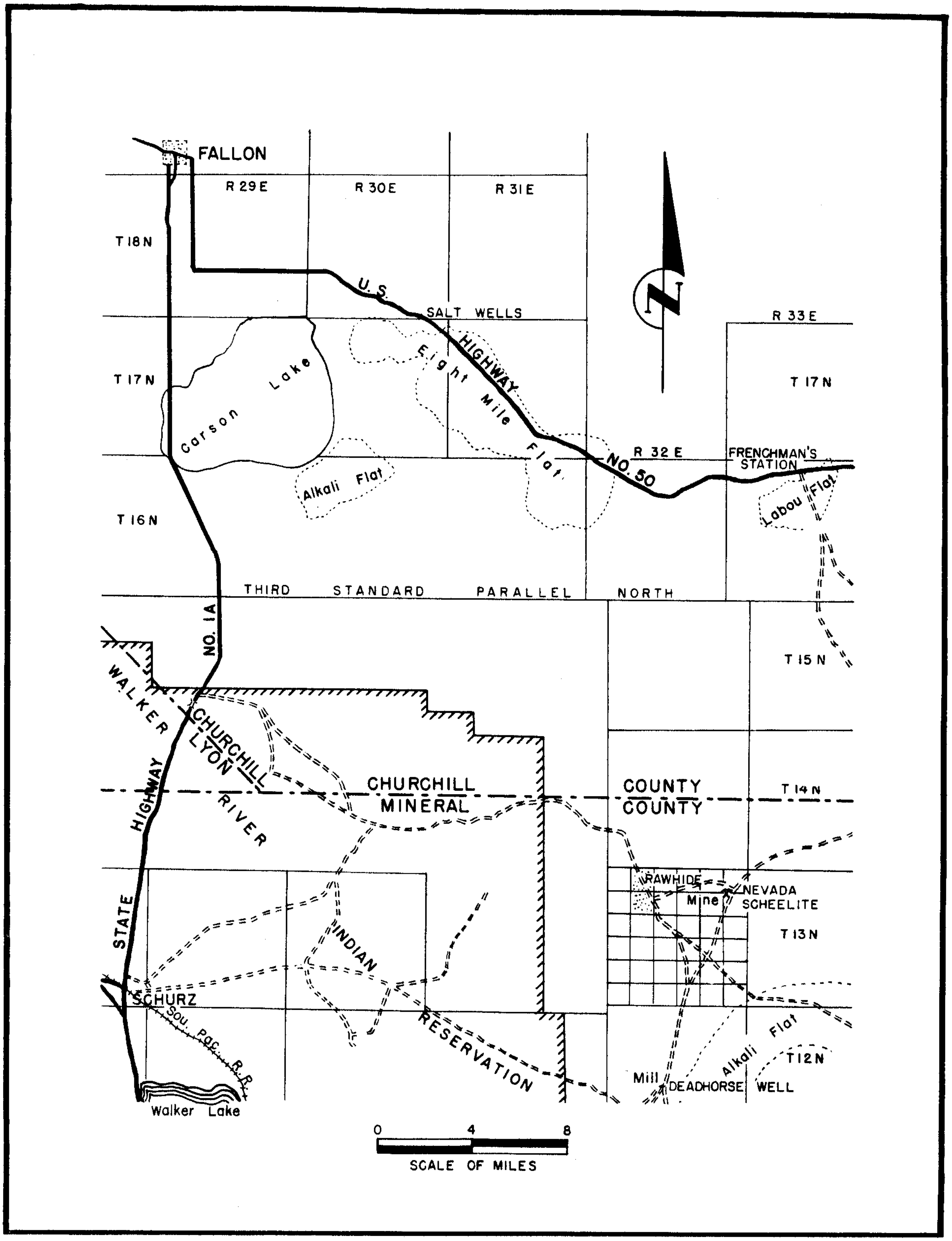

Figure 1. - Location map, Nevada Scheelite, Inc., Mineral County, Nev.

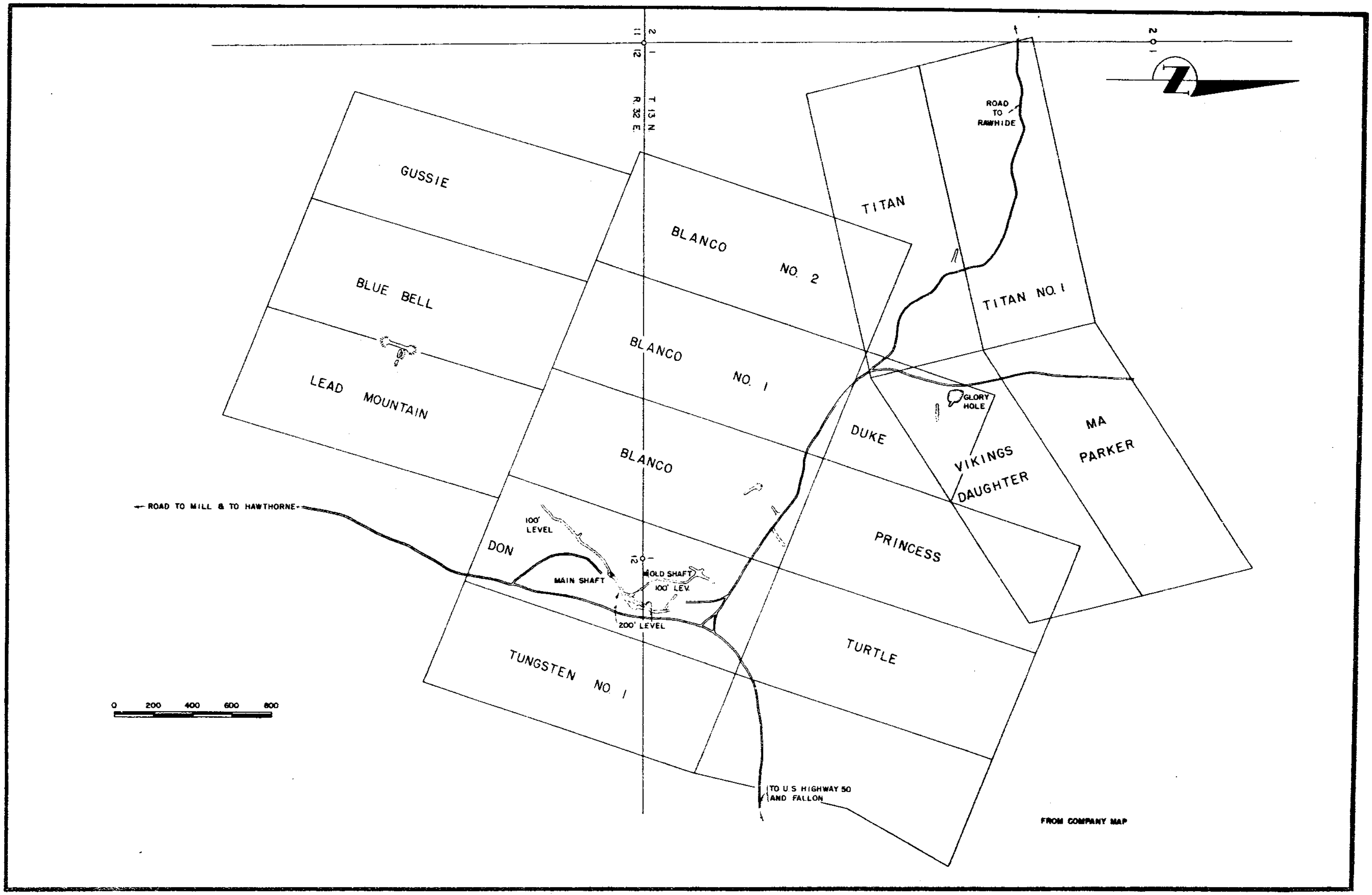

Figure 2. - Claim map.

roads extend to the mine, one 22 miles long leading south from U. S. Highway 50 at a point 35 miles east of Fallon and one extending 30 miles east from U. S. Highway 95 at a point 25 miles south of Fallon. An ungraded dirt road extends 25 miles from Schurz to Deadhorse Well. Desert roads lead from the district to Gabbs, Luning, and Hawthorne.

Altitudes of the mine workings range from 4,480 to 5,110 feet; the mill was at an altitude of 4,180 feet. The relief in this area is rugged. The region is shown on Federal Geological Survey topographical maps of the Hawthorne and Carson Sink quadrangles.

An ample supply of water for use in the mill and mill camp was obtained from wells at the mill. Water for mine and mine-camp use was trucked about 5 miles from a well southeast of the mine. These conditions were changed after the mill and most of the buildings were destroyed by fire in 1946. It was then decided to rebuild the mill at the mine rather than at the old site to eliminate the long ore haul. The water for the combined operation of mine and mill is now supplied from wells on a nearby dry lake, by a 4-inch pipe line, 4-1/2 miles long with three electrically operated pumping stations.

PROPERTY AND OWNERSHIP

Nevada Scheelite, Inc., owns 16 unpatented mining claims totaling 240 acres in the Regent or Sunnyside mining district. (See fig. 2.) General offices are at 11320 S. Alameda Street, Los Angeles 2, Calif. The president of the corporation was the late Oscar L. Mills, and the resident manager was A. J. Mills.

The climate is variable, with very hot, dry summers and moderately cold winters. Wind storms are common and sometimes have damaged the camp buildings. No timber suitable for mine use is found in the district; sagebrush is the only common vegetation.

Freight shipments are handled through Fallon and Schurz; both towns are on branch lines of the Southern Pacific Railroad. Mail is delivered to the mine area from Fallon three times a week. Telephone and telegraph service is available at Schurz, Frenchman's Station, and Fallon.

LABOR AND LIVING CONDITIONS

Living quarters and board for about 20 men were provided at the mine camp, and the mill camp could serve 30 men. A shower room and dry house are provided at the mine.

Miners were paid $0.94 an hour; muckers received $0.875 an hour; mill operators, $0.95 an hour; and mill helpers, $0.89 an hour - all with time and a half for work over 40 hours.

Miners, muckers, and millmen were hired in Fallon and Reno; some experienced men were available. The mine had to compete for men with the Naval Depot at Hawthorne and Basic Magnesium, Inc., at Gabbs, Nev. and the labor turn-over was high at both mine and mill.

GEOLOGY AND ORE DEPOSIT[3]

The mine area is underlain chiefly by metavolcanic rocks, andesites, basalts, and tuffs of undetermined thickness, in which there is an interbedded stratum of limestone which has a maximum thickness of 500 feet. Tuffaceous material up to 40 feet in thickness is present on both sides of the limestone. These rocks probably belong to the Excelsior formation of Middle Triassic age, described by Muller and Ferguson. The rocks have been intruded by a granite stock that crops out over an area of 1 square mile and by numerous small granitic dikes and sills. Tactite bodies, locally up to 50 feet thick, occur along contacts between granite and limestone. The tuffaceous material bounding the limestone is locally altered to hornfels along granite contacts. Volcanic rocks of Tertiary age locally intrude and overlie these rocks. In places all rocks are either silicated or silicified.

Southwest of the Nevada Scheelite mine the strike of the stratified rocks gradually turns from east to northeast in the vicinity of the mine, and the dip changes from 20° S. to steep northwest or southeast. Granite contacts are for the most part sharp. However, in the vicinity of the mine post-granite faulting along soft oxidized tactite zones generally has obscured the contacts. Three sets of pre-granite faults are recognizable in the district, trending east, northeast, and northwest. Of these, only one northwest fault has direct bearing on the ore deposit. This fault, which has displaced the limestone 350 feet horizontally, locally controlled the emplacement of the granite. Post-granite faults are rarely recognizable on the surface but are well exposed in the underground workings of the Nevada Scheelite mine...where they are mainly restricted to contacts between granite and tactite.

Scheelite, the ore mineral, occurs in tactite along the contacts between limestone and granite. Associated with it are the usual minerals of tactite--garnet, epidote, diopside, wollastonite, quartz, calcite--and oxidation products. Pyrite is locally abundant, and in places a small amount of chalcopyrite or copper carbonate occurs. The scheelite contains an average of 0.5 percent of molybdenum.

In general the granite contacts follow the limestone beds, which in the vicinity of the mine are essentially vertical. The tactite is usually narrow, seldom exceeding 15 feet in width. About 110 feet north of the Nevada Scheelite shaft--A pre-granite northwest fault dipping 30° - 40° NE. has broken the limestone, displacing the northeast portion at least 350 feet northwest. The strike of this fault is nearly normal to the strike of the limestone beds. Large bodies of tactite, locally 50 feet thick, were formed where intruding granite followed this fault and cut

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3/ Stopper, Robert, Preliminary Report on the Nevada Scheelite Mine, Regent District, Mineral County, Nev.: Geol. Survey, unpublished rept., 1944.

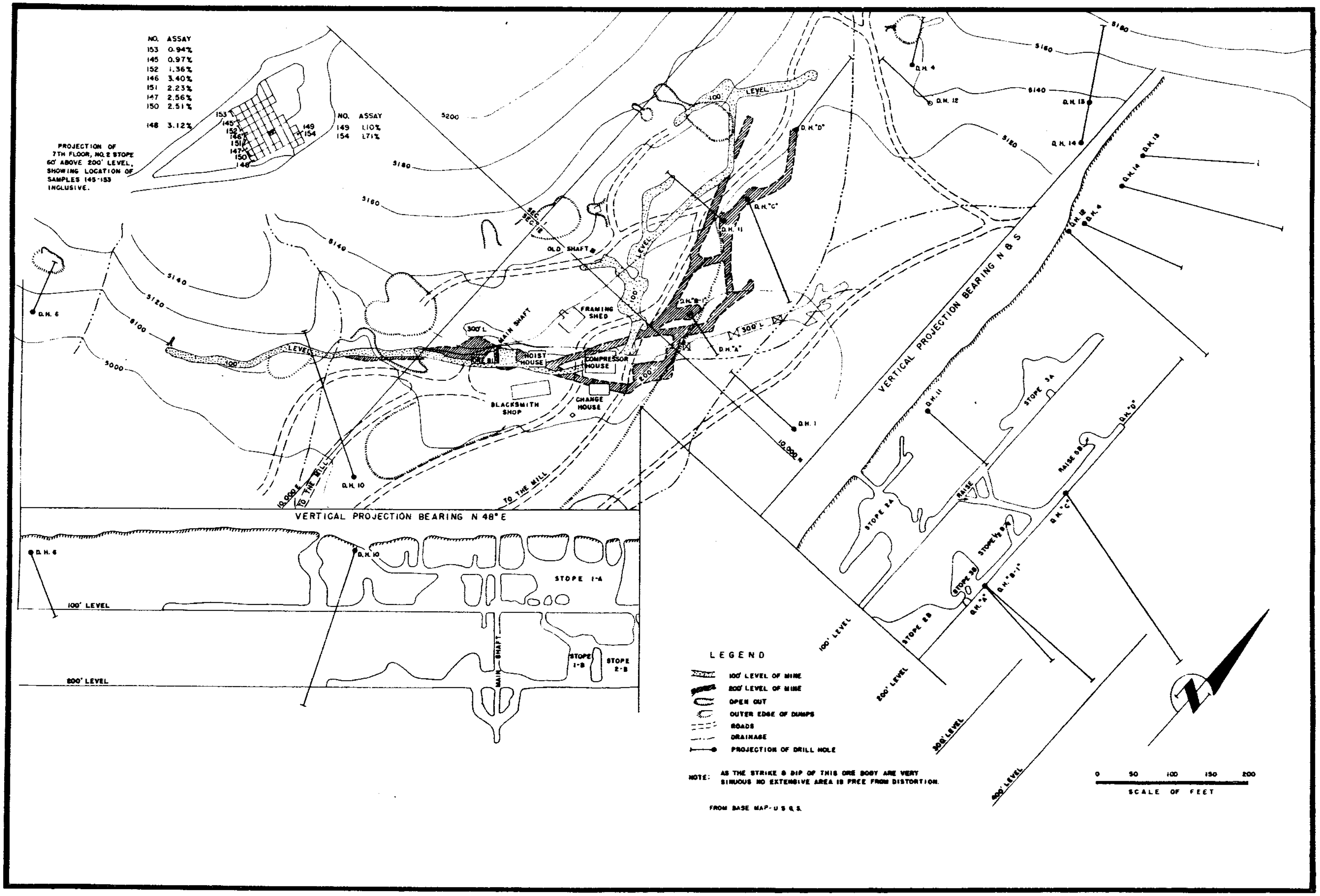


Figure 3. - Composite of underground workings and showing vertical projections, Nevada Scheelite, Inc.

across limestone beds. Several small fingers of tactite penetrate the limestone along bedding planes in this area. One large finger on the 100-level of the mine yielded nearly 10,000 tons of ore. The larger concentrations of scheelite also occur in this area.

Scheelite is restricted to the tactite, and the mineralization was uniform over large areas. Evidently the tungsten-bearing solutions were contemporaneous with tactite-forming solutions.

In places, mainly along concordant contacts between granite and sedimentary rocks, the granite is separated from the limestone by hornfels as much as 40 feet thick. In some of these places, alteration of the adjacent limestone to tactite has not taken place; in other areas the hornfels has not prevented the formation of tactite.

Generally the tactite zones have been well oxidized to the 200-level (bottom level) of the mine, the principal oxide mineral being limonite. However, small areas of unoxidized tactite also occur on the 200-level. The oxidized areas have been crushed by post-mineral faults, probably of small displacement.

MINE WORKINGS AND PLANT

Nevada Scheelite, Inc., has produced tungsten ore from surface pits and trenches and from an underground mine. In the same district, the Eed-A-How claim was worked from a shallow shaft. The Hooper No. 1, the Moore shaft, and the Yankee Girl, developed by a short adit and shallow winze, had suspended operations.

At the time Bureau work was in progress, the Nevada Scheelite mine workings consisted of a vertical three-compartment shaft 270 feet deep, 250 feet of drifts on the 50-foot level, 1,400 feet of drifts and crosscuts on the 100 level, and 1,300 feet of drifts and crosscuts on the 200 level, together with several stopes and raises. (See fig. 3.)

The mine was well-equipped both underground and on the surface. Electric power, generated by two Diesel engines, was available throughout the mine. Electricity was used to operate tuggers, fans, lights, and a diamond drill, underground, and the hoist, compressors, and shop equipment on the surface. A 2-1/2-kw. gasoline-engine-driven generator light plant was used to supply power for camp lighting when the main power plant was not in operation. Compressed air for operating rock drills and tugger hoists was furnished by a 240-c.f.m., V-type, 6-cylinder compressor direct-connected to a 50-horsepower motor, and by a 140-c.f.m., 4-1/2- by 8-inch compressor driven with a V-belt from a 40-horsepower motor.

Hoisting was done with a 4-foot double-drum hoist converted from steam to electric drive by replacing a steam engine with a 75-horsepower motor. This hoist, with 4-foot drums add 1,200 feet of 1-inch cable per drum, had a capacity far exceeding the 40 to 60 tons hoisted per day.

Mine timbers were framed in a timber shed equipped with a 40-inch swing cut-off saw driven by a 25-horsepower motor, a combination band, rip, and cut-off saw with 10-horsepower motor, and a 40-foot conveying roller. Repair work and rock-drill bit sharpening were done in a shop equipped with a forge, electric and acetylene welding outfits, drill press, miscellaneous tool-sharpening equipment, and hand tools.

MINING METHODS

Ore produced from square-set stopes and development drifts was trammed to a shaft with a small electric battery locomotive, hoisted in counter-balanced skips to a surface bin, and trucked to the mill.

The ore occurs in bodies of tactite along the contact of granite and limestone and in fingers of tactite extending into the limestone. In the mine workings the granite forms the hanging wall, with a layer of fault gouge of varying thickness just above the ore. Where the ore zone is nearly vertical, this gouge zone is generally thin, and side pressure on the stopes is moderate. North of the shaft, in stopes 2 and 3, the contact dips under the granite at low angles, and the gouge zone is thick. In this area the hanging wall tends to cave and exerts a heavy pressure on stope and drift timbers. The ore varies from a porous mass of limonitic tactite to very hard, sulfide-bearing tactite. In general, the ore stands well and seldom caves. The limestone footwall is competent, and workings in it normally require no timber.

The mine was developed by drifts driven both north and south from the shaft at the 50, 100, and 200 levels. The early practice was to drive large drifts along the contact for both development and haulage. This method was successful in the thin ore body south of the shaft, but in the thick, flat-dipping ore north of the shaft, the cost of maintaining the timber was excessive. Common practice was to drive the drifts along the contact for prospecting and to drive parallel drifts in the limestone foot-wall for haulageways. Stopes were started from the "contact" drifts, and connecting raises were carried up from the parallel haulageways. After these raises were holed through to the stopes, the broken ore was passed down through them, and the original raises from the contact drifts were used only as manway and supply raises.

Drifts and crosscuts were driven with an unusually large cross section, to permit slusher loading. These workings range in section from 6 to 10 feet to 8 by 12 feet, and in some instances the walls were slabbed off to give final widths up to 20 feet. Drifts along the contact usually are timbered, a 6- by 10-foot 3-piece set being used. In some of the "contact" drifts, notably south of the shaft, no timber was required, whereas in the heavy ground north of the shaft, sets were spaced on 20-inch centers, with pony sets inside the main sets. Drifts and crosscuts in the limestone were not timbered. Wooden ramps, used for slusher loading, were of semipermanent type and were advanced in steps of 150 feet or more. Scrapers used were of the crescent and hoe types, the latter predominating. In the north drift of the 100-foot level, the broken ore and waste were slushed to finger raises that branch off No. 4 raise. It was planned to pass ore mined in stopes above the 100 level through this raise to the 200 level to avoid hand tramming.

Square-set stopes were used throughout the mine, notwithstanding the great variations in the stability of the wall rocks. The original practice was to leave these stopes unfilled. Some are still standing open and show no signs of crushing; others were filled after the stope was completed. In the heavy ground north of the shaft, two large stopes were lost because of caving. When it became apparent that unfilled square sets would not stand, waste raises for stope filling were started in the hanging-wall granite, but the stopes were completely caved before they could be filled. The caving was believed to be almost entirely in the granite hanging wall, with little crushing of the ore.

The square sets used were 4.7 feet, center to center, and 6.7 feet high, constructed of 10-inch square timber. In heavy ground, angle braces and cribbed sets were used. The management justified the use of square-set stoping because of the flexibility of the method in the irregular ore bodies. The company was using raises from level to level before stoping to provide information as to the width and attitude of the ore and to permit more latitude in stoping methods.

THE ORE

Ore is mainly a porous limonitic tactite made up of garnet, epidote, diopside, and limonite, often with some quartz, calcite, wollastonite, and pyrite. Some ore is more massive than the average ore, with little or no limonite. Scheelite is present in all sizes from minus 400-mesh to crystals 1 inch in diameter and larger. Many of the large crystals that show euhedral outlines are actually made up of a fine powder, apparently as a result of crushing or chemical disintegration. Nearly all the scheelite is soft and can be scratched off a specimen with a fingernail. No powellite has been found, and the molybdenum content of the ore is very low. Much of the ore is stained green by copper carbonates, and isolated drill cores were found that assayed 5.4 percent copper. The general mine-run ore, however, contains less than 0.6 percent copper.

At several isolated zones on the 200-foot level the ore contains a high percentage of sulfides, chiefly pyrite and chalcopyrite. Some of these appear to be primary sulfides formed simultaneously with the tactite; others occur as narrow bands of sulfides cutting the tactite. The limonitic and copper carbonate-bearing ores are believed to be oxidation products of these high-sulfide tactites. Hole A, which cut the ore near the 300 level, showed 2.13 percent sulfide sulfur content in the tactite, whereas two bands of ore cut in hole B-1 near the 400 level contained 0.74 percent and 0.50 percent sulfide sulfur, respectively. Hole C, which started in ore on the 200 level and cut an ore body near the 300 level, showed 0.02 percent and 0.07 percent sulfide sulfur for the upper and lower ore zones, respectively. Other holes drilled to ore at or above the 200 level showed less than 0.01 percent sulfur in the ore zones.

BENEFICIATION

The original Nevada Scheelite mill was located at Deadhorse Well, 9-1/2 miles south of the mine. The mill was in two sections, the "old" and "new", both of which employ gravity concentration followed by cleaning on magnetic separators. A new mill was recently constructed at the mine.

Metallurgical results are typical of those produced in gravity - concentration plants on scheelite, where flotation is not used for recovery of the slime values, that is, clean, high-grade concentrate and high tail losses, especially in the slime portion of the tail.

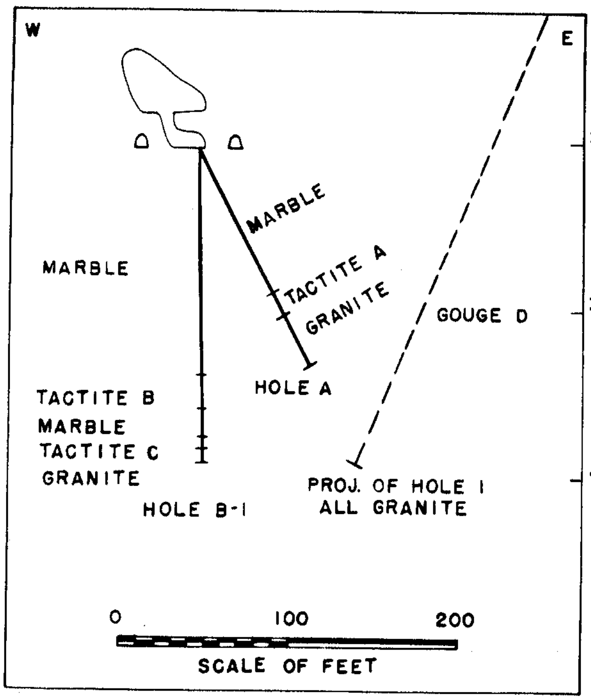
DEVELOPMENT WORK BY BUREAU OF MINES

In July 1943 a proposal was made by the Bureau of Mines and the Federal Geological Survey for core drilling on this property. This proposal included holes designed to test the ore body at the 300 level of the mine and to explore the lateral extension of the ore bodies at the 100 and 200 levels.

Eleven diamond-drill holes with a total length of 2,365 feet were drilled during the project. (See figs. 3, 4, 5, 6, 7, 8 9.) All holes, with the exception of hole 1, cut the tactite zone. Hole 1 was drilled to a depth of 396 feet in granite. This proved that the dip of the contact had reversed in this section and necessitated a revision of the deep-drilling program. The mining company drilled holes A and B from the 200 level of the mine and located the ore zone on the 300 and 400 levels. The Bureau then drilled holes B-1, C, and D from stations on the 200 level. The original surface program to test the lateral extent of the ore bodies was completed and resulted in location of an ore body north of the present mine workings and extension of the ore zone south of the mine workings.

The drilling program outlined at the beginning of the project called for nine surface holes to test for lateral and vertical extensions of known ore bodies. After the first hole was drilled, it was found that underground holes were necessary to test the vertical extensions. Eight surface and three underground holes were drilled for a total length of 2,365 feet. Ten of these holes cut the tactite zone. One hole was drilled by the mining company to assist the project program. The holes are tabulated as follows:

HOLE NO.	INTERVAL FROM	INTERVAL TO	LENGTH FEET	PERCENT WO_3 CORE	PERCENT WO_3 SLUDGE	SIZE OF CORE
	TACTITE "A"					
A	98	111	13	1.09	-	EX = 7/8"
	TACTITE "B"					
B-1	137.5	145.0	7.5	0.63	-	EX = 7/8"
	145	154	9.0	.39	-	"
	138	143	5.0	-	0.62	"
	143	148	5.0	-	.64	"
	148	153	5.0	-	.80	'
B-1	TACTITE "C"					
	170	171	1.0	0.07	-	EX = 7/8"
	171	176.5	5.5	-	0.47	"
1	GOUGE "D"					
	290.5	291.0	0.5	2.37	-	EX



HOLE NO. 1

COORDINATES:	10,029 N.-10,433 E.
ELEVATION:	5,086
DIP:	73°
BEARING:	WEST
LENGTH:	396'

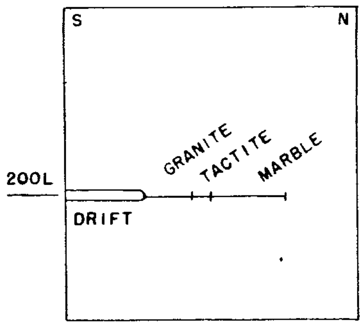
HOLE A

COORDINATES:	10,046 N-10,230 E
ELEVATION:	4,910
DIP:	64°
BEARING:	S 78 E
LENGTH:	146'

HOLE B-1

COORDINATES:	10,046 N 10,230
ELEVATION:	4,910
DIP:	VERTICAL
LENGTH:	189

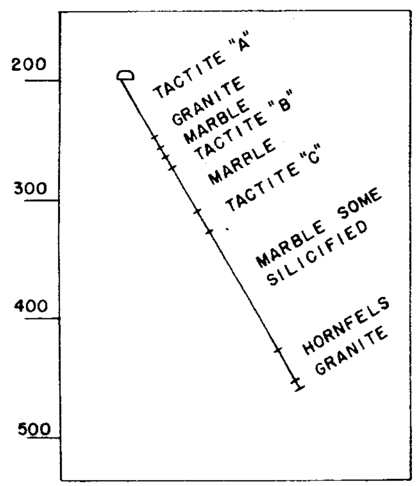
Figure 4. - Vertical section through core-drill holes 1, A, and B-1, Nevada Scheelite mine.



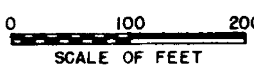
D. D. HOLE "D"

COORDINATES: 10 320 N 10,172 E
ELEVATION: 4,913
DIP: HORIZONTAL
BEARING: N 5 W
LENGTH: 120.0

HOLE NO.	INTERVAL FROM	INTERVAL TO	LENGTH FEET	PERCENT WO3 CORE	PERCENT WO3 SLUDGE	SIZE OF CORE
D	40	44	4	-	0.15	EX = 7/8"
"	44	49	5	-	.06	"
"	49	54	5	-	.05	"



D. D. HOLE "C"



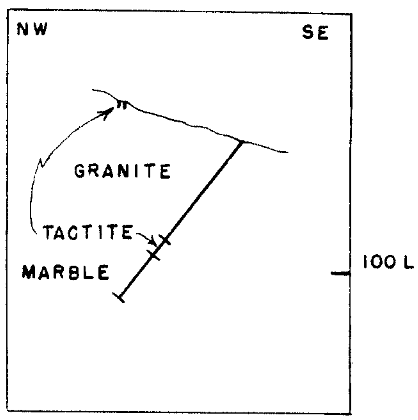
COORDINATES: 10,208 N, 10, 181 E.
ELEVATION: 4,910
DIP: 60°
BEARING: S 65° E
LENGTH: 300'

HOLE NO.	INTERVAL FROM	INTERVAL TO	LENGTH FEET	PERCENT WO3 CORE	PERCENT WO3 SLUDGE	SIZE OF CORE
	TACTITE "A"					
C	0	4	4	1.00	-	NX = 2 1/8"
"	4	10	6	1.84	-	BX = 1 5/8"
"	10	13	3	.85	-	"
"	13	16	3	.21	-	AX = 1 1/8"
"	16	20	4	1.03	-	"
"	20	30	10	.05	-	"
"	30	37	7	.07	-	"
"	37	44	7	1.28	-	"
"	44	48	4	.16	-	"
"	48	51	3	.89	-	"
"	51	54	3	.37	-	"
"	54	57	3	.70	-	"
"	57	62	5	0	-	EX = 7/8"
	TACTITE "B"					
C	76	86	10	0.06	-	EX = 7/8"
	TACTITE "C"					
C	128	133	5	1.11	-	EX = 7/8"
"	133	138	5	1.00		"
"	138	143	5	2.44	1.28	"
"	143	148	5	.68	0.46	"

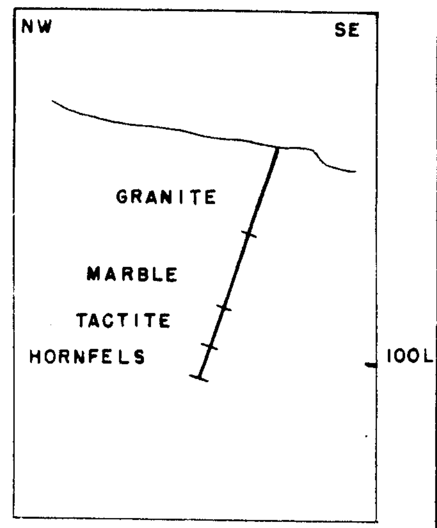
Figure 5. - Vertical sections through core-drill holes C and D, Nevada Scheelite mine.

COORDINATES:	9,463 N 9,585 E	COORDINATES:	10,485 N 10,230 E
ELEVATION:	5,092	ELEVATION:	5,133
DIP:	51°	DIP:	70°
BEARING:	N 13 W	BEARING:	N 25 W
LENGTH:	122'	LENGTH:	151'

HOLE NO. 6



HOLE NO. 4



HOLE NO.	INTERVAL FROM	INTERVAL TO	LENGTH FEET	PERCENT WO_3 CORE	PERCENT WO_3 SLUDGE	SIZE OF CORE
4	103	110	7	0.03	-	AX = 1 1/8"
"	110	113	3	.16	-	EX = 7/8"
"	113	118	5	.04	-	"
"	118	130	12	.01	-	"
6	80	90	10	.47	-	BX = 1 5/8"

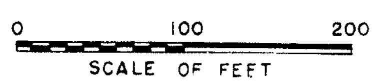


Figure 6. - Vertical section through core-drill holes 4 and 6, Nevada Scheelite mine.

A S S A Y S

HOLE NO.	INTERVAL FROM	INTERVAL TO	LENGTH FEET	PERCENT WO3 CORE	PERCENT WO3 SLUDGE	SIZE OF CORE
10	257	260	3.0	2.48	-	EX = 7/8"
"	258	260	2.0	-	0.45	"
"	260	260.5	.5	.58	-	"
"	260.5	265	4.5	1.66	-	"
"	265	270	5.0	.88	-	"
"	265	267	2.0	-	.09	"
11	124	130	6.0	.01	.07	BX = 1 5/8"
"	130	135	5.0	.03	.28	"

COORDINATES:	9,589 N.-10,045.
ELEVATION:	5,085
DIP:	45°
BEARING:	N 61 W
LENGTH:	295'

COORDINATES:	10,165 N.-10,182 E.
ELEVATION:	5,120
DIP:	46°
BEARING:	WEST
LENGTH:	146'

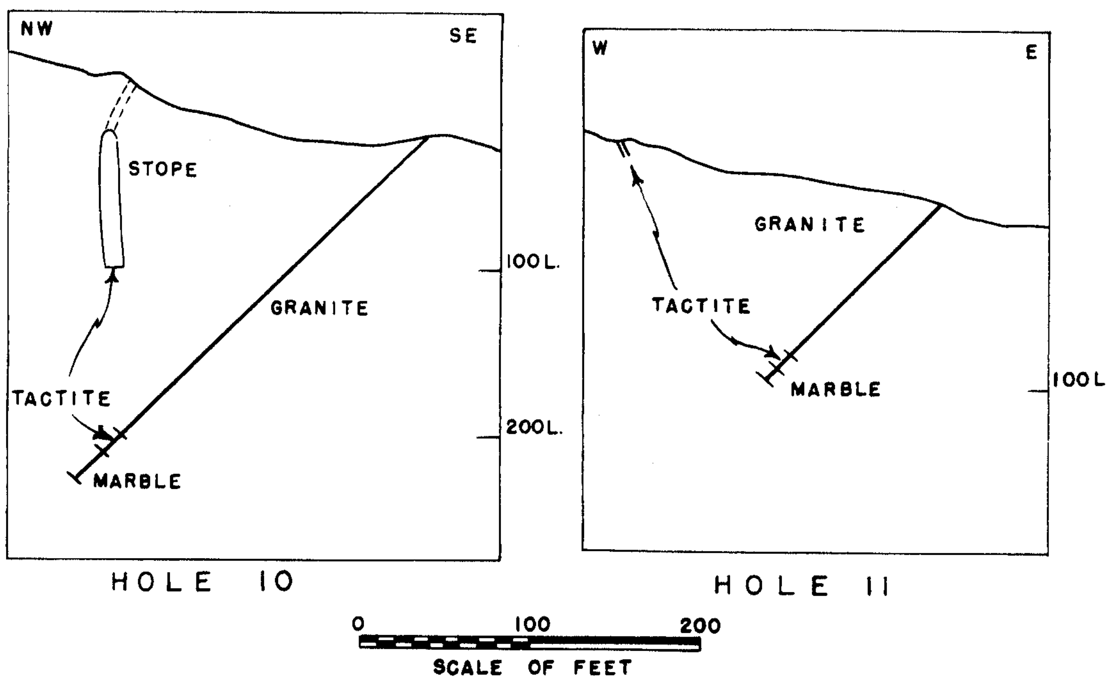
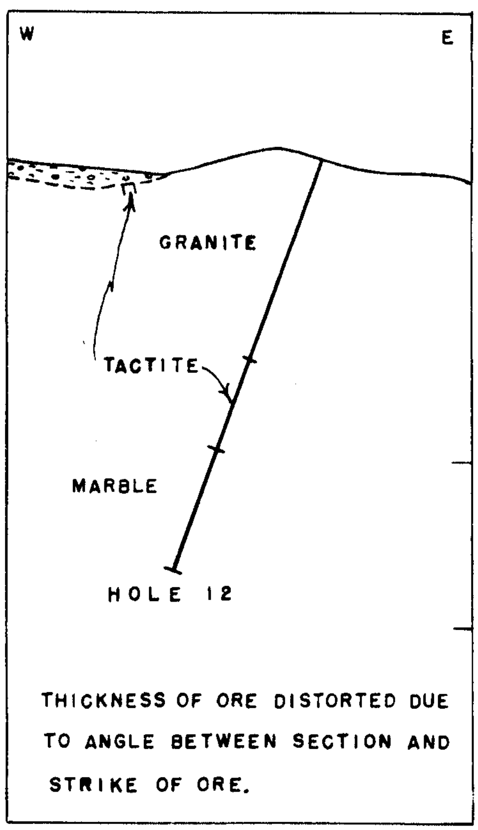


Figure 7. - Vertical sections through core-drill holes 10 and 11, Nevada Scheelite mine.

A S S A Y S

HOLE NO.	INTERVAL FROM	TO	LENGTH FEET	PERCENT WO3 CORE	SLUDGE	SIZE OF CORE
12	128	132	4	0.55	-	BX = 1 5/8"
"	132	137	5	2.35	0.48	"
"	137	139	2	.05	-	"
"	137	141	4	-	.86	"
"	139	143	4	GRANITE	AND	GOUGE "
"	143	147	4	0.71	0.68	"
"	147	152	5	.23	.80	"
"	152	157	5	.45	.65	"
"	157	162	5	1.38	2.99	"
"	162	167	5	.76		"
"	167	170	3	.26	1.16	"
"	170	175	5	1.49	1.04	AX = 1 1/8"
"	175	180	5	.70	.86	"
"	180	183	3	0	.97	"



COORDINATES: 10,466 N 10,282 E

ELEVATION: 5,137

DIP: 70°

BEARING: WEST

LENGTH: 260'

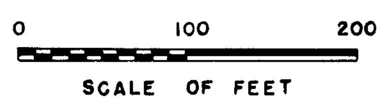


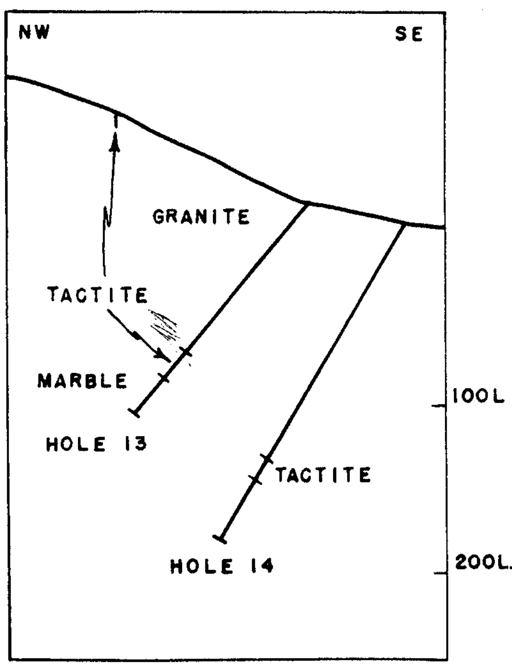
Figure 8. - Vertical section through core-drill hole 12, Nevada Scheelite mine.

A S S A Y S

HOLE NO.	INTERVAL FROM	INTERVAL TO	LENGTH FEET	PERCENT WO_3 CORE	PERCENT WO_3 SLUDGE	SIZE OF CORE
13	117	126	9	1.16	-	AX = 1 1/8"
				-		
"	126	131	5	-	0.01	"
"	131	133	2	.01	-	"
"	131	136	5	-	.04	"
"	136	140	4	-	.01	"

1./ ORE IN HOLE 13 IS BELIEVED TO EXTEND FROM 117 TO 122 FEET WITH BARREN TACTITE FROM 122 TO 126 FEET.

HOLE NO.	INTERVAL FROM	INTERVAL TO	LENGTH FEET	PERCENT WO_3 CORE	PERCENT WO_3 SLUDGE	SIZE OF CORE
14	165	167	2	0.02	0.02	BX = 1 5/8"
"	167	172	5	.65		"
"	172	177	5	.02	.02	"



HOLE 13

COORDINATES: 10,603 N,-10,435 E

ELEVATION: 5,132

DIP: 50°

BEARING: N 30 W

LENGTH: 166'

HOLE 14

COORDINATES: 10, 557 N - 10, 463 E

ELEVATION: 5, 126

DIP: 60°

BEARING: N 30 W

LENGTH: 220'

0 100 200

SCALE OF FEET

Figure 9. - Vertical section through core-drill holes 13 and 14, Nevada Scheelite mine.

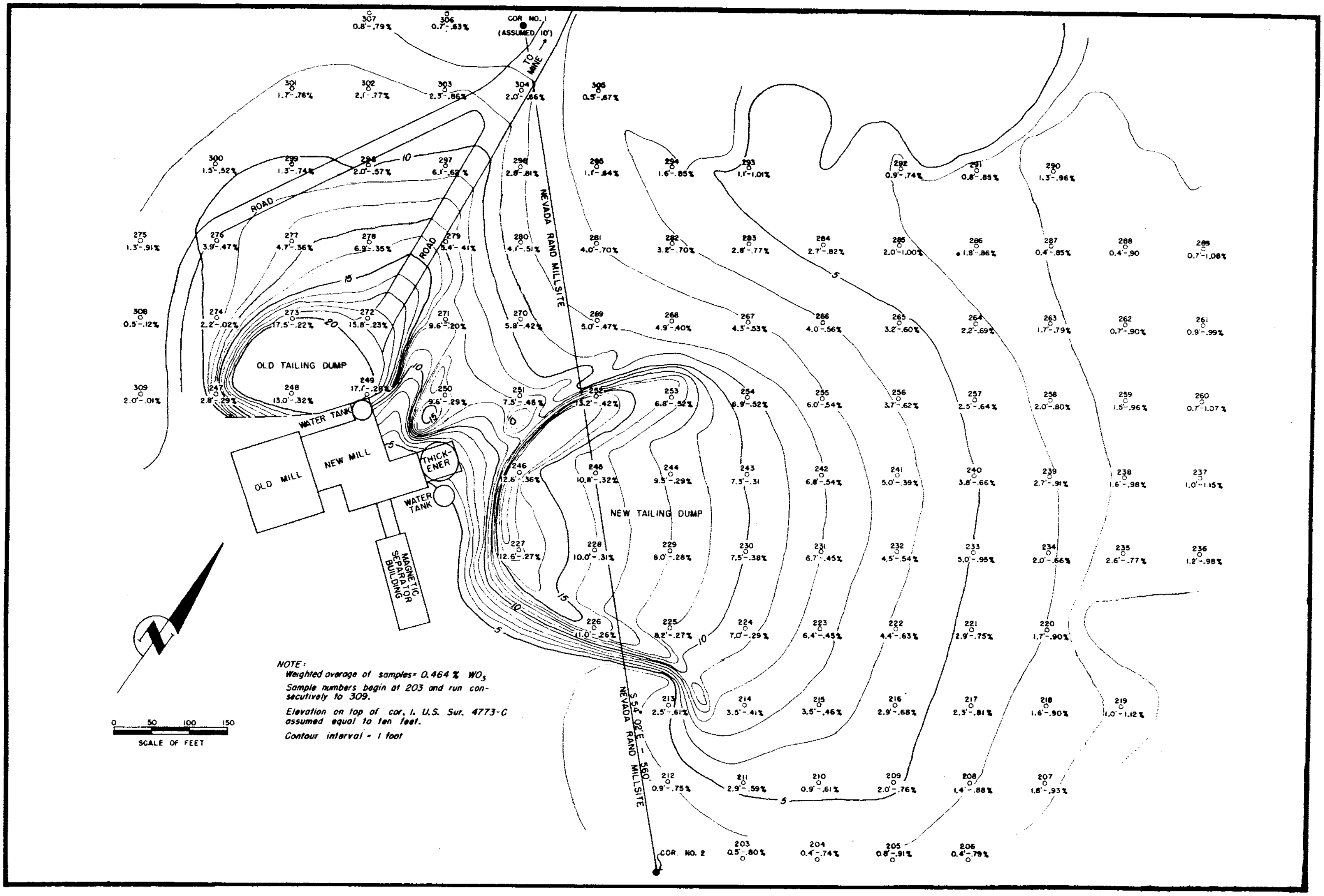


Figure 10. - Tailing dumps.

Hole	Coordinates North	East	Elevation	Dip	Bearing	Depth
1.......	10,029	10,433	5,086	73°	W.	396
4.......	10,485	10,230	5,133	70°	N.25° W.	151
6.......	9,463	9,585	5,092	51°	N.13° W.	122
10.......	9,589	10,045	5,085	45°	N.61° W.	295
11.......	10,165	10,182	5,120	46°	W.	146
12.......	10,466	10,282	5,137	70°	W.	260
13.......	10,603	10,435	5,132	50°	N.30° W.	166
14.......	10,557	10,463	5,126	60°	N.30° W.	220
A1/......	10,046	10,230	4,910	64°	S.78° E.	1/(146)
B-1......	10,046	10,230	4,910	90°	-	189
C........	10,208	10,181	4,910	60°	S.65° E.	300
D........	10,320	10,172	4,913	0	N. 5° W.	120
						2,365

1/ Hole drilled by mining company to assist Bureau project.

Core recovery in the tactite zone ranged from 0 to 100 percent, averaging 42 percent. The inclination of hole 1 was checked by surveying with a hydrofluoric acid etch on a glass tube. Analyses of samples for diamond-drill holes C, 10, and 12 are given in the appendix.

METALLURGICAL REPORT ON TAILINGS DUMP

In April 1943 the Bureau sampled the mill tailing dump (fig. 10), calculated at that time to contain about 51,000 tons. There were a total of 107 4-inch-diameter auger holes drilled and sampled. These holes were regularly spaced at 250 foot intervals. A composite of the 107 samples, weighing 2,400 pounds, was sent to the Bureau of Mines Salt Lake City Branch for testing to determine whether the tungsten remaining in the dump could be recovered as a shipping or leaching-grade product.

The following is a report on the tests by H. G. Poole of the Salt Lake City Branch, Bureau of Mines:

> Mineralogically, this ore consists of garnet, quartz, calcite, fluorite, orthoclase, iron-manganese oxides, and minor amounts of pyrite and chalcopyrite. The sample assayed 0.47 percent WO_3, and over half of the tungsten in the sample is represented by scheelite; however the intimacy of association of tungsten and limonitic iron in some of the magnetic fractions indicates the possible presence of tungstite or some Fe-WO_3 mineral. Grain size of the scheelite ranges from 100- to 400-mesh, with an average of minus 200-mesh. Despite the uniformly small grain size of the tungsten mineral, best recoveries were obtained at sizes coarser than necessary for optimum liberation. When fine grinding was employed, excessive amounts of tungsten mineral were lost in refractory slime portions. Owing to the presence of calcite with the scheelite, the selectivity of fatty-acid flotation in the size ranges of optimum liberation was very poor.

The ore was difficult to treat, and neither high recoveries nor high-grade concentrates were obtained by ore-dressing methods. Extensive testing has been done with gravity, flotation, and leaching methods of treatment. The ore is too low-grade for direct autoclave digestion with sodium carbonate solutions as used by U. S. Vanadium Co., and all leaching was carried on at atmospheric pressures.

Over half the weight of the sample occurs in the 10- to 100-mesh sizes, and little or no concentration was possible by ore-dressing methods in this range. Optimum results were obtained by flotation and gravity concentration of ore ground to minus 65-mesh. By this treatment, 45 percent of the tungsten content was recovered in a marketable product assaying 3 to 4 percent WO_3. The slime portion of the ore proved refractory to all methods of treatment except leaching. By hot alkaline digestion at 1 atmosphere and 100° C., 51 to 71 percent of the tungsten content of the slime was extracted. The period of digestion could be shortened and the recoveries increased by high-pressure autoclave treatment, but the available tonnage and grade are too low to stand the high amortization charges for this type of plant.

METALLURGICAL REPORT ON SAMPLE OF ORE FROM SULFIDE ZONE, NEVADA SCHEELITE PROPERTY

This sample assayed considerably higher in WO_3 than the normal mill feed but represents the type of high-sulfide ore that cannot be handled readily in the present mill. The ore contains chiefly feldspar, quartz, calcite, garnet, and a small amount of epidote. The heavy minerals are scheelite, magnetite, pyrite, chalcopyrite, covellite, limonite, and a small amount of manganese oxide and hematite. The scheelite content is distributed uniformly throughout the ore, and fine inclusions in iron minerals were noted down to minus 400-mesh. A representative sample cut from this lot of ore assayed as follows:

	Assay, percent							
	WO_3	Fe	Mn	Cu	S	Insol.	SiO_2	CaO
Sulfide ore....	2.88	19.3	1.25	0.65	8.15	43.0	28.8	17.0

In order to treat this type of ore in the present mill, it would be necessary to install flotation equipment ahead of the roasters and magnetic separators to remove the bulk of sulfides. As the iron sulfides and oxides vary in their tungsten content, and as even optimum operating conditions will leave a refractory middling product, it would be desirable to operate the flotation, roaster, and magnetic separator plant as a twin unit. Half of this plant would treat a high-grade scheelite product containing only a small portion of the sulfide iron to make a tungsten concentrate and a stock-pile middling; the other half would handle a lower-grade scheelite product containing the bulk of sulfide iron to make a tungsten concentrate, which probably would require an additional pass on cleaner table, and a finished iron reject.

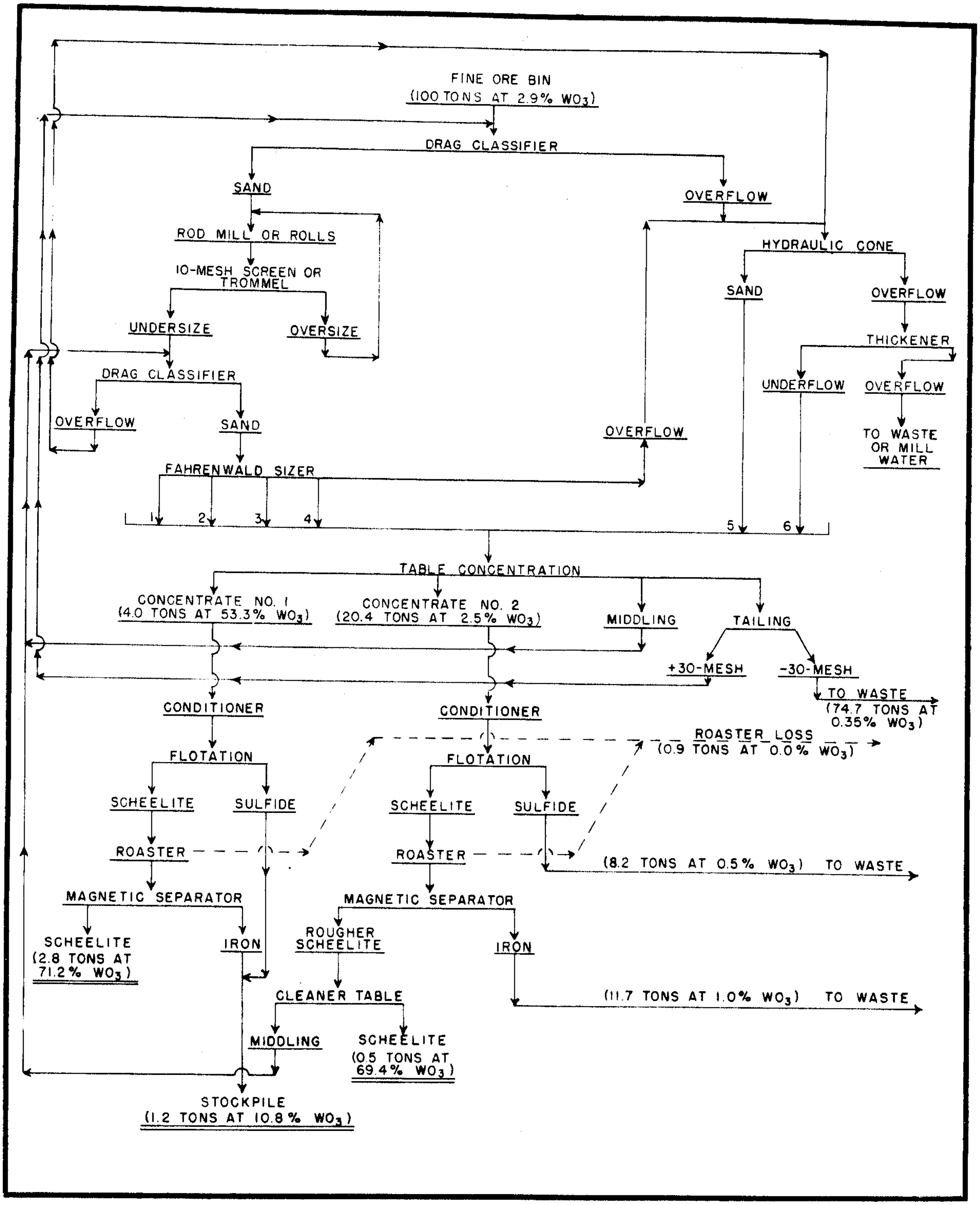


Figure 11. - Flow sheet Nevada Scheelite, Inc., Mineral County, Nev.

The following table shows the tungsten distribution following this type of treatment and illustrates the difference in grade of the iron rejects from the two concentrate re-treatment circuits:

	Weight, percent	WO_3, percent	Distribution, percent WO_3
Combined concentrate..	3.3	70.9	80.7
Stock-pile Fe.........	1.2	10.8	4.6
Rject Fe..............	19.9	.8	5.7
Rougher tailing.......	61.6	.2	4.9
Slime.................	13.1	.9	4.1
Roaster loss..........	.9	-	-
Calculated heads......	100.0	2.9	100.0

To avoid overloading the mill, the iron products should not be circulated but should be stock-piled either for separate re-treatment at intervals or for sale to chemical treatment plants. By keeping the iron circuits separate, the bulk of iron can be rejected at a relatively low tungsten grade.

A tentative flow sheet incorporating the above treatment details is shown on figure 11.

APPENDIX

ANALYSES OF DIAMOND DRILL-HOLE SAMPLES

Hole C. (See fig. 5)

Footage			Core		Analyses Percent WO_3		
From-	To-	Feet	Size	Percent Recovery	Core	Sludge	Remarks
0	4	4	2-1/8	30	1.00	-	Tactite "A"
4	10	6	1-5/8	65	1.84	-	
10	13	3	1-5/8	70	.85	-	
13	16	3	1-1/8	66	.21	-	
16	20	4	1-1/8	67	1.03	-	
20	30	10	1-1/8	26	.05	-	
30	37	7	1-1/8	48	.07	-	
37	44	7	1-1/8	29	1.28	-	
44	48	4	1-1/8	32	.16	-	
48	51	3	1-1/8	53	.89	-	
51	54	3	1-1/8	57	.37	-	
54	57	3	1-1/8	53	.70	-	
57	62	5	7/8	14	0	-	
76	86	10	7/8	41	.06	-	Tactite "B"
128	133	5	7/8	84	1.11	-	Tactite "C"
133	138	5	7/8	66	1.00	-	
138	143	5	7/8	24	2.44	1.28	
143	148	5	7/8	26	.68	.46	

HOLE 10. (See fig. 7)

257	260	3	7/8	-	2.48	-	Core recovery 250-260 = 25%
258	260	2	7/8	-	-	0.45	
260	260.5	0.5	7/8	40	.58	-	
260.5	265	4.5	7/8	84	1.66	-	
265	270	5	7/8	10	.88	-	
265	267	2	7/8	-	-	.09	

Hole 12. (See fig. 8)

Footage			Core		Analyses		
				Percent	Percent WO_3		
From-	To-	Feet	Size	Recovery	Core	Sludge	Remarks
128	132	4	1-5/8	45	0.55	-	
132	137	5	1-5/8	46	2.35	0.48	
137	139	2	1-5/8	50	.05	-	
137	141	4	1-5/8	42	-	.86	
143	147	4	1-5/8	55	.71	.68	
147	152	5	1-5/8	46	.23	.80	
152	157	5	1-5/8	34	.45	.65	
157	162	5	1-5/8	28	1.38	2.99	
162	167	5	1-5/8	24	.76	-	
167	170	3	1-5/8	10	.26	1.16	
170	175	5	1-1/8	34	1.49	1.04	
175	180	5	1-1/8	14	.70	.86	
180	183	3	1-1/8		-	.97	Core recovery 180-185 = 28%