



GEOLOGICAL
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OF
CANADA

DEPARTMENT OF MINES
AND TECHNICAL SURVEYS

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MINERAL INDUSTRY OF YUKON TERRITORY
AND SOUTHWESTERN DISTRICT OF MACKENZIE
1960

R. Skinner



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MINERAL INDUSTRY OF YUKON TERRITORY
AND SOUTHWESTERN DISTRICT OF MACKENZIE, 1960

INTRODUCTION

Information for this preliminary account was gathered from visits during 1959 and 1960 to most of the properties described, from personal communications with individuals and companies, from recent technical papers, from annual reports of the Mining Recorders at Dawson and Mayo and from the staff of the Mining Recorder's office at Whitehorse. The writer is grateful to the persons and companies concerned for their assistance and cooperation. Some of the historical and geological information was taken from earlier reports of the Geological Survey.

During the 1960 field season the writer visited the silver-lead-zinc mines of United Keno Hill Mines Limited on Galena and Keno Hills, the copper deposit of Johobo Mines Limited at Sockeye Lake, the tungsten deposit of Canada Tungsten Corporation Limited on Flat River, District of Mackenzie, most of the placer operations in the Klondike area, and the placer operations on Burwash and Bullion Creeks in the Kluane Lake area. These and other properties had been visited by the writer in previous years.

Reports on the mining industry of Yukon for the years 1929 and 1930 were written by W. E. Cockfield, and for the years 1931 to 1940 by H. S. Bostock; these are listed in the Selected Bibliography. Useful and interesting accounts of geological surveys and mining activity during the years 1898 to 1933 are reprinted in GSC Memoir 284 (see Bostock, 1957)*.

Mining activity in the Yukon during 1960 was about the same as in the previous year. The chief producer—United Keno Hill Mines Limited—operated the Hector, Calumet, and Elsa mines on Galena Hill, and produced \$8,793,284 silver, lead, zinc, and cadmium. Two small lode-mining operations were conducted: Johobo Mines Limited produced about 1,000 tons of high-grade copper ore from the Bornite Creek deposit near Sockeye Lake in Dezadeash map-area; and B. O'Neil and R. McKamey mined about 100 tons of high-grade silver-lead ore from the Comstock property on Keno Hill. Yukon Coal Company at Carmacks produced 4,445 tons of coal.

Yukon Consolidated Gold Corporation, Limited—the second-largest producer in the Yukon—operated six dredges, a hydraulic-sluicing plant and a bulldozer-sluicing plant near Dawson in the Klondike area, and produced \$2,169,300 gold and silver. Several small-scale

*Names and dates in parentheses refer to publications listed in the Selected Bibliography.

placer operations, mainly in the Klondike area, produced a total of about \$448,400 gold and silver. Table I, made up from Mining Recorders' annual reports, gives approximate 1960 production of placer gold and silver by areas in the Yukon.

Table I
Yukon Placer Gold and Silver Production, 1960

Area	Number of Operators	Production (approx.)	
		Gold (ounces)	Value of Gold and Silver (\$)
Klondike			
Y. C. G. C. *	1	63,300	\$2,169,300
Others	14	6,365	207,400
Sixtymile	3	1,500	50,000
Henderson-			
Kirkman Creek	2	1,050	31,000
Mayo	6	2,465	80,000
Kluane Lake	4	4,000	120,000
Total	30	78,680	\$2,657,700

* Yukon Consolidated Gold Corporation, Limited.

Most of the exploration and prospecting in Yukon and southwestern District of Mackenzie in 1960 was done by large companies. The most important recent development was the discovery and exploration of a large high-grade tungsten deposit on Flat River, District of Mackenzie, about 135 miles north of Watson Lake. The orebody is estimated to contain 1.32 million tons of ore with 2.51 per cent tungsten trioxide per ton. Of interest is the exploration being done by Klondike Lode Gold Mines Limited in the Klondike area; trenching and sampling between upper Bonanza and Eldorado Creeks has revealed zones of gold-bearing quartz veins that may be large and rich enough to mine on a large scale. Ormsby Mines Limited has acquired the Laforma property—a small high-grade gold mine on Freegold Mountain, west of Carmacks—and hopes to explore and develop the mine soon. Cerro de Pasco Corporation explored a copper deposit on Sockeye Lake in Dezadeash map-area. Conwest Exploration Company Limited explored a gold property in the Ketzka River area and a silver-lead deposit on Tinta Hill near Freegold Mountain.

Prospecting emphasis was in the Logan Mountains in the areas of Flat, South Nahanni, and upper Hyland Rivers, where Mackenzie Syndicate, Phelps Dodge Corporation, Canadian Explorations Limited, Nahanni Sixty Syndicate, and Conwest Exploration Company Limited were active. Cassiar Asbestos Corporation prospected the southeastern Pelly Mountains area and discovered a large copper-bearing sulphide zone at Fire Lake, which it will explore in 1961. The St. Elias Mountains have been prospected during the last 2 or 3 years by Frobisher Limited and Southwest Potash Corporation. American Smelting and Refining Company Limited examined properties in the Galena Hill - Keno Hill area. The Consolidated Mining and Smelting Company Limited examined several showings in the Yukon and made preparations for an exploration program in 1961.

Table II

Mineral Production of Yukon Territory
(figures supplied by Dominion Bureau of Statistics)

Mineral	1959		1960*	
	Quantity	Value (\$)	Quantity	Value (\$)
Gold.....	66,960 oz	\$2,247,847	77,770 oz	\$2,638,736
Silver	7,054,632 oz	6,192,556	6,765,450 oz	6,011,779
Lead.....	21,592,456 lb	2,290,960	17,546,060 lb	1,873,919
Zinc.....	13,246,532 lb	1,621,375	10,323,961 lb	1,377,216
Cadmium .	141,750 lb	181,440	143,513 lb	203,788
Coal.....	3,879 tons	58,200	4,945 tons	74,414
Total		\$12,592,378		\$12,179,852

*Preliminary figures.

Table III

Mineral Claims Recorded, Yukon Territory
(figures supplied by Department of Northern Affairs and
National Resources)

Mining District	1957	1958	1959	1960
Whitehorse	280	725	521	928
Mayo	144	94	71	165
Dawson	<u>443</u>	<u>124</u>	<u>85</u>	<u>244</u>
Total	867	943	677	1,337

Table IV

Value of Mineral Production, Yukon Territory
(figures supplied by Dominion Bureau of Statistics)

Mineral	1956	1957	1958	1959	1960*	Cumulative Total to Dec. 31, 1960
Gold.....	\$2,480,434	\$2,481,425	\$2,301,975	\$2,247,847	\$2,638,736	\$252,373,102
Silver	5,553,619	5,665,232	5,569,348	6,192,556	6,011,779	78,375,175
Lead	3,971,215	3,488,023	2,449,920	2,290,960	1,873,919	39,797,815
Copper	- - -	- - -	- - -	- - -	- - -	2,711,695
Coal.....	111,104	91,595	56,379	58,200	74,414	1,945,339
Tungsten.....	- - -	- - -	- - -	- - -	- - -	25,888
Zinc.....	3,124,194	2,069,741	1,688,811	1,621,375	1,377,216	21,886,087
Antimony	- - -	- - -	- - -	- - -	- - -	173
Cadmium	415,868	315,782	244,323	181,440	203,788	3,276,407
Total.....	\$15,656,434	\$14,111,798	\$12,310,756	\$12,592,378	\$12,179,852	\$400,391,681

*Preliminary figures.

PLACER MINING

Klondike Area

The Yukon Consolidated Gold Corporation, Limited operated six electrically driven dredges, a hydraulic operation, and a bulldozer-sluicing plant in the Klondike area in 1960. The company holds most of the placer ground in the district (1,109 claims and two hydraulic leases). This is on Hunker and Bonanza Creeks, southern tributaries of Klondike River, and on Dominion, Sulphur, and Quartz Creeks, northern tributaries of Indian River. A 100-mile network of roads connects all the operations with Dawson and with the company's office, shops, gold room, etc. at Bear Creek, 8 miles east of Dawson. The company also operates a 15,000-hp. hydro-electric plant on Klondike River about 4 miles below the junction of the north and south forks of the river. This plant supplies power to the city of Dawson and drives the dredges and shop equipment.

The discovery of gold on Bonanza Creek in August 1896 resulted in the Klondike gold rush of 1898. Production reached a peak value of \$22,275,000 in 1900, but by 1907 most of the rich, easily mined ground had been worked out and production declined to \$3,150,000. However, when dredging was introduced to the Klondike in 1905 and various interests were amalgamated, gold production increased to \$5,846,780 in 1913, an amount unexceeded since. The richer hydraulic and dredging areas were gradually exhausted and the value of production diminished to \$1,243,287 in 1923; from then until 1934 it was less than \$1,000,000.

Yukon Consolidated had acquired most of the reserves of the Klondike district, and in 1932 the company began to explore these gravels; this work proved the presence of huge reserves. The rise in the price of gold on January 31, 1934—from \$20.67 (U.S.) to \$35 (U.S.) an ounce—increased the yardage and value of these reserves and made it possible to improve equipment and methods, so that by 1939 annual production had increased to more than \$3,000,000. Labour shortages during World War II resulted in fewer dredges being operated, and production decreased to \$618,400 in 1944.

Available figures on operations of the Yukon Consolidated Gold Corporation (from Financial Post Survey of Mines, 1961, p. 327) are as follows:

Year	Cubic Yards Treated	Value of Gold (and Silver) Recovered
1932-56	160,102,905	\$41,415,185
1957.....	6,283,046	1,934,843
1958.....	6,130,347	1,894,772
1959.....	5,914,587	1,804,449

The following is a short account of the present operations of the company.

Dredge No. 6 (7-cubic-foot buckets) is at the mouth of lower Sulphur Creek. It was built in 1935 on lower Dominion Creek and placed in service in 1936. It mined until November 1960, except for the years 1943-47 inclusive.

Dredge No. 8 (7-cubic-foot buckets) is about 3 miles up Sulphur Creek. It was built in 1937 on claim No. 49 Below Discovery on Middle Sulphur area and placed in service in 1938. It mined until November 1960, except for the years 1943-45 inclusive.

Dredge No. 9 (5 3/4-cubic-foot buckets) is on the left limit of Sulphur Creek about 6 miles from King Solomon Dome. It was constructed in 1938 on upper Sulphur Creek and put in operation that autumn. It mined until the end of the 1960 season, except for the years 1943-48 inclusive.

Dredge No. 10 (7-cubic-foot buckets) is on the left limit of Dominion Creek about a mile above Jensen Creek. It was constructed in the autumn of 1939 on claim No. 10 Below Lower Discovery (about a mile above Portland Creek) in the middle Dominion Creek area. It mined until November 1960, except for the year 1945.

Dredge No. 11 (7-cubic-foot buckets) is on Hunker Creek at the mouth of Last Chance Creek. It was constructed on claim No. 57 Below Discovery in Middle Hunker area during the spring and summer of 1939 and started digging in September of that year. It mined until November 1960, except for the year 1944.

Dredge No. 12 (1.2-cubic-foot buckets) finished mining No. 12 Reserves in the autumn of 1960 on claim No. 145 Below Discovery, on the left limit bench of Dominion Creek about 1/2 mile below Jensen Creek. It was constructed on claim No. 134 Below Discovery on Dominion Creek in 1953 and commenced digging in the spring of 1954. It mined every season including 1960.

Dredge No. 4 was the last of the large dredges to operate in the Klondike. Its bucket line had about 65 buckets of 16-cubic-foot capacity—as did dredges No. 2 and 3. Dredge No. 4 started on Bonanza Creek in 1941, on or near claim No. 65 Below Discovery (a short distance above Sourdough Hill). It worked its way up Bonanza Creek (except during 1945) until the end of the 1959 season, when it finished just above Queen Gulch, or about on claim No. 23. This dredge was capable of digging as much as 5 feet into the schistose bedrock that underlies the district and to a total depth of 52 feet below the waterline. Its average capacity was about 12,000 cubic yards of gravel per day or 1,800,000 cubic yards a season. During the last few years of its operation,

dredge No. 4 was hindered by the large amount of gravel that had to be dug. Some tailings from hydraulic mining of the White Channel bench gravels are up to 50 feet above the level of the creek. This, as well as the 40 or 50 feet of gravel below the waterline, had to be dug, reducing the value of the grade handled to as little as 10 cents a cubic yard. Consequently, the dredge was operating at a loss and had to be shut down.

Most of the following information was kindly supplied by Mr. A. G. Barrett, Manager of Yukon Consolidated Gold Corporation, Limited, Dawson.

The hydraulic-sluicing plant is in White Channel gravels on Paradise Hill, which is on the left limit bench of Hunker Creek Road. This plant began operations in 1952 and continued each season, except 1959, until the work was completed in 1960. During the 1960 season, 169,000 cubic yards of gravel was mined and 161,000 square feet of bedrock was cleaned; 2,697 ounces of gold and 589 ounces of silver were recovered, yielding \$92,200. In the years 1952 to 1960 inclusive, 1,634,000 cubic yards was mined and 830,500 square feet of bedrock was cleaned. The recovery totalled 22,378 ounces of gold and 4,901 ounces of silver, valued at \$1,634,000.

During the 1958 and 1959 mining seasons the bulldozer-sluicing plant was on the left limit bench of Dominion Creek on No. 14 Reserves about 3 miles above Jensen Creek. In 1958 the plant mined 154,000 cubic yards of gravel and recovered 3,077 ounces of gold and 650 ounces of silver, valued at \$105,000. The plant's 1959 yield, from the mining of 121,000 cubic yards of gravel, was 2,083 ounces of gold and 450 ounces of silver, valued at \$70,000. In 1960 the bulldozer-sluicing plant moved on to No. 15 Reserves, where it mined 139,000 cubic yards of gravel and recovered 2,339 ounces of gold and 472 ounces of silver, yielding \$79,700.

Stripping of No. 9 and No. 10 Reserves was completed in 1960, and was also carried out on No. 15 Reserves on Dominion Bench. Total stripping for the year was 1,021,000 cubic yards. Thawing was done ahead of dredges No. 6, No. 9, and No. 10, for a 1960 total of 3,456,000 cubic yards. From 1941 to 1948 inclusive, thawing points were spaced at 16-foot centres, but since 1948 the spacing has been increased to 24 feet.

Mining commenced on April 25, 1960 and continued until November 21, employing a maximum of 347 men. The six dredges, together with the hydraulic and bulldozer operations, mined 4,826,000 cubic yards of gravel and recovered 63,314 ounces of gold and 13,588 ounces of silver, valued at \$2,169,300.

At the close of the 1960 season, stripped reserves were 8,202,200 cubic yards, thawed reserves were 7,114,000 cubic yards and proven gravel reserves were 19,536,800 cubic yards grading a value of about 38 cents a cubic yard.

The geology of the Klondike area is described by McConnell (1905, 1907) and reprinted in Bostock's report (1957, pp. 64, 217), and is shown on a map by Bostock (1942). This area is an unglaciated region of deeply weathered rolling hills separated from one another by open V-shaped valleys. The rocks are mainly quartz-sericite schists derived from igneous rocks (Klondike schists), but include metamorphic rocks derived from sedimentary rocks—gneiss, quartzite, dark schist, and slate (Yukon group)—and gneissic granite, and basic igneous rocks, all probably of Precambrian age. Granite and granodiorite, probably of Jurassic age, intrude Yukon group rocks in the western part of the district. Some Tertiary sedimentary and volcanic rocks are also present. The gold is derived chiefly from innumerable quartz stringers and veins that cut the Klondike schist. A long history of undisturbed weathering and erosion has enabled the gold to accumulate and remain in the stream channels.

Bonanza Creek

Arthur Fry operates a small hydraulic pit in White Channel gravels on King Solomon Hill, 3 miles up Bonanza Creek on the left limit bench immediately south of Boulder Creek. From April 15 to October 31, 1960, Fry, assisted by his son during the school holidays, mined 35,000 cubic yards of gravel from which 225 ounces of gold was recovered. The pit, about 250 feet above the level of Bonanza Creek, has a working face 25 to 30 feet high and 75 to 100 feet long. Water is piped from upper Boulder Creek for use in the monitors and an RD-6 bulldozer is used to move the gravel to the sluice-box, which drains through a ditch cut in the Klondike schist bedrock.

H. C. and D. F. Boutillier operate a bulldozer-sluicing plant about 3,500 feet up Adams Creek—one of the largest tributaries of Bonanza Creek; it comes in from the west about a mile below Eldorado Forks. The Boutillier brothers, using a TD-40 bulldozer and a sluice-box, mined from April 1 to October, 1960 on claim No. 8 (above the mouth of the creek) and recovered 280 ounces of gold. Adams Creek flows in a narrow V-shaped valley whose bed at the workings is about 50 feet wide and contains about 5 feet of coarse gravel. These gravels are difficult to work as they contain a large number of Klondike schist slabs between 18 inches and 4 feet long. Although the gravels are relatively poor, they contain coarse gold. Nuggets up to 6 1/2 ounces have been recovered from them.

Joseph Lamontagne stripped ground on Bonanza Creek from late July to October 15, 1960 in preparation for mining in 1961. From April 1 to mid-July, Lamontagne operated on Bedrock Creek in the Sixtymile River area.

Eldorado Creek

In preparation for mining in 1961, Ballarat Mines Limited tested and stripped placer ground on Eldorado Creek below Gay Gulch and built a gravel dam equipped with an automatic gate at the gulch. (The main operation is described here under 'Dominion Creek'.)

Hunker Creek

John and Ian C. Bremner operate a hydraulic-sluicing plant on Last Chance Creek, the first main tributary of Hunker Creek; it comes in from the southwest as one goes upstream. In 1960, the Bremners and a hired man mined from April 15 to October 15, and produced about 200 ounces of gold.

R. S. and J. A. Gould have a small hydraulic-sluicing plant in White Channel gravels on the left limit bench of Hunker Creek, at Nugget Hill, between Hester and Independence Creeks. The gravels there are coarse, about 10 feet thick, and contain many quartz boulders up to 2 feet long. The boulders are removed with a wheelbarrow or D-4 bulldozer and the finer material is washed into a sluice-box through a short ditch cut in the graphitic-schist bedrock. John Gould, who operates the plant alone, had a very poor season because 6 weeks of work were lost due to injury, and the gravels mined were of low grade.

George Fant and Ivor Norbeck operate a hydraulic-sluicing plant in White Channel gravels on the left limit bench of Hunker Creek at Temperance Hill, immediately below Gold Bottom Creek. From April 15 to October 1, 1960 they mined a 50-foot-high face with a pump, three monitors, a TD-18 bulldozer and a sluice-box, and produced 578 ounces of gold.

Gold Bottom Creek

B. Bratsburg mined during the 1960 season on the right limit of the upper part of Gold Bottom Creek with a D-8 bulldozer and sluice-box. He did no work on his Hunker Creek property, 1 1/2 miles below Last Chance Creek, because of a boundary dispute.

E. Schink and J.R. Colbourne mined with a bulldozer and sluice-box on Gold Bottom Creek about a mile from its mouth, and on Paradise Hill with a hydraulic plant, bulldozer, and sluice-box; from May 1 to July 15, 1960 they recovered 52 ounces of gold.

After the Schink-Colbourne partnership broke up in July, Schink, using a D-7 bulldozer and a 50-foot-long sluice-box, continued to mine on Gold Bottom Creek; his 1960 recovery from this operation was 190 ounces of gold.

Dominion Creek

Mr. and Mrs. Gus Burgelman have twenty claims along the lower left limit of Caribou Creek, one of the larger tributaries of upper Dominion Creek, coming in from the south. The productive part of the creek is a wide low bench along the left limit, much of which has been mined since 1898. In 1959 the Burgelmans mined a cut 50 feet wide by 125 feet long on claim No. 10 (about a mile from the mouth of the creek), where the gravel was about 15 feet thick; they recovered 220 ounces of gold. When the writer visited the property in August 1960, the Burgelmans were mining with a D-6 bulldozer and a sluice-box on claim No. 19 (about 2 miles from the mouth of the creek), where the gravel is about 4 feet thick. Their water supply comes through a ditch from upper Caribou Creek. Mining was carried out from April 1 to September 30, 1960, and recovery was 177 ounces of gold.

Ballarat Mines Limited—owned by Glen Franklin of Seattle, Washington and Harold Schmidt of Healdsburg, California—operated a bulldozer-sluicing plant in 1960 on the left limit bench of Dominion Creek about 1/2 mile below Portland Creek, on ground leased from Yukon Consolidated Gold Corporation, Limited. The company also tested and stripped ground about 3 miles above Portland Creek and on Eldorado Creek below Gay Gulch, in preparation for 1961 operations. A six-man crew was employed from May 4 to September 19, 1960, using pumps, sluice-boxes, and three D-8 bulldozers.

Ballarat Mines started mining in 1951 on upper Ballarat Creek, a small tributary of Yukon River, about 80 miles south of Dawson. The company worked there until 1955. Operations were then moved to Grøetcher Bench at the mouth of Klondike River, where mining was carried out until 1959—the year the operation was moved to its present site on Dominion Creek. In 1952 the company also mined on Hghet Creek in the Mayo area.

Spruce Creek Placers Limited—owned by F.M. Wilson of Kirkland, Washington, J.M. Acheson of San Francisco, California, and W.L. Drury of Whitehorse—in 1960 mined ground subleased from Ballarat Mines Limited on Dominion Creek. This operation, managed

by Acheson, mines the present creek gravels in the valley bottom about 2 miles below Portland Creek. There the creek flows in a wide, open valley with a gradient of about 35 feet to the mile. The valley bottom is about 500 feet wide and contains from 2 to 4 feet of gravel overlain by 12 to 15 feet of muck. Because the creek flows on or near the top of the muck, the mining operation requires a long deep drainage ditch. In 1960, some pay gravels could not be mined, either because they were not completely drained or because they had not been stripped. Otherwise, the company had a successful season.

Equipment used included a 1 1/2-cubic-yard Keohring dragline for digging the drainage ditch and stacking the tailings; a pump and monitor for stripping; and a TD-18 and a D-8 bulldozer for stripping, feeding gravel into the sluice-box, and removing the tailings.

This company started mining on Dominion Creek in 1959 and on Spruce Creek in the Atlin area, British Columbia in 1958. The Atlin area operation, managed by F. M. Wilson, mined on Spruce Creek until September 1960, when it was moved to Pine Creek.

Eureka Creek

Eureka Creek Placers Limited—owned by George Shaw, Wm. Hakonson, and Henry Hanulix, all of Dawson—was formed in 1959 to mine on Eureka Creek, a northward-flowing tributary of Indian River, about 6 1/2 miles below Sulphur Creek. The company, employing three men, operated on the left fork of Eureka Creek between April 1 and September 30, 1960 with a D-6 and D-7 bulldozer and sluicing equipment, and mined 30,000 bedrock square feet of gravel. Production was 951 ounces of gold.

M. D. and L. G. Cole (brothers), using a bulldozer, pump, monitor, and sluice-box, mined at the forks of Eureka Creek under agreement with Eureka Placers Limited from April 15 to September 30, 1960. With the help of three hired men they mined 120,000 bedrock square feet of gravel and produced 800 ounces of gold.

Quartz Creek

Ole Lunde, early in July 1960, moved his mining equipment—a pump, a monitor, a D-6 bulldozer and a sluice-box—from Dominion Creek to Quartz Creek, a southerly flowing tributary of Indian River lying southeast of King Solomon Dome. Lunde stripped ground on Quartz Creek from mid-July until early September; he then mined until October 11, and produced 120 ounces of gold.

Sixtymile River Area¹

Sixtymile River

Yukon Placer Mining Company, managed by Glen D. Franklin, operates Yukon Exploration Company's property on Sixtymile River near the mouth of Glacier Creek, about 45 miles west of Dawson. From 1949 to 1959 two methods of mining were used: dredging with a 3 1/2-cubic-foot bucket-line diesel electric dredge with two D-7 bulldozers stripping in front of it; and open-cut sluicing with three or four D-9 bulldozers, a pump, and a sluice-box. In 1959, the dredge operating for 44 days, and the open-cut for the whole season, together produced \$78,713 gold and silver. In 1960 the sluicing plant operated from May 4 to September 6 and produced \$32,690 gold and silver.

Bedrock Creek

J. Lamontagne mined from April 1 to mid-July, 1960 with a D-6 bulldozer-sluicing plant on Bedrock Creek, a tributary of Sixtymile River, about 6 miles above Glacier Creek. Production was 400 ounces of gold. Then he moved his operation to Bonanza Creek where he stripped ground in preparation for the 1961 season.

Miller Creek

Ole Medby, using a D-6 bulldozer-sluicing plant, mined from July 7 to September 29, 1960 on Miller Creek, a tributary of Sixtymile River, 3 miles above Glacier Creek. Production was about 150 ounces of gold.

Henderson and Kirkman Creeks Area²

Kirkman Creek

Lorne Ross operates a bulldozer-sluicing plant on ground leased from Ballarat Mines Limited, 6 miles up Kirkman Creek—a 12-mile-long westerly flowing tributary of Yukon River, about 70 miles south of Dawson. Access is by chartered float plane from Dawson, or by chartered river-boat from Dawson or Pelly Crossing and thence via a 6-mile truck road up Kirkman Creek. Mail and supplies are flown in every 2 weeks and a radio schedule with Dawson is maintained.

¹A description of the geology of the Sixtymile River area is given by Cockfield (1921a).

²A description of the geology of the Henderson and Kirkman Creeks area is given by Cairnes (1917a) and reprinted in Bostock (1957, p. 407).

Ross first leased Ballarat Mines Limited ground on Ballarat and Kirkman Creeks in 1955; he worked Ballarat Creek in 1955, 1956, 1958, and 1959, and Kirkman Creek from 1957 to 1960 inclusive, and produced a total of about 2,500 ounces of gold. Assisted by his brother Norman, he mined about 800 feet up the creek from May 10 to September 25, 1960 with two D-8 bulldozers, a pump, and a sluice-box. They recovered about 800 ounces of gold, most of which was coarse. During the 1960 mining, they encountered several shafts and drifts that had been made between 1914 and 1920.

Kirkman Creek valley is open-V-shaped. At the mining site, the creek bed is about 200 feet wide and contains about 5 feet of gravel overlain by 15 to 20 feet of muck—both frozen. As the gold occurs in the lowest 1 foot of gravel and in the crevices of the schistose bedrock, the upper 3 or 4 feet of gravel, as well as the muck, is stripped. Then the following year the remaining gravel and the upper foot of bedrock are put through the sluice-box. Mining cuts are about 100 feet wide and 200 feet along the creek.

Henderson Creek

F. Perret and E. LeSaux operated a sluicing plant on Henderson Creek from May 1 to September 1, 1960 and produced about 250 ounces of gold. They do not expect to mine there in 1961 because the paystreak is not continuous.

Mayo Area¹

Dublin Gulch

Fred Taylor, who has held a placer lease on Dublin Gulch since about 1936, operates a sluicing plant on the lower part, about 1/4 mile from its mouth. It can be reached by a 26-mile road that branches off the Mayo-Elsa Road at Halfway Lakes, 17 miles north of Mayo. His gold production from 1936 to 1941 was about 810 ounces; from 1953 to the end of 1959 it was about 3,510 ounces; and in 1960 it was 576 ounces.

George Smashnuk operates a hydraulic-sluicing plant about 1 1/2 miles up Dublin Gulch on claims (No. 5 to 9 Above Discovery) purchased from Clifford Greig in 1960. Greig had purchased the claims from Fred Taylor in 1955 and had worked the lower claim until the end of the 1959 season, producing a total of about 1,065 ounces of gold. Smashnuk's 1960 production was about 373 ounces.

¹The geology of the placer deposits of the Mayo area is described in Bostock (1957, pp. 132, 384, 472).

The gravel there is about 20 feet thick and contains many large boulders, which make mining difficult. Water for the operation is impounded in a storage reservoir and directed into a smaller reservoir equipped with an automatic gate; this releases the water at intervals down a flume and pipe to the workings. A monitor undermines the working face, and a 955 Traxcavator equipped with a skeleton-front bucket removes the large boulders from the gravel and loads them into a dump-truck to be hauled away. The Traxcavator also has a front blade for pushing the gravel into the sluice-box.

The gold in Dublin Gulch gravels is coarse and occurs with considerable scheelite and wolframite. According to Smashnuk, 1/2-ounce gold nuggets are common; he reports recovering several weighing from 1 to 1 1/2 ounces, and one weighing 7 oz. 12 dwt.

Haggart Creek

E. H. Barker has held placer claims on Haggart Creek below Dublin Gulch since as early as 1937, but has only worked them intermittently. From 1953 to 1957 inclusive, Waddco Placers Limited—owned by F. M. Wilson, J. M. Acheson, and W. L. Drury—mined on Barker's ground and produced about 13,000 ounces of gold. The company employed five or six men and used a 1 1/2-cubic-yard dragline, a TD-18, and D-8 bulldozer.

In recent years Barker has spent considerable time and effort prospecting for lode deposits; however, in 1959 he mined 123 ounces, and in 1960, 147 ounces of gold from his claims.

Walter Malicky, who holds a lay on several of Barker's claims, mined for only a few weeks and produced 141 ounces of gold.

Highet Creek

E. C. Bleiler owns 36 placer claims and a 1-mile lease on Highet Creek. Access to his hydraulic-sluicing plant is by a 12 1/2-mile road that branches westward off the Mayo-Elsa Road at the Elsa-Keno fork. He started mining on Highet Creek in 1958, producing 83 ounces of gold that season, 108 ounces in 1959, and 202 ounces in 1960. The claims were formerly owned by his father-in-law, Elmer Middlecoff, who worked them from 1906 to 1946.

Bleiler uses a dam, a 1-mile-long ditch, several hundred feet of 10-inch-diameter water pipe, two monitors, wing boards, a TD-14 bulldozer and a sluice-box equipped with grizzly. He reports that between 25 and 40 feet of a mixture of gravel and boulder till fills the valley where he is mining, and that about 1,000 feet of the creek

there was mined during the period 1903 to 1915. The old workings with their boulder-filled drifts are a hindrance, but he hopes to have progressed through them by the end of next season. Water supply has been sufficient during the last two seasons.

Johnson Creek

Barduson Placers Limited, owned by K. Kjukastein and John Sandanger, has a sluicing plant on Johnson Creek—an eastward-flowing tributary of McQuesten River heading in the same area as Hight Creek. The mining operation is reported to be near the mouth of Savage Gulch, about 2 1/2 miles from the Johnson Creek - Hight Creek divide, and is accessible by a 6-mile tractor road up Hight Creek from Bleiler's camp.

Barduson Placer Limited prospected its ground on Johnson Creek in 1956 and 1957. The company's gold production in 1958 was about 325 ounces; in 1959, about 780 ounces; and in 1960, 990 ounces.

Duncan Creek

Fred Taylor holds a 1-mile lease on Duncan Creek about 5 miles from its mouth. He prospected this property in 1958, 1959, and 1960, but no production has been reported.

Week-end prospectors staked several claims in 1958 on upper Duncan Creek, in the canyon above Lightning Creek, and are reported to have recovered small amounts of gold during the last three seasons.

Kluane Lake Area¹

Burwash Creek

Burwash Mining Company Limited, whose president and operations manager is Henry Besner, operates a sluicing plant on Burwash Creek, 6 miles above the Alaska Highway. The access road leaves the highway at mile 1104 and follows the creek. Since Besner started mining on Burwash Creek in 1945 in the canyon about 3 1/2 miles from the highway, he has mined about 2 1/2 miles of the creek and has produced about 17,000 ounces of gold. In 1960, Besner, with a crew of four men, started mining two shifts a day on the 9th of June; this was later than usual because of heavy frost. At the time of the writer's

¹The geology of the placer deposits of the Kluane Lake area is described in Bostock (1957, pp. 123, 357; 1952, p. 40).

visit early in September, Besner expected to mine until the 10th of October, to advance about 700 feet, and to move about 70,000 cubic yards of gravel during the season. His 1960 production was 1,430 ounces of gold.

At the mining site the valley bottom is about 300 feet wide and contains about 15 feet of coarse gravel. This Besner mines in the following manner: D-8 bulldozers strip the upper 6 feet of gravel; water flows in a pipe from a gravel dam above the workings to a 50-foot sluice-box in the centre of the upper end of a 120-foot-wide cut; a 3/4-cubic-yard Bucyrus-Erie diesel shovel moves the remaining gravel onto a grizzly at the head of the sluice-box; the large boulders roll off; and the gravel goes through the sluice-box. A D-8 bulldozer pushes the boulders and tailings to the rear of the cut. The sluice-box is moved up to the face whenever the cut has advanced about 20 feet beyond it. Clean-ups, commonly amounting to about 400 ounces of gold, are made after every 175 to 200 feet of advance.

The gold is coarse and is accompanied by native copper and some platinum. The two largest nuggets recovered by Besner weighed 12 and 16 ounces; these were taken from the creek about a mile below the present workings.

Bullion Creek

Action Mining Company—owned by J. P. La Cross and J. Kelly of Fairbanks, Alaska—operates a sluicing plant about 3 miles up Bullion Creek. The 7.1-mile road to the mining camp leaves the Alaska Highway at mile 1060.5, Slims River. The company owns sixteen claims, leases seven others, and has a 4-mile prospecting lease.

This company started mining on Bullion Creek in 1958, but most of the work was of a preliminary nature and only 10 ounces of gold was recovered. At that time Harry Thorsen was mining adjoining claims on the creek, and he produced 220 ounces of gold. The following year (1959) the company purchased Thorsen's claims and used heavy equipment to mine 400,000 bedrock square feet of the creek (150,000 cubic yards of gravel). Production was 2,940 ounces of gold. In 1960, Action Mining Company mined 500,000 bedrock square feet of the creek, handled 150,000 cubic yards of gravel, and recovered about 2,300 ounces of gold. Late in the autumn of 1960 the company tested the gravels on upper Burwash Creek but found them to be about 60 feet thick and of low grade, so it expects to continue mining Bullion Creek for another 2 years.

When the writer visited the property early in September 1960, the company was preparing an 1,880-foot section of the creek for mining about 1 1/4 miles above the camp. The creek bed there is about 500 feet wide and covered with about 10 feet of coarse gravel containing boulders up to 10 feet long. The large boulders are raked to one side with a D-9 bulldozer and stacked beyond the mining area with a dragline. During the first part of the summer the company mined a 2,800-foot section of the creek about 1 3/4 miles above the camp. The 5-foot-thick gravels from the upper part of this section to Metalline Creek contained little gold as they had already been mined between 1904 and 1914. Equipment used included a 2 1/2-cubic-yard Northwest dragline, a D-9 bulldozer equipped with a rake, a D-8 bulldozer, and a 60-foot-long by 6-foot-wide steel sluice-box equipped with a 30-foot-long hopper.

The gold is reported to be about 65 per cent coarse grained (10-cent-sized grains and larger) and nuggets weighing up to 7 1/2 ounces have been taken from the creek; however, the largest nugget recovered by the company weighed 3 ounces. Native copper, pyrite concretions, galena, and some platinum are also recovered with the gold.

Sheep Creek

R. Chaykowsky mined on Sheep Creek between Fortyeight Pup and Fisher Pup in 1960 and produced about 120 ounces of gold. The Sheep Creek road, which is very steep, branches off the Bullion Creek road on the west side of Sheep Creek about 3 1/2 miles from the Alaska Highway, and follows the west side of the creek. The writer attempted to visit the workings in September 1960, but was unable to go more than 1 1/2 miles up the road because of a very muddy section at this point.

Arch Creek

P and G Placers Limited—owned by A. H. Clark, W. L. Drury, and Ray O. Davis (operations manager), all of Whitehorse—has a 1-mile lease and two claims along the lower part of Arch Creek, a westerly flowing tributary of Donjek River, 10 miles south of the Alaska Highway. The operation can be reached by a 10- or 12-mile truck road that follows the east side of Donjek River flats.

The company started mining on Arch Creek in September 1958 about 1 1/2 miles above the mouth of the creek at the lower end of a canyon. In 1959 and 1960 it tested the ground by drilling and trenching, and did some mining. Production in 1959 was about 205 ounces of gold, and in 1960 about 105 ounces. A D-6 and a TD-18 bulldozer were used, but these were too light for the large boulders encountered and the company is purchasing two new D-8 bulldozers for the operation.

P and G Placers Limited mined on Sugden Creek in Dezadeash map-area from 1955 until mid-1956, when it moved its operations to the foot of the lower canyon on Burwash Creek. It mined there until the end of August 1958 and then moved to its present site.

Dezadeash Area¹

Bates River

R. S. Richards of Anchorage, Alaska, and Frank Young and son of Haines, Alaska have three placer claims on Bates River below Iron Creek in Dezadeash map-area. These were staked in 1958, but no production has been reported. Equipment used includes a Saeurman-system dragline, a D-8 bulldozer, a D-4 front loader, and a grizzly-equipped sluice-box. Access to the property is by truck from Beloud Post to Mush Lake then by small boat. The road from Dalton Post, near the Haines Road, to Onion Lake, was improved in 1960 and it may be extended down Wolverine Valley to Bates River, a total distance of 40 miles.

Squaw (Dollis) Creek

Ad Astra Minerals Limited holds a 1-mile placer lease and two placer claims on Squaw (Dollis) Creek in Yukon Territory and an adjoining 1 1/2-mile placer lease on the same creek in British Columbia, about 10 miles west of the Haines Road. Access is by a 16-mile road from mile 106 on the Haines Road, through Yukon Territory to a point on Squaw Creek near the British Columbia - Yukon border.

Most of the work has been done on the British Columbia side of the border. Between June 28 and October 16, 1959 a crew of five men tested ground, hydraulic-sluiced about 5,000 cubic yards of gravel, and recovered 66 ounces of gold. A D-8 bulldozer was used to remove the overburden and tailings. No production figures for 1960 are known. The creek gravels on the company holdings have been prospected and found to be about 80 feet thick, with an estimated volume of about 7,000,000 cubic yards. It has been reported (Financial Post Survey of Mines, 1961, p. 314) that a contract was signed in November 1960 for a large-scale operation in a Tertiary channel estimated to contain 60 million cubic yards of gold-bearing gravel.

¹ The geology of the placer deposits of the Dezadeash area is described by Kindle (1953, p. 48).

Southern Areas

Livingstone Creek

Livingstone Creek Mining Company Limited—owned by George Murdock, James Ballentine, and the late Chris Alexander, all of Whitehorse—has four claims in the canyon of Livingstone Creek, a 1-mile lease on Lake Creek, and a 1-mile lease on Summit Creek—all westward-flowing tributaries of South Big Salmon River, 50 miles north-northeast of Whitehorse. Access to the area is by small wheel-equipped aircraft from Whitehorse to a short airstrip 2 1/2 miles north of the deserted settlement of Livingstone Creek. Murdock and Ballentine spent several week-ends prospecting their claims on Livingstone Creek with a D-2 bulldozer, and ground-sluicing their 1-mile leases on Summit and Lake Creeks. No production has been reported. (For descriptions of the geology of these creeks see McConnell, 1901, pp. 25-39; Bostock, 1932, pp. 621-626; and Bostock and Lees, 1938, p. 22.)

Louis Engle of Whitehorse holds Discovery claim on Livingstone Creek just above the canyon. Only assessment work was done in 1960.

Big Creek

Leo Proctor of Proctor Construction Company Limited, Whitehorse, acquired four 5-mile prospecting leases in the autumn of 1960 on Big Creek—an easterly flowing tributary of Yukon River in Carmacks map-area. The leases adjoin and extend above Stoddart Creek. The ground was to be tested with a Keystone drill during the spring of 1961. (The geology of the placer deposits of this area is described by Bostock, 1936a, p. 51.)

Canadian Creek

Since 1956, Jack Meloy of Kirkman Creek, Yukon, has held twelve placer claims at the head of Canadian Creek, 35 miles west of Fort Selkirk. Although no production has been reported in recent years, about \$30,000 gold and a few thousand pounds of tungsten were recovered from Canadian Creek prior to 1950. (A description of the geology of the placer deposits of Canadian Creek is given in Bostock, 1957, p. 442.)

Finlayson River

In June 1960, Charles Sweet of Costa Mesa, California, and associates, staked and recorded a group of nine placer claims on Finlayson River where it flows into Frances Lake. These claims are the first placer recordings in this area since 1947.

George E. Stephen of Watson Lake, Yukon staked and recorded a 4-mile placer lease in March 1961 on the lower part of Money Creek—an eastward-flowing tributary of Frances Lake, 6 miles south of Finlayson River.

LODE MINING

Mayo Area

Galena and Keno Hills

United Keno Hill Mines Limited is Canada's leading producer of silver, and operates the only large-scale lode mines in Yukon. Its three producing mines—the Hector, Calumet, and Elsa—are situated on Galena Hill near Elsa, about 32 miles north of Mayo, in central Yukon. The company also owns several other properties in the district that are or have recently been under development or exploration. These include the Silver King, Galkeno, Jock, U.N., No Cash, Birmingham, and Dixie on Galena Hill; and the No. 9 (Keno), Onek, Lucky Queen, and Sadie-Friendship-Ladue mines on Keno Hill. The company owns 620 mineral claims and fractions covering most of the 16-mile-long mineralized belt in the Galena and Keno Hills area.

Alexander McDonald, who explored Mayo Lake and Ladue River in 1887, is believed to have been the first white man to enter the area. Placer gold was discovered in 1895 and most of the creeks were staked between 1897 and 1903. The Silver King vein, exposed in the canyon of Galena Creek on the north side of Galena Hill, was discovered about 1906 by H. W. McWhorter, but it was not until 1913 that lode mining began. At that time Keno Hill was known as Sheep Hill; it was given its present name in 1919 when Louis Beauvette discovered the spectacularly rich silver ore there and staked the Keno mineral claim. Beauvette's claims were acquired by the Yukon Gold Company which formed a subsidiary—Keno Hill, Limited—in 1920 to mine them. The first ore was shipped to Mayo that winter and was smelted in the summer of 1921. The high silver values drew the attention of the mining world and started a wave of development in the Yukon, based on the high-grade silver-lead ore.

The following outline of the subsequent history is taken from a paper entitled "Current Operations at United Keno Hill Mines", by staff of that company. This paper was presented at the western meeting of the Canadian Institute of Mining and Metallurgy in Vancouver, October 19, 1960.

The Treadwell Yukon Company, Limited entered the Mayo area and started mining on the Ladue claim in 1921. This company, under the direction of Livingstone Wernecke, gradually acquired the better showings in the area and in 1923 commenced shipping hand-cobbed ore. A 150-ton concentrator was built at Wernecke on Keno Hill in 1924 and operated until 1932 when the high-grade ore in the Ladue, Sadie-Friendship, and Lucky Queen mines was exhausted. In 1935 the concentrator was moved to the Elsa mine on Galena Hill, and in 1936 it began treating ore from the Calumet, Elsa, and Silver King mines. The Silver King produced until May 1939, but the Elsa and Calumet mines remained in production until October 1941. Production by the Treadwell Yukon Company during its 21 years of operation totalled 625,000 tons of ore, from which 44 million ounces of silver and 96 million pounds of lead were recovered.

In 1945, Frobisher Limited and Conwest Exploration Company Limited formed the Keno Hill Mining Company and purchased the holdings of the Treadwell Yukon Company; the company was reorganized in 1946 as United Keno Hill Mines Limited. Development work was started that year on the Hector and Calumet mines, and the following year they began to produce. The Elsa mill was rehabilitated at that time and has since been developed, with production recommencing in 1958. Development work has been carried out on several other properties including the Sadie-Ladue, Shamrock, No. 9 (Keno mine) and Onek, all on Keno Hill, and the Birmingham and No Cash mines on Galena Hill. The Onek mine was developed to the production stage, but has not been brought into production because of the low value of the ore. In 1958 the company purchased the holdings of Galkeno Mines Limited—an adjoining property. Total production by United Keno Hill Mines Limited from 1947 to 1960 inclusive was 1,696,207 tons of ore from which 63,128,930 ounces of silver, 255,054,370 pounds of lead, 191,180,125 pounds of zinc and 2,424,168 pounds of cadmium were recovered.¹

About 36,000 tons of concentrates are shipped annually as follows: from Elsa to Whitehorse by a fleet of company-owned trucks; from Whitehorse to Skagway, Alaska by the White Pass and Yukon Route narrow-gauge railway; from Skagway to Vancouver by boat; and from Vancouver to the smelter at Trail, British Columbia by rail—a total distance of 1,700 miles, at a cost of about \$10 a ton. (Additional data on United Keno Hill Mines Limited transportation is given by Gritzuk, 1959.) Transportation of concentrates and supplies over the

¹ Communication from Mr. A. E. Pike, Manager, United Keno Hill Mines Limited.

287 miles of highway was greatly facilitated by the completion of bridges across Yukon River in 1959, and across Pelly and Stewart Rivers in 1960. Communications were also greatly improved by the installation of a Canadian National Telegraph telephone line between Whitehorse and Elsa in 1960.

The following information on 1960 production and operation of United Keno Hill Mines Limited is from the company's annual report covering the fiscal year ended September 30, 1960.

Of the 176,745 tons milled, 37,008 (20.94%) came from the Hector mine, 103,807 (58.73%) from the Calumet, 34,150 (19.32%) from the Elsa, the balance being drawn from development in the Keno mine, from dumps and from development and clean-up in the Galkeno mine.

The cyanide plant treated 149,356 tons of flotation tailings for recovery of 535,873 ozs. silver. This compares with treatment of 142,840 tons for recovery of 490,994 ozs. silver in the previous fiscal year. Overall silver recovery by flotation and cyanide was 94.62% against 95.50% in 1959.

Limited development was done on the Hector mine during the year with no significant new oreshoots being developed. Production from this mine showed a reduction of 31.6% from the previous year, reflecting a decrease in available ore, much of which is in pillars and not presently available.

Accelerated mining and development in the Calumet mine boosted production by 35 tons per day over the preceding year.

A total of 1,102 ft. of ore was developed averaging 44.0 ozs. silver per ton over an average width of 5.9 ft. Of this amount the major part totalling 889 ft. was in the No. 18-19 vein zone in the area north of the Calumet fault.

Ore was developed on the 400, 525, and 775 levels which showed ore lengths of 174 ft. grading 41.5 ozs. of silver per ton over an average width of 5.5 ft., 317 ft. averaging 43.4 ozs. of silver per ton over 5.6 ft. and 380 ft. grading 45.7 ozs. of silver per ton over 6.2 ft. respectively. In addition 18 ft. of ore was added on the 650 level. Development in this area is proceeding on all levels from the 300 to 900 levels.

In the No. 1 vein a total footage of 179 ft. of ore grading 46.9 ozs. of silver per ton over an average width of 6.4 ft. was developed, mainly on the 900 level. Development in the No. 1 vein is proceeding on the 1040 level.

The remainder of the advance in ore was a 34-ft. extension in the No. 15 vein on the 650 level.

The Elsa mine continued to provide high grade silver ore. Average grade of the 34,150 tons treated from this mine was 74.27 ozs. silver per ton, 6.30% lead and 0.14% zinc.

Much of the development was directed to outlining ore-bodies found at the junction of the steep-dipping No. 5 vein and the flat-dipping No. 15 vein. This work has fairly well established continuous ore in the junction structure from the 650 level up to the 400 level. Drifting and subsequent raising from the 775 level has shown ore to continue to about 50 ft. below the 650 level where it terminates against the Porcupine Creek Fault.

Lateral development was also done on strong vein structures to the north and below the Porcupine Creek Fault. Short oreshoots totalling 119 ft. grading 62.2 ozs. of silver per ton over a width of 5.8 ft. were developed. Exploration is proceeding in this area.

Lateral development was continued on the Jock property but no ore was found.

Early in the year, 797 ft. of lateral exploration was carried out at the U. N. property. One small oreshoot 25 ft. long and grading 36.8 ozs. of silver per ton over a width of 5.0 ft. was located. After further drifting heading was stopped when both walls of the vein became graphite schist.

Early in the fiscal year a total of 516 ft. of lateral work and raising was done at the Keno mine on the No. 6 vein and associated structures but failed to locate the No. 9 vein on the 700 level. The Porcupine vein was drifted for 149 ft. and a raise started but did not make ore. The 700 adit level camp was closed in December.

In May the 200 level camp was opened and the south incline winze was sunk 287 ft. to just below the 450 level and developed 84 ft. of ore averaging 39.2 ozs. of silver per ton over a width of 6.0 ft. Limited drifting on the 450 level failed to make ore.

At the end of the year operations were again moved to the 700 level and a program of connecting the 700 level to the bottom of the winze was started to permit further and more economic development of the No. 9 vein. This program will be continued during the coming year.

The 900 adit at Galkeno was driven 1,703 ft. during the year, making a total of 3,650 ft. from the portal. The advance was slowed by wet heavy ground, and late in the year the heading was stopped temporarily by excessive water flows. It will be continued when the area is sufficiently drained.

Development mining in the old mine workings above the 100 level was carried out during the summer and produced 626 tons of ore grading 72.8 ozs. of silver per ton.

Unwatering and retimbering the No. 3 shaft at the Silver King was started in late summer to allow access to part of the gold workings for remapping and exploration. At year end the shaft had been rehabilitated and water lowered to the 200 level. Work will be continued during the coming year.

No work was done on the Onek, Shamrock, Lucky Queen, Ladue, Birmingham and No Cash properties during the year.

New construction was limited to renewal or extension of necessary services. The new 75-ton per hour crushing plant being constructed for the Elsa mill is expected to be in operation by early next summer.

An exploration program was carried out during the summer in the Grey Copper Hill, Davidson Range, Patterson Range and Dublin Gulch areas but failed to find any deposits of importance.

Operating Results Compared

	12-Month Period Ended Sept. 30	
	1960	1959
Dry tons milled	176,745	173,477
Average tons daily	483	475
Mill heads:		
Silver (oz/ton)	43.35	44.11
Lead (%)	7.25	7.42
Zinc (%)	4.80	5.88
Concentrates, tons	27,071	29,841
Metal content:		
Silver (oz) ^a	7,249,101	7,307,815
Lead (lb)	21,986,887	22,865,276
Zinc (lb)	14,440,774	17,717,019
Cadmium (lb)	181,132	220,281
Ore reserves:		
Tons ^b	512,577	549,565
Silver (oz/ton)	38.39	38.21
Lead (%)	6.36	6.60
Zinc (%)	4.84	4.89
Metal sales	\$8,793,284	\$9,058,292

^aIncludes 535,873 oz (1960) and 490,994 oz (1959) from treatment of flotation tailings in cyanide plant.

^bExclusive of Onek mine reserves of 123,491 tons averaging 10.27 oz silver per ton, 4.4% lead and 13% zinc.

The geology of the Keno Hill and Galena Hill silver-lead-zinc deposits has been described by Boyle (1956, 1957) and that of the Hector, Calumet, and Elsa mines has been described by the staff of United Keno Hill Mines Limited in the paper mentioned earlier; it is summarized below.

The silver-lead-zinc deposits of Keno and Galena Hills are on the south limb of an easterly trending open anticline in Precambrian or Palaeozoic quartzites and schists. The ore occurs as vein fillings, mainly in the northeasterly trending left-hand faults in a thick-bedded quartzite formation. The quartzites lie between an upper and a lower schist formation. They dip at about 30°S and, in the Galena Hill area, are about 2,600 feet thick. Greenstone is present in all three formations and some ore is associated with it. The veins

commonly dip 50 to 80°SE and are offset by northwesterly trending, right-hand cross-faults which dip about 45°SW. The ore minerals are commonly silver-bearing galena, sphalerite, and freibergite and occur in a manganiferous siderite gangue. Oxidation extends to about 400 feet below the surface, and within this zone cerussite and anglesite are common.

The Hector-Calumet vein system has been traced for 6,000 feet. Its general strike is N45°E and its average dip is 65°SE. There are many branching veins and some rejoin the main vein horizontally and/or vertically. The system is offset by the Jock (at the west end), and by the Hector and Calumet (at east end) right-hand cross faults which strike northwest and dip 45°SE. The horizontal displacement along the Hector and Calumet faults on the 400 level is about 280 and 320 feet respectively. Orebodies vary in size from 50 to hundreds of feet vertically and laterally, with widths of from 5 to 50 feet. The largest orebodies, however, occur where veins join at an acute angle. The ore minerals are silver-bearing galena, sphalerite, freibergite, and ruby silver, and are found in a manganiferous siderite gangue. Oxidation extends to about 400 feet below the surface, and within this zone cerussite and anglesite are common.

The Elsa vein system, which has been traced laterally for 2,300 feet, is more complex than the Hector-Calumet system. The No. 2 vein strikes N70°E and dips 65°S. Branching from it is the No. 5 vein, which strikes N45°E and dips 65°SE; and branching from the No. 5 vein is the No. 15 vein, which strikes N20°E and dips 30 to 40°W. The system is offset at the west end by the Befault fault (a crushed zone about 120 feet wide), which strikes N70°W and dips 50°S. The east end of the system is offset to the right about 90 feet by the Porcupine Creek fault, which strikes easterly and dips 30°S (nearly parallel with the bedding).

The largest known orebodies in the Elsa mine are below the Porcupine Creek fault, at the junction of the No. 5 and No. 15 veins. There the ore shoots have attained a width of 40 feet and a depth of 45 feet, and ore extends for as much as 100 feet outward in the two veins. The ore zone extends from the 200 to the 650 level along a slope distance of 1,200 feet. Mineralization at the Elsa differs from that at the Hector and Calumet mines. There is much more freibergite, less galena, and very little sphalerite. Pyrite and chalcopyrite are also present. The gangue is manganiferous siderite, brecciated quartzite, and minor quartz. Oxidation extends to about 400 feet below the surface, and in this zone native silver, ruby silver, and argentiferous jarosites are found with primary freibergite and galena.

Comstock Keno Mines Limited holds the Gold Star and ten other silver-lead claims on Keno Hill. In 1954 the company explored the Gold Star claim with a 303-foot crosscut, 299 feet of drifts

and 167 feet of raises. This development work outlined a 4,000-ton orebody estimated to average 51.7 ounces of silver to the ton and 19.7 per cent lead¹. No work was done on the property until 1959, when the Gold Star claim was leased to J. B. O'Neil of Keno who that year mined several tons of ore. In 1960, O'Neil, in partnership with R. L. McKamey of Mayo, mined and shipped to the Trail smelter about 100 tons of ore that averaged 186 ounces of silver per ton.

Dezadeash Area

Sockeye Lake

Johobo Mines Limited—owned by H. Johannes, H. Honing and H. E. Boyd, all of Whitehorse—is mining high-grade copper ore on a small scale 2 miles southeast of Sockeye Lake, in Dezadeash map-area. The property, consisting of 48 claims, is accessible from mile 142 on the Haines Road over an 18-mile truck road along the south side of Kathleen Lakes. The showings are on the steep western slope of the Kluane Range, north and immediately south of Bornite Creek, at an altitude of 3,550 feet.

The showing south of Bornite Creek was discovered in 1950 by E. D. Kindle of the Geological Survey and is described in his memoir (1953, p. 57). H. Honing and associates staked this showing in June 1958 and a local syndicate mined the deposit on a small scale during the winter of 1958-59. Three men, using a compressor, jack hammer, front-end loader, and D-6 bulldozer, produced 150 tons of bornite ore. Early in 1959 Honing discovered a chalcopyrite deposit 3,000 feet north of Bornite Creek, and in August of the same year the property was optioned to Conwest Exploration Company Limited. The company drilled four short diamond-drill holes to test the mineralized zone south of Bornite Creek. The results were discouraging and Conwest relinquished the option in September. In November 1959 the syndicate became incorporated as Johobo Mines Limited. During 1959 about 150 tons of bornite ore and 600 tons of chalcopyrite ore were mined; in December, 750 tons, averaging about 15 per cent copper, was shipped to Japan.

In May 1960 the property was optioned to Cerro de Pasco Corporation. This company spent the summer surveying and geologically mapping Johobo holdings and diamond-drilling the deposit discovered by Honing in 1959. Seven diamond-drill holes were drilled, but apparently the results were not satisfactory as the company surrendered the option in November 1960. During 1960, Johobo Mines Limited mined 650 tons of bornite ore from the original showing south of Bornite Creek. In the autumn of 1960 Honing discovered another orebody about 150 feet east-northeast of the one discovered in 1959.

¹Annual Report, 1960, Mining Recorder, Department of Northern Affairs and National Resources, Mayo, Yukon.

By March 31, 1961 the company had mined 600 tons of ore from the most recently discovered orebody, and had 1,500 tons of ore, averaging about 20 per cent copper, ready for shipment to Japan. Because the deposits outcrop on a 45-degree slope, open-cut mining is impractical beyond a depth of 75 feet; consequently, the management is considering resorting to underground mining.

The writer spent a day at the property in September 1960 and was shown the deposits by G. Warnock, the Cerro de Pasco Corporation geologist, who had spent the summer surveying, mapping the geology, and directing exploratory diamond-drilling. Much of the following description was supplied by Warnock.

The deposits are on the eastern limb of a tightly folded, northwest-trending anticline in andesite flows of the volcanic and sedimentary rocks of the Lower Mesozoic Mush Lake group (Kindle, 1953). The ore is present in faults and shear zones as irregular bornite lenses (a few inches to a few feet long) containing smaller chalcopyrite lenses, or vice versa; as veinlets; as breccia fragments; or as disseminated particles. Malachite and minor chalcocite are present along fractures cutting the ore. The strike of the mineralized faults and shear zones varies from east to N65°E and the dip varies from 70°S to 70°N.

A westerly trending, left-hand fault along Bornite Creek has a horizontal displacement of about 2,000 feet and some of its subsidiary faults, striking east to N65°E, are mineralized. The andesites along some of these subsidiary faults are altered to an orange or purple rock. Indications of a strong fault along the contact between the volcanic rocks of the Mush Lake group and the sedimentary rocks of the Dezadeash group are visible about 250 feet northeast of the main showing south of Bornite Creek. As much as 200 feet west of the contact the andesites are highly shattered and altered, and much gouge is present; east of the contact the sedimentary rocks are drag-folded and fractured.

The known deposits adjacent to Bornite Creek lie within an area 450 feet along, and from 50 to 150 feet south of the creek, and are exposed in three open-cuts. These deposits consist mainly of bornite lenses up to a few feet long, disseminated within four shear zones trending east to N65°E. The bornite lenses commonly contain one or more chalcopyrite lenses. The mineralized zones are 6 to 8 feet wide and 50 or more feet long and deep. The andesite host rock is relatively unaltered.

The deposit, discovered in 1959, is 3,000 feet north of Bornite Creek. It consists mainly of chalcopyrite lenses, up to a few feet long, disseminated in a N65°E-trending shear zone that dips vertically. The lenses commonly contain one or more lenses of bornite. An open-cut in the deposit shows that the mineralized zone varies from

6 to 12 feet in width, is more than 75 feet long and deep, and that the andesite wall-rocks are altered to an orange or purple rock. Five diamond-drill holes across the extension of the ore zone indicate that the ore is discontinuous for at least 300 feet horizontally. Furthermore, two of the holes indicate that either the mineralized zone branches, or that another lies about 40 feet south of the main zone.

The most recently discovered deposit is reported to strike westerly, to dip northerly, to vary in width from 5 to 10 feet, to be at least 75 feet long and deep, and to contain chalcopyrite and bornite in a ratio of about 3:2.

COAL MINING

The Yukon Coal Company Limited—owned by Territorial Supply Company Limited, a subsidiary of United Keno Hill Mines Limited and Cassiar Asbestos Corporation Limited—operates the Tantalus Butte coal mine under management of United Keno Hill Mines Limited. The mine is at Carmacks, about 100 miles north-northwest of Whitehorse. The Tantalus Butte mine has operated since about 1923, except for the years 1939 to 1948. The Yukon Coal Company was formed in 1947 and the mine reopened in 1948. Production from 1948 to 1960 inclusive was about 84,500 tons, an average of 6,500 tons a year. In 1960, production was 4,445 tons, most of which was used by United Keno Hill Mines at Calumet.

Most of the following information was kindly supplied by United Keno Hill Mines Limited. The main adit is 350 feet above the river and follows the main coal seam northward for 1,800 feet. The coal is taken from rooms and pillars up to 200 feet above the north end of the adit. The coal seam dips 50 to 55°W and averages 10 feet in thickness, but in places it is as much as 16 feet thick.

The geology of Tantalus Butte, the workings of the mine, and coal analyses are given by Bostock (1936a, p. 59). Tantalus Butte is underlain by conglomerates, sandstones, etc. of the Tantalus formation of Jurassic or Cretaceous age. Cairnes (1910, p. 52) stated that the strata contain three coal seams that outcrop near the top of the Butte and are 8 feet 10 inches, 9 feet 10 inches, and 7 feet thick. The mine workings expose two seams—an upper one about 2 feet thick and a lower one that varies from 7 to 16 feet thick. The main adit follows the lower seam. This seam is cut by several small faults with only a few feet of displacement, but about 1,300 feet from the portal the seam is offset to the right a distance of 90 feet along a northeasterly trending, steeply dipping fault. About 500 feet farther north there is a similar fault, of unknown offset.

EXPLORATION AND PROSPECTING

Klondike Area

Eldorado and Bonanza Creeks

Klondike Lode Gold Mines Limited was formed in Vancouver in 1960 to explore a triangular-shaped area of gold-bearing rocks lying mainly between Eldorado Creek, upper Bonanza Creek, and Victoria Gulch, about 10 miles south-southeast of Dawson. The company holds most of this area with 147 claims that surround 38 staked in 1960 by J. Lamontagne and J. Castonguay, and 13 Crown-granted claims, 9 of which were formerly owned by the Consolidated Lone Star Mining Company¹.

Exploration on the property commenced early in July 1960 and continued until freeze-up, about the first of October. A D-8 bulldozer equipped with a U-blade was used to make sidehill cuts closely following the surface contour. Between Victoria and O'Neil Gulches, five subparallel cuts, averaging about 3,400 feet long, were made between elevations of 2,200 and 2,700 feet. Along and north of Gay Gulch four subparallel cuts, averaging about 4,300 feet long, were made between elevations of 2,000 and 2,600 feet. Other cuts were made on the right limit of Eldorado Creek opposite French Gulch.

All of the cuts were sampled at intervals averaging 100 feet. The samples consisted of vertical channels on the uphill side of the cut and averaged about 3 cubic feet in volume. These were put through a small sluice-box and the concentrates were panned and examined for gold. The final panning concentrates were stored in pint sealers for future reference. The sampling revealed some gold-bearing zones, and one in the vicinity of Gay Gulch was exposed by making downhill cuts. Further bulldozer-trenching and sampling is planned for the 1961 season to delimit and explore the source areas indicated in the 1960 work.

The geology of the Klondike area is described by McConnell (1905) and reprinted in Bostock's report (1957, p. 64), and is shown on a map by Bostock (1942). A brief summary is given here under 'Placer Mining—Klondike Area'.

The Klondike Lode Gold Mines' property is underlain by light grey to light green quartz-sericite schists (Klondike schist). Sidehill cuts opposite French Gulch, west of Victoria Gulch, and north of Gay Gulch, and deeper downhill cuts to bedrock in the latter area

¹The geology of the Lone Star mine is described by MacLean (1914, p. 20), Cockfield (1930, p. 2A; 1931, p. 9A) or Bostock (1957, pp. 597, 617), and Bostock (1936b, p. 7).

show that these rocks are cut by numerous quartz stringers and veins, some of which carry pyrite and gold. The schistosity of the schists commonly strikes northwest and dips moderately to the west. Evidence of a large fault, of probably major significance to ore control in the area, was found by G. Hilchey, geologist in charge of exploration for Klondike Lode Gold Mines Limited. He found a northwesterly trending zone of gouge in the bed of Eldorado Creek at Gay Gulch and large quantities of gouge on the dredge tailings along lower Bonanza Creek.

Mayo Area

Galena Hill

In 1959, C. D. Poli and A. Smith, both of Mayo, optioned their Leo and K. P. O. properties on Galena Hill to Petcal Company Limited of Calgary, Alberta; this company transferred the option to B. O. Jones and M. Mizel. The Leo group, consisting of 15 claims and fractions, lies about 3,500 feet north of the Silver King mine. The K. P. O. group, consisting of 45 claims and fractions, lies about a mile west of the Silver King mine. Both the Leo and K. P. O. properties are almost completely covered by a thick mantle of drift, but they are probably underlain by the Central Quartzite formation that contains the rich Hector, Calumet, Elsa, and Silver King silver-lead-zinc veins of Galena Hill. (A description of the geology of the Galena Hill silver-lead-zinc deposits is given by Boyle, 1957.)

Keno Hill

Canex Aerial Exploration Limited in 1960 optioned the Bob, Yukon, Ada, Bell, York, Ivan, and Forrest claims on Keno Hill from Dr. A. Duncan of Vancouver. The claims adjoin the Lake property on the south and are at the head of Gambler Gulch on the northwest side of Keno Hill. The company did some stripping on the property in 1960 and will explore it in 1961 by sinking shallow shafts. The adjoining Lake property is described briefly by Boyle (1956, p. 18). Siderite and galena are present in two northeasterly trending parallel vein faults cutting graphite schist, phyllite, thin-bedded quartzite, and greenstone. The veins may be an extension of the Ladue-Sadie-Friendship vein system 3,000 feet to the southwest.

Haggart Creek

Tanar Gold Mines Limited has optioned C. D. Poli's Peso and Rex groups of mineral claims, which lie between Secret and upper Haggart Creeks. The company also staked 40 claims adjoining the two groups to make up a block of 100 claims. This block ties in on the west to E. H. Barker's Barber group of claims on Haggart Creek

opposite Dublin Gulch. In 1950 Poli exposed a large antimony-silver-lead vein on the Peso group and traced it, by means of bulldozer cuts, the full length of the Peso and Barber groups¹.

The bedrock geology of the area is shown by Bostock (1943). The underlying rocks are Yukon group schists, quartzites, and limestones intruded by small stocks of granodiorite and diorite.

Dublin Gulch

Prospectors Airways Company Limited examined several old gold prospects in 1960 on the south side of Dublin Gulch, 30 miles north of Mayo. E. H. Barker and J. Colt own a group of 50 claims that cover these showings. Prospectors explored and mined these veins between 1907 and 1914, but the adits and drifts have since caved in. Barker did considerable stripping with a D-8 bulldozer during 1959 and 1960 and exposed many of the veins. The area is interesting because it probably is the source of about \$2 million worth of gold taken from Dublin Gulch and Haggart Creek placer deposits.

The geology of the deposits is described by Cairnes (1916, p. 29) and Cockfield (1919, p. 7B) (reprinted in Bostock, 1957, pp. 401, 468), and Bostock (1959, p. 21-29). The gold is present in arsenopyrite-bearing quartz veins that are at and near the contact between a small granite stock and schists. The veins rarely exceed 2 feet in thickness. They strike southwesterly, dip steeply to the southeast, and average about 0.45 ounce of gold to the ton.

Carmacks Area

Freegold Mountain

Ormsby Mines Limited in 1960 purchased the Laforma gold mine on Freegold Mountain, 28 miles west of Carmacks, from W. J. Langham and the late E. Forrest, and the adjoining property from G. Fairclough. The properties, consisting of nineteen and nine claims respectively, are on the south side of Freegold Mountain at an elevation of between 3,500 and 4,000 feet. Access is by a 42-mile truck road from Carmacks.

Lode gold was discovered on Freegold Mountain in 1930 by P. E. Guder, but the most important discovery was the northeasterly striking G-3 zone on the Goose claim of the Laforma property. The showing was discovered and staked by W. J. Langham in April 1931. Another promising showing—called the 'Pal' vein—which strikes northwesterly and may join the G-3 zone, was discovered and staked by Langham in June 1931. Still another important vein—the Rambler—which parallels the G-3 zone and lies about 2,300 feet southeast of it,

¹Annual Report, 1950, Mining Recorder, Department of Northern Affairs and National Resources, Mayo, Yukon.

was staked in 1945. Two other northwesterly striking veins—the Alpha and Tourmaline—were staked in 1945.

In 1934, N. A. Timmins Corporation optioned the property, constructed a winter road to it and drove No. 2 level adit, 645 feet of drift, and three short crosscuts. In the summer of 1935 the Timmins Corporation option was relinquished and Yukon Consolidated Gold Corporation took an option on the property. The latter company advanced the drift 400 feet, drove five short crosscuts on the No. 2 level and 165 feet of raise from the No. 2 level to the surface, as well as a 220-foot adit, driven to reach the Alpha vein. The option was dropped in May 1936. During the winter of 1936-37 the owners and associates of the Fairclough property erected a 10-ton mill and carried out development on their property for a short period only.

Late in 1938, T. C. Richards of Whitehorse optioned the Laforma property and moved the 10-ton mill from the Fairclough property to the No. 2 adit. One hundred and twenty-five feet of cross-cutting and seven stopes were started on the No. 2 level. The No. 3 level adit was driven 365 feet to the G-3 zone and 350 feet of drifting along the zone was completed, as well as an 85-foot raise to the No. 2 level. During the summer of 1939 a truck road was built from the old Dawson-Whitehorse Road up Crossing Creek to the millsite, a distance of 25 miles. Richards terminated the option in June 1940 because of wartime shortages of supplies and labour. Between January 1939 and June 1940, Richards produced 1,418 tons of ore averaging 1.46 ounces of gold to the ton; however, he recovered only 1,414 ounces of gold because of improper mill equipment and shortage of water.

Laforma mine was held under option from 1951 to 1953 inclusive by Garskie Gold Mines Limited who performed \$20,000 worth of exploratory assessment work (mainly trenching) on the claims.

Ormsby Mines Limited planned to explore the property in 1960 by driving about 3,000 feet of adit and drifts to test the main ore zone about 650 feet below the surface. At the same time the company intended to do surface stripping, sampling, and detailed geological mapping. But because of the poor condition of the access road, the company did not go ahead with its program.

The mine has three adits. No. 1 is at an elevation of 3,900 feet, is 65 feet long, and follows a 10-foot-wide quartz vein in a northeasterly direction in the centre of the main shear zone. No. 2 adit—the main level—is at an elevation of 3,625 feet. The adit goes in a northerly direction for 170 feet where it intersects the main shear zone. There a 160-foot drift extends westerly and the main drift extends northeasterly along the shear zone for 820 feet. Short crosscuts every 100 feet along the drifts extend east and west into the hanging-wall and foot-wall of the shear zone. Three main veins up to 2 feet thick and

within the shear zone have been mined in seven small stopes. No. 3 adit, at an elevation of 3,545 feet, goes northward for 365 feet to the shear zone. There a 50-foot drift extends to the west and the main drift follows the shear zone to the northeast for 300 feet.

A description of the geology is given by Bostock (1936a, p. 54; 1941, p. 24) and Johnston (1937, p. 14). Consulting geologists A. P. Beaven and L. F. Gauvreau examined the property in 1951 and 1953 respectively for Garskie Gold Mines Limited, and some of the following information is taken from their reports.

The property is underlain by grey, medium- to coarse-grained granodiorite, intruded by dykes of andesite porphyry, quartz-feldspar porphyry and rhyolite. The granodiorite is cut by two sets of fracture systems and shear zones: one strikes northeasterly and dips steeply northwest; the other strikes northwest and dips steeply northeast. The important veins appear to be in the northeasterly trending system and include the G-3 or main zone on the Goose claim and the Rambler zone on the Connie and Donalda No. 4 claims. Those of the northwest-trending system include the Pal vein on the Pal claim, the Alpha vein on the Yukonia No. 1 claim, and the Tourmaline vein on the Yukonia No. 3 claim.

The G-3 zone is a 10- to 40-foot-wide shear zone that strikes N22°E and dips 70 to 80°W. The south end of the zone swings to the west and may join the northwest-striking Pal vein. The G-3 zone contains gouge seams from a few inches to 10 feet thick, bands of crushed and altered granodiorite, and quartz veins. The quartz veins are up to 10 feet wide in No. 1 adit, but in No. 2 and No. 3 levels they do not appear to be more than 2 feet wide. Between the adit and the 400-west crosscut on No. 2 level, three parallel veins—referred to as 'Foot-wall', 'Centre', and 'Hanging-wall' veins—are present. The gold is present with pyrite, chalcopyrite, arsenopyrite, sphalerite, and galena in both the quartz veins and the gouge.

Tinta Hill

Conwest Exploration Company Limited in 1959 and 1960 explored a large sulphide vein on Tinta Hill, 4 miles east of Freegold Mountain. According to Bostock (1936a, p. 55; 1941, p. 26), this vein was discovered in 1930 and explored until 1932 by trenches and shallow shafts. In 1939 or 1940 the vein was restaked and other large veins were discovered in the vicinity. Several trenches were dug, two shafts were sunk to 50 and 35 feet, and a 52-foot adit was driven into a 22-foot vein.

In 1959, Conwest Exploration Company Limited staked 18 claims over the original discovery and exposed the vein for 3,000 feet. In 1960 the company staked 27 more claims around the showing and drilled five diamond-drill holes, totalling 1,345 feet, to test the vein at depth. The drilling along 1,200 feet of the zone up to a depth of 350 feet showed that a persistent galena-sphalerite vein up to 2 1/2 feet wide lies along a shear zone about 100 feet wide. Chalcopyrite and pyrite are disseminated on either side of the vein and in places the mineralized zone is up to 10 feet wide. Silver values are good at the surface, but poor at depth. Lead, zinc, and copper values are good at depth, but the mineralized zone is too narrow to be of economic value at the present time.

The following geological description is taken from Bostock (1936a, p. 55). The vein varies between 3 and 6 feet in width and contains pyrite, galena, sphalerite, chalcopyrite, tetrahedrite, and minor amounts of silver and gold. It occurs in granite, strikes N61°W, dips nearly vertically, and is traceable for more than 4,000 feet.

St. Elias Mountains Area¹

During 1959 and 1960, Southwest Potash Corporation had an eight-man prospecting party, supported by a Hiller helicopter, searching the St. Elias Mountains, principally for molybdenite. The area they prospected lies between White River and the British Columbia - Yukon border and between Shakwak Valley and the Icefield Ranges.

St. Elias Mountains are underlain by a thick assemblage of northwesterly trending Palaeozoic and Mesozoic sedimentary and volcanic rocks that have been intensely folded, faulted, and intruded by large bodies of granite and much smaller masses of basic igneous rocks. Tertiary sedimentary and volcanic rocks cap large areas of the older rocks. The area has a variety of mineral occurrences, some of which are: placer gold deposits in Burwash, Bullion, and Sheep Creeks; native copper in the White River and Burwash Creek areas; nickel and copper associated with basic intrusive rocks at Hudson Bay Mining and Smelting Company's Wellgreen property on Quill Creek and at the Canalask property on White River; and gypsum east of Bullion Creek. Molybdenite and chalcopyrite are in silicified, pyritized, porphyritic biotite granite south of Steele (Wolf Creek) Glacier, 13 miles west of Donjek River, and in monzonite float on a medial moraine on the glacier (see Bostock, 1952, p. 41). Southwest Potash Corporation reported finding the source of the molybdenite-chalcopyrite-bearing float.

¹ The geology of this area is described by Bostock (1952), Muller (1958), and Kindle (1953).

Frobisher Limited, using two Piper Super Cub float planes and a Hiller helicopter, has been exploring the northern coastal areas of British Columbia and the St. Elias Mountains in Yukon for the last three seasons. In the summer of 1959 the company discovered and staked a large replacement body in greenstone, consisting of pyrrhotite, pyrite, and chalcopyrite, about 20 miles north of the junction of Alsek and Tatshenshini Rivers. During the same season the company discovered and staked a large high-grade gypsum deposit near the head of O'Connor River 10 miles west of the Haines Road.¹ In 1960 the company spent about 3 weeks investigating possible and known mineral occurrences in the western part of Dezadeash map-area and a few days exploring St. Elias Mountains northwestward to the Alaska-Yukon boundary.

The geology of the Dezadeash area is described by Kindle (1953) and that of the northern part of St. Elias Mountains by Bostock (1952) and Muller (1958).

Dezadeash Area

Sockeye Lake

In May 1960, Cerro de Pasco Corporation optioned the Bornite Creek copper deposit, 18 miles south of Haines Junction, from Johobo Mines Limited. (The property is described here under 'Lode Mining—Dezadeash Area'.) The company spent the summer surveying and geologically mapping the Johobo holdings and diamond-drilling one of the deposits. Seven diamond-drill holes were drilled, but apparently the results were not satisfactory as the company surrendered the option in November.

Mush Creek - Fraser Creek Pass

The British Yukon Navigation Company Limited in 1959 optioned a copper property on the Mush Creek - Fraser Creek Pass, 6 miles south of the east end of Mush Lake. The deposit is described by Kindle (1953, p. 56). Chalcopyrite is in small quartz veins and in veinlets in altered andesite on the west side of a strong northerly trending fault at elevations between 3,250 and 3,900 feet, on the north end of a 6,000-foot ridge. At an elevation of about 3,900 feet a zone 90 feet wide and at least 100 feet long is traversed by numerous intersecting faults. The andesite is replaced along these faults by chalcopyrite veinlets. A chip sample taken by Kindle (1953, p. 57) of 75 feet of the mineralized zone assayed: gold, a trace; copper, 0.46 per cent.

¹ British Columbia Minister of Mines, Annual Report 1959, p. 6.

The company investigated the Mush Creek - Fraser Creek Pass deposit in 1960 and then relinquished the option. It examined several other showings throughout the Yukon during 1960, but to the writer's knowledge made no options.

Nicolet Asbestos Corporation in August 1960 optioned an asbestos deposit 3 miles southeast of the junction of Dezadeash and Kathleen Rivers. The property is owned by the late J. Noble and associates of Whitehorse and can be reached by a 6- or 8-mile truck road branching eastward from mile 152 on the Haines Road.

Asbestos float was discovered there in the autumn of 1953 by J. Noble and some trenching was done by Noble and associates in 1957 and 1958. In the autumn of 1958, Canex Aerial Explorations Limited optioned the property; they explored it in the summer of 1959 and then relinquished the option. Nicolet Asbestos Corporation made a magnetometer survey of the property in 1960.

The asbestos—a good-grade cross-fibre chrysotile up to an inch or more in length—is in dunite on a small low-lying hill largely covered by overburden. According to Kindle (1953, p. 39) the dunite body is possibly a mile in diameter and intrudes Yukon group metamorphic rocks.

Whitehorse Area

Montana Mountain

New Imperial Mines Limited in 1960 optioned the Jean group of fifteen mineral claims from Matthew Watson of Carcross. The claims are situated about 7 miles south of Carcross on Montana Mountain, about a mile northwest of the peak. Access is by an 8-mile truck road. The main showing is reported to be a 12- to 24-inch, gold-bearing quartz vein containing about 20 per cent sulphides (galena, sphalerite, and pyrite). The vein outcrops on a talus slope at an elevation of 6,200 feet, and is in the southwestern part of a granodiorite stock. It strikes northerly and dips steeply, and has been exposed for 70 feet. The company engineer is reported to have taken several samples at regular intervals along the vein. These assayed up to 5 ounces of gold per ton, but averaged 3 ounces. The geology of the area and a description of similar deposits is given by Cockfield and Bell (1926, p. 39) and Wheeler (1952, p. 12).

New Imperial Mines also has options on the Montana group of six mineral claims, a mile southeast of the peak of Montana Mountain, and on the Charlton property at the head of Watson River. These are gold-silver-lead-zinc showings. It also holds twelve Crown-granted copper claims along the Whitehorse copper belt.

Pelly Mountains Area

Ketza River

Conwest Exploration Company Limited has a gold property on upper Ketza River, 31 miles south-southeast of Ross River settlement. The property consists of about 90 claims. The showing is at lat. $61^{\circ} 32'N$, long. $132^{\circ} 16 \frac{1}{2}'W$, at an elevation of about 5,300 feet. A 35-mile winter road to the Conwest camp leaves the Canol Road at Jackfish Lake (5 miles from Ross River), and a 5-mile trail beyond the camp leads to the showing. The last 4 miles of the trail goes up a west tributary of Ketza River, locally called 'Cache Creek'. The showing is on a 20-degree slope on the northwest side of, and about 400 feet above, Cache Creek.

The gold deposit was discovered in the autumn of 1954 by Conwest Exploration Company. In 1955 the company explored the showing with fourteen trenches, sampled the mineralized zone, and made a geological survey of the area and showing. In 1956 the company explored the deposit to a depth of about 90 feet with a pack-sack drill, doing about 2,000 feet of drilling; and in 1958 and 1959 they explored the deposit to a depth of 200 feet, drilling about 5,000 feet of AX core and 1,500 feet of EX core. An orebody—about 600 feet long, 200 feet deep, and averaging about 12 feet wide—was outlined. In 1960 the company drilled a 1,100-foot BX diamond-drill hole to test the ore zone at depth. No ore was cut and the country rock differed from that in the shorter holes. Because the orebody appeared to be small and of modest grade, exploration of the property was discontinued in June of that year.

Wheeler, Green, and Roddick (1960a) have described the regional geology of the area. The following description is from a 1955 Conwest Exploration Company report and from personal communications with that company's representatives. The showing is about 500 feet long and 100 feet wide, and consists of irregularly shaped sulphide bodies interspersed with large remnants of limestone. The orebody is in a 500-foot-thick bed of Lower Cambrian limestone that occurs along a steeply dipping fault zone. This is on the crest of a small northeasterly trending anticline superimposed on a larger easterly trending syncline. Underlying the host rock is phyllite. The ore consists of nearly-horizontally-bedded pyrrhotite, gold-bearing arsenopyrite, pyrite, and minor chalcopyrite, and replaces the limestone along the fault. Bedding control is apparent from the irregular shape of the orebody.

Ketzakey Silver Mines Limited was formed in 1960 to explore and mine the Key group of 44 silver-lead mineral claims on the upper Ketza River, 28 miles south-southeast of Ross River. The property was acquired from R.R. Kirwan of Cassiar, British Columbia. The main showing is at lat. $61^{\circ} 34 \frac{1}{2}'N$, long. $132^{\circ} 13'W$, at an elevation

of about 5,500 feet, about a mile west-southwest of the Conwest Exploration Company camp on Ketz River. A 35-mile winter road to the Conwest camp leaves the Canol Road at Jackfish Lake (5 miles from Ross River).

Silver-lead showings were discovered in the Ketz area in 1947 by Hudson Bay Exploration and Development Company Limited. The original discovery is on the Vic 3 claim about 2 miles southeast of the Ketzakey main showing. In 1954, G. Fairclough, E. Erickson, and associates of Whitehorse discovered the Ketzakey main showing and several others. They staked 39 claims and 5 fractions and optioned them to Conwest Exploration Company Limited, who explored and mapped the area and showing in 1954 and 1955. The company drove a 20-foot adit southwest into the hill over the main showing and cut mainly quartzites and argillites. A 2 1/2-foot-deep winze was sunk near the portal to expose the vein. A 3-foot sample across the vein material assayed 40 ounces of silver and 7 per cent lead. Another adit 30 feet long was driven S20°W from a point 30 feet southeast of and about 7 feet higher than the first adit. The second adit was in black fractured slates and did not cut ore. In 1959, Kirwan, who had acquired the controlling interest in the property, drove a 30-foot adit S15°W, starting immediately east of and 6 feet lower than the first adit. This adit cut the ore near the portal. Ketzakey Silver Mines Limited have not explored the showing, but intend to in 1961. In 1960 the company built the 35-mile winter access road to the Conwest Exploration Company camp on Ketz River about a mile from the main showing.

Wheeler, Green, and Roddick (1960a) have described the regional geology of the area. The following description of the showing is mainly from a 1955 Conwest Exploration Company report and from personal communications with consulting geologists of Ketzakey Silver Mines. The property is underlain by Middle and Upper Cambrian (?) phyllites, slates, and argillites. The main showing is reported to be a 14-foot width of massive high-grade silver-bearing galena that appears to strike N10°W and dip 30°W. The host rock is highly fractured, buff or grey, cherty quartzites and argillites; its average strike is N60°W and its average dip is 30°SW. A large fault lies immediately below the showing and separates the quartzite-argillite host rock from underlying fractured black slates. The fault cuts across the bedding at a small angle, striking about N45°W and dipping about 40°SW. Selected samples taken from the vein are reported to have assayed as high as 500 ounces of silver per ton and 35 per cent lead, but average assays are about 80 ounces of silver per ton and 35 per cent lead. Company consulting geologists estimated that 4,000 tons of high-grade ore could readily be mined by open-cut methods. Nine other showings are exposed on the property but have not yet been explored by Ketzakey Silver Mines Limited.

Upper Sheep Creek

Canol Metal Mines Limited has a molybdenum property consisting of 30 claims at the head of Upper Sheep Creek, 36 miles south-southeast of Ross River. The adit is at lat. $61^{\circ}29\frac{1}{2}'N$, long. $132^{\circ}48'W$, at an elevation of about 6,400 feet on the south side of a ridge about 7,000 feet high. The property is accessible by a 14-mile truck road along Upper Sheep Creek from mile 100 on the Canol Road.

The showing was discovered by A. Racicot in 1955. In 1958, Racicot cut eleven trenches exposing disseminated molybdenite along the contact between granodiorite and limestone. Samples from four of these assayed from 4.2 to 9.3 per cent molybdenum. Canol Metals was incorporated in September 1958 to acquire and explore the property. In 1959 the company explored the property with a total of about 1,000 feet of adit, drifts, and crosscuts and 26 or more diamond-drill holes. The company made a detailed geological survey of the property in 1960.

At the end of August 1959 the underground workings consisted of the following: an adit extending $N52^{\circ}W$ for 150 feet; a cross-cut at 110 feet from the portal, extending southwest for 20 feet to a drift paralleling the adit; this drift extended 80 feet northwesterly and 40 feet southeasterly along the granodiorite-limestone contact; a second drift at 105 feet from the portal extended north for 240 feet; a third drift at 160 feet extended $N50^{\circ}E$ for 70 feet; and a fourth drift at 240 feet extended northwest for 140 feet. About 95 per cent of the tunnel is in granodiorite.

The regional geology of the area has been described by Wheeler, Green and Roddick (1960a). Canol Metal Mines Limited molybdenite showing is at the north contact between a large granodiorite stock and Middle and Upper Cambrian (?) limestone and phyllite. The contact is conformable with the bedding of the overlying limestone and phyllite. From 75 to 250 feet northeast of the adit the bedding is almost flat-lying; however, southwest of there it dips to the southwest. Thirty feet southwest of the adit the bedding strikes $N50^{\circ}W$ and dips $40^{\circ}SW$.

A skarn zone is present in the limestone near the contact with granodiorite. This zone is about 20 feet thick where the bedding is almost flat-lying and about 3 feet thick where the bedding dips $40^{\circ}SW$. Molybdenite is disseminated in the skarn and granodiorite near the contact, but grades are better where the contact dips to the southwest. Assays from samples taken in a 40-foot trench across the contact above the adit were 0.68 per cent molybdenum sulphide along 22 feet in skarn, and 8.4 per cent molybdenum sulphide along 12 feet in granodiorite. A high-grade molybdenite body cut in the adit from 95 to 120 feet from the portal is in granodiorite from 10 to 20 feet from the contact, where

the contact is dipping 30 to 40°SW. The body is from 4 to 7 feet thick, more than 45 feet down dip, and about 24 feet along strike. The grade of this body has not been released, but it is probably greater than 4 per cent molybdenum sulphide.

The granodiorite in the underground workings is highly fractured and cut by many small faults. Several of these faults strike northeasterly and dip steeply southeastward. Two sets of faults strike northwesterly: one dips steeply northeastward, the other steeply southwestward. A few of the faults are easterly striking and dip steeply. One northerly striking normal fault dips 50°E and displaces the orebody a few feet.

Fire Lake

In August 1960, Cassiar Asbestos Corporation Limited discovered a copper showing on North River in Finlayson map-area (105G), about 95 miles northwest of Watson Lake. The property comprises 272 claims which lie east of the largest lake on North River (locally called 'Fire Lake'). The main showing is reported to be at the head of a small southerly flowing tributary of Fire Lake about 1 1/2 miles northwest of the centre of the lake, at lat. 61°13'N, long. 130°30'W, at an elevation of about 5,000 feet.

The main showing is reported to be a 47-foot-wide, northwesterly trending zone of sulphides consisting mainly of pyrite, but containing some narrow chalcopyrite-rich bands. One chalcopyrite band is 5 feet wide and assays between 3 and 4 per cent copper. The mineralized zone has been traced for some distance to the northwest and southeast. Very little exploration has been done on the showing, but the company plans to explore it in 1961.

The geology of the area was described by Wheeler, Green, and Roddick (1960b). According to their map, the showing is in a metamorphic formation that contains quartz-biotite and quartz-chlorite schists, micaceous quartzite, hornfels, and minor phyllite and limestone, and dips at 30°E. A granodiorite stock lies about a mile to the east, a second about 1 1/2 miles to the north, and a third about 3 miles to the south.

Cassiar Asbestos Corporation Limited during the summer of 1960 prospected Pelly Mountains west of Frances Lake and Finlayson River to Tintina Valley (Hoole and Black River valleys).

Pelly Plateau Area

Kennco Explorations (Western) Limited in February 1960 staked the 'Pad' group of nine copper-bearing mineral claims on the south shore of Dragon Lake, at lat. 62°37'N, long. 131°32'W, about 50 miles northeast of Ross River settlement. This group lies in Sheldon Lake (105J) map-area, which was mapped by Green and Roddick (1961a) in 1960. Access is by bush plane, 160 air miles from Whitehorse.

The company geologically mapped and made a magnetometer survey of the property and sampled the showings. The deposits are in skarn zones at and near the contact between limestone and a small granite stock. The underlying rocks, which strike northeasterly and dip about 45°NW, are mainly quartzite with some mica schist and limestone bands. Chalcopyrite and some scheelite are disseminated in the pyrrhotite-bearing skarn zones.

A. K. Lytle did exploratory work on a former Kennco Explorations Limited copper property—restaked as the 'Norken', 'Fool', 'Peak', and 'Rain' groups of mineral claims. These 40 claims are in Sheldon Lake (105J) map-area at lat. 62°15'N, long. 130°43'W. In August 1959 the 'Norken', and 'Fool' groups were trenched, sampled, and geologically mapped. In June and July 1960, electromagnetic and magnetometer surveys were made of all four groups, and some prospecting and trenching was done. Disseminated sulphides are present in five or more showings in thin-bedded argillites and quartzites that strike easterly and dip steeply.

Logan Mountains Area

Upper Flat River, District of Mackenzie

Canada Tungsten Mining Corporation Limited has a large, high-grade tungsten deposit on upper Flat River, about 135 miles north of Watson Lake, Yukon. The property consists of about 145 claims including and surrounding the main orebody. The deposit lies at an elevation of about 4,750 feet, at lat. 61°56 1/2'N, long. 128°15'W, on the east flank of the mountain range forming the boundary between Yukon Territory and District of Mackenzie. Access is by small wheel-equipped aircraft from Watson Lake.

The following information is from personal communications with L. G. White, Manager, and R. W. Burton, Assistant Manager, of Canada Tungsten Mining Corporation Limited, when and after the writer visited the property in the autumns of 1959 and 1960; and from a paper given by White in October 1960 at the western meeting of the Canadian Institute of Mining and Metallurgy in Vancouver.

The main orebody was discovered by Axel Berglund in 1954 while prospecting for Northwestern Explorations Limited. In 1955 the company sampled and geologically mapped the deposit and made a geological survey of a belt 7 miles long and 2 miles wide that included the main showing. In 1956 the company explored the deposit with seven diamond-drill holes and found that as a copper orebody it was too small and too low in grade. The best section cut by diamond-drill was 50 feet of chalcopyrite-pyrrhotite-bearing skarn that averaged 0.42 per cent copper, so the claims were allowed to lapse in the autumn of 1958. Mackenzie Syndicate had prospecting parties in the area that summer and visited the showing. Scheelite was identified in the pyrrhotite-chalcopyrite skarn by panning and lamping samples. The main showing was sampled and mapped. The assay returns ranged from 1.5 to 5 per cent WO_3 , and the property was restaked in November 1958.

Early in 1959 the main showing was systematically sampled. Because the assays were favourable, Canada Tungsten Mining Corporation Limited was formed to provide funds for exploring the deposit. Eleven AX diamond-drill holes were drilled in a widely spaced pattern to determine roughly the size and grade of the orebody. By the autumn of 1959 the orebody was estimated to contain 1.2 million tons of ore averaging 2.5 units of tungsten trioxide per ton. In 1960, about 41 AX diamond-drill holes, totalling 11,737 feet, were drilled on about 100-foot centres to substantiate estimates based on the previous year's work. Estimates of both tonnage and grade were increased. Final calculations indicate a reserve of 1.32 million tons of ore grading 2.51 units of tungsten trioxide per ton, after making allowance for a 10-per-cent dilution factor.

During the period March 11 to April 11, 1960, two C-46 aircraft and a Bristol Freighter aircraft transported about 400 tons of equipment and supplies from Watson Lake airport to a 200- by-4,000-foot airstrip prepared on the ice of Flat Lake. The freight included building supplies for a 35-man camp, fuel-oil tanks for 40,000 gallons of storage, a portable sawmill, two D-7 bulldozers, a Bombadier, an International 4-by-4 pickup truck, and ten sets of winter freight sleighs. This was hauled 12 1/2 miles by tractor train down Flat River valley to the property.

A comfortable camp, consisting of a bunk-house, cook-house, and office, was erected in April in the bottom of Flat River valley at an elevation of about 3,700 feet. A temporary airstrip, 150 by 2,000 feet, was built adjacent to the camp and used throughout the 1960 season by a Cessna 180 and other light aircraft. In the latter part of June, clearing was started for a larger airstrip; by the end of September the total cleared area was 400 by 6,500 feet, and a second runway, 155 by 3,300 feet, had been completed. The two airstrips are to be joined in 1961 to form one that will be 5,400 feet long, suitable for large freight-carrying aircraft.

A 3-mile tote road was built from the camp to the main orebody. The lower 2 miles has a grade of 4 to 6 per cent and the upper mile has seven switch-backs with a grade of 12 per cent.

A portable sawmill, cutting timber from the clearing of the airstrip, produced about 45,000 board feet of rough lumber. Some of this was used to build a 20- by-40-foot storage warehouse and other auxiliary buildings.

The regional geology of Logan Mountains is not well known. In 1953, E.R. Roots¹ of the Geological Survey made a reconnaissance survey north of Watson Lake and established the age of a limestone-shale sequence in the Flat River area as Lower Cambrian. In 1960, Green and Roddick (1961a) mapped the southern part of Nahanni map-area (105I) and the northern part of Frances Lake map-area (105H). Canada Tungsten Mining Corporation Limited in 1960 mapped, on scale of 1 inch to 400 feet, an area about 1 1/2 miles wide and 6 1/2 miles long that included the main orebody and other scheelite occurrences to the southeast. The company also mapped the main orebody from outcrops and diamond-drill core, on a scale of 1 inch to 40 feet. A paper on the geology of these tungsten deposits was given by the company geologist, C. Brown, at the western meeting of the Canadian Institute of Mining and Metallurgy at Vancouver in October 1960. A brief outline of the geology of the property, taken from Brown's paper and company maps and sections, is given below.

The mountains in the area are rugged; they are up to 8,000 feet high and contain numerous glaciers and cirques. They trend northwesterly and are highly dissected by subsequent (e.g. Flat River) and obsequent (e.g. tributaries of Flat River) streams, the pattern of which reflects the structure of the underlying sedimentary rocks.

The Canada Tungsten Mining Corporation property is underlain by a series of Lower Palaeozoic marine sedimentary rocks. From the exposed base upwards these are: more than 500 feet of brownish to purple massive argillite; 120 to 150 feet of interbedded chert, argillite, and limestone; 100 feet of blue-grey crystalline limestone, in which most of the ore occurs; about 1,150 feet of interbedded argillite and limestone; and more than 5,000 feet of argillite. These rocks have been folded about northwesterly trending axes and intruded by granitic stocks. One of these stocks lies 4,400 feet northwest of and another 3,000 feet southeast of the main orebody. The granite has recrystallized the limestone and formed skarn zones adjacent to faults along a chert-limestone contact and in some limy parts of the chert. Many of the skarn zones contain scheelite and some contain chalcopyrite.

¹Unpublished field notes.

The main orebody is roughly tabular in shape, dips at about 20°W, and is about 650 feet long, 300 feet wide, and 65 feet thick. It is in a thick skarn zone at the base of the 100-foot-thick limestone bed, but some ore is present in the foot-wall cherts, especially at the chert-argillite contact. The deposits are mainly on the west limb of a minor northerly trending open anticline superimposed on the southwest limb of a northwesterly trending anticlinal flexure. The anticlinal flexure itself is superimposed on the northeast limb of a major northwesterly trending anticline. Furthermore, the ore is confined to a zone within 400 feet of a fault that cuts across the minor northerly trending fold. The fault is along a zone up to 25 feet wide and less than 2,000 feet long. It strikes N50°E, dips 65°SE, and appears to be a normal right-hand fault with a displacement vertically of about 30 feet and horizontally of about 90 feet. The ore is cut off to the south by a northwesterly trending anticlinal flexure that is overturned to the northeast.

Hyland River

In 1960, Mackenzie Syndicate prospected the Logan Mountains in Yukon Territory and Mackenzie District, between Hyland River on the west and Coal and Flat Rivers on the east. They went as far north as the Canada Tungsten Mining Corporation property and as far south as Green River—a southwesterly flowing tributary of Hyland River. This area is mainly in Flat River (95E) map-area, and partly in Frances Lake (105H), Watson Lake (105A), and Coal River (95D) map-areas. The helicopter-supported crew of ten men made up one geophysical, two prospecting, and two geological parties. The base camp was at a small lake—locally called 'Caesar Lake'—at lat. 61°26'N, long. 127°55'W.

The syndicate examined three showings. The most promising, the 'B.G.' group, consists of about 45 lead-zinc-silver-bearing claims at lat. 61°32'N, long. 127°30'W, about 5 miles northwest of a small lake—locally called 'Lucky Lake'—in the District of Mackenzie. The showing was discovered in 1954 by B. Groat of Lower Post, British Columbia while working for Northwestern Explorations Limited. In 1960 the syndicate trenched and sampled the showing and made a geological and a geophysical survey of the property. The deposits will probably be diamond-drilled in 1961. The showing is in a skarn zone about 40 feet wide that has been traced for 10 miles in a northeasterly direction. The main part of the zone is about 3 miles long and contains scattered deposits of sulphides averaging between 15 and 20 per cent combined lead and zinc.

The second is a tungsten-copper showing at lat. 61°50'N, long. 128°03'W on the Yukon - District of Mackenzie boundary. The deposit is a pyrrhotite-bearing skarn zone containing some scheelite and chalcopyrite. The third showing is a copper deposit on the Yukon - District of Mackenzie boundary at lat. 61°16'N, long. 127°05'W, about

3 miles north of two small lakes that are locally called 'Twin Lakes'. The showing is a small bornite deposit in quartzites.

Phelps Dodge Corporation spent a month in 1960 prospecting the Logan Mountains west of Hyland River as far north as Summit Lake in Nahanni (105I) map-area, and as far south as lat. 60°45'W in Watson Lake (105A) map-area. The base camp for the helicopter-supported seven-man party was at Anderson Lake in Frances Lake (105H) map-area. The party spent the early part of the summer near Burns Lake, British Columbia. The results of the work are not known to the writer.

South Nahanni River

Canex Aerial Exploration Limited, Centennial Mines Limited, and Magnum Copper Limited—all managed by Canadian Exploration Limited—discovered a tungsten deposit in Nahanni (105I) map-area, District of Mackenzie, in 1960 at lat. 62°22'N, long. 128°37 1/2'W, at an elevation of 6,000 feet. The property consists of 67 claims situated about 165 miles north of Watson Lake, Yukon and 32 miles north-northwest of the Canada Tungsten Corporation orebody. Granite-limestone contacts were mapped from the air and later prospected by ground parties. The scheelite-bearing skarn zone is about 100 feet wide, and strikes easterly and dips at about 70°S. It is of a similar type and grade to the Canada Tungsten Mining Corporation orebody. The newly discovered deposit will be explored by diamond-drill in 1961. The three companies in 1960 had a ten-man crew prospecting mainly between South Nahanni River on the east and the northward continuation of the Flat River valley on the west; south as far as the Canada Tungsten Mining Corporation property, and north as far as lat. 62°40'N.

Nahanni Sixty Syndicate in 1960 prospected in the middle South Nahanni River area. The syndicate is financed by these companies: Northfield Mines, Incorporated; Rio Tinto Canadian Explorations; National Explorations; Rayrock Mines; Premium Iron Ores; Nordain Explorations; and Nova-Co Exploration. The area prospected was mainly to 20 miles north of South Nahanni River between long. 126°W and 127°15'W in Flat River (95E) and Glacier Lake (95L) map-areas. Some prospecting was also done to 15 miles southwest of the river between long. 127°15'W and 127°40'W. A silver-lead showing was examined about 25 miles up Prairie Chicken Creek in Virginia Falls (95F) map-area. The fourteen-man helicopter-supported prospecting party operated from a small lake—locally called 'Rabbit Kettle Lake'—in South Nahanni River valley, 34 miles east of the Canada Tungsten Mining Corporation property. The syndicate is reported to have discovered some silver-lead showings.

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