CANADA
DEPARTMENT OF MINES AND RESOURCES

MINES AND GEOLOGY BRANCH
BUREAU OF GEOLOGY AND TOPOGRAPHY

GEOLOGICAL SURVEY

MEMOIR 234

MINING INDUSTRY OF YUKON, 1939 AND 1940

BY
H. S. Bostock

OTTAWA
EDMOND CLOUTIER
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1941

No. 2466

Price, 25 cents

CANADA

DEPARTMENT OF MINES AND RESOURCES

MINES AND GEOLOGY BRANCH

BUREAU OF GEOLOGY AND TOPOGRAPHY

GEOLOGICAL SURVEY

MEMOIR 234

MINING INDUSTRY OF YUKON, 1939 AND 1940

BY

H. S. Bostock

OTTAWA
EDMOND CLOUTIER
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1941

No. 2466

Price, 25 cents

CONTENTS

Mining Industry of Yukon, 1939 and 1940

INTRODUCTION

Information for this report on mining activities in Yukon during 1939 and 1940 was gathered by the writer during the field seasons and by correspondence in the winter months. The writer offers his thanks to all who assisted him. In July 1939 visits were paid to the Klondike and Mayo districts and to the Freegold Mountain area near Carmacks. In 1940 Mayo district was visited and a number of properties carrying tungsten and antimony were examined. In the course of these examinations the writer visited the scheelite deposits on Dublin Gulch and Potato Hills and those at the head of Highet Creek. A. R. Allen, the writer's chief assistant, examined the ferberite-bearing placer on Canadian Creek. The writer examined antimony veins at the head of Highet Creek and in Wheaton River area.

Early snowfall in the winter of 1938-39 prevented the ground freezing as deep as usual. In 1939 the spring was late and on the last day of May snow still mantled areas above 4,000 feet above sea-level. The summer as a whole was cold and wet except for a short, hot, dry spell in July. In general the weather kept the water at good levels for placer work and river navigation, but hampered land travel and road construction. The first snow in the autumn of 1939 fell on the mountains on August 8 and by September 17 snow fell below 2,000 feet in elevation in Pelly Valley. After early snowfall and freeze-up in 1939 exceptionally mild weather followed in November and continued in the main through the winter, so that in the spring of 1940 the seasonal frost was shallow. The break-up on Yukon River in 1940 was the earliest on record at Dawson, April 28, but as a whole the spring months and early summer were colder than usual. The summer temperature otherwise was normal, but precipitation was low, particularly in the earlier part of the season. In the autumn of 1940 freeze-up came abruptly in November, but later the weather moderated and the winter was mild.

The mineral production of Yukon for 1939, valued at $4,961,321, was the highest figure reached since 1916. The increase over 1938 was due mainly to an increased production of placer gold in Klondike district, but there were also substantial increases in the silver and lead production and a substantial contribution from lode gold mining. In 1940 the mineral production was lower than in 1939. The decrease was due primarily to a smaller production from the silver-lead mines in Mayo district, but a number of other factors contributed such as the closing down in July of one of the largest dredges in the Klondike and the cessation of lode gold mining at Carmacks in June. Notable increase in production by the small placer operators in Mayo district was an encouraging factor.

The following figures of production for 1938, 1939, and 1940 are supplied by the Dominion Bureau of Statistics.

	1938		1939		1940
	Fine ozs. or lbs.	$	Fine ozs. or lbs.	$	Fine ozs. or lbs.
Gold from placer mining.....	71,303	.....	85,572	.....	79,905
Gold from lode gold mining...	60(a)	.....	1,150(b)	.....	292(d)
Gold from lode silver mining.	1,065(c)	.....	1,023(c)	.....	261(d)
Total gold production.....	72,368	2,545,544	87,745	3,171,192	80,458
Silver from placer mining.....	16,043	6,975	19,254	7,795	17,979
Silver from lode mining.....	2,828,616	1,229,797	3,811,610	1,543,245	2,241,364(e)
Total silver production....	2,844,659	1,236,772	3,830,864	1,551,040	2,259,343
Lead from silver-lead mining.	5,198,990	173,854	7,544,632	239,089	(f)
Coal.....	361 tons	3,400	.....	.....	.....
Total mineral production..	.....	3,962,970	.....	4,961,321	.....

(a) Approximate figure not added in this column, but may have been included in the figure for placer mining.

(b) Production from Freegold Mountain. The figure is approximate.

(c) Production from Treadwell Yukon Corporation, Limited.

(d) This figure is that for bullion recovered at the Laforma mine and does not take into account the gold recovered from concentrates shipped, which may amount to over 500 ounces.

(e) 160 ounces are included here for silver recovered from lode gold mining, a figure that may be subject to revision.

(f) Figures not released for publication.

An important event in 1939 was the beginning of production from the Laforma mine in Carmacks district. This property, discovered in 1931, bonded in 1934 by the N. A. Timmins Corporation, bonded in 1935 by the Yukon Consolidated Gold Corporation, was optioned in the late autumn of 1938 by Mr. T. C. Richards of Whitehorse. It operated throughout 1939 and showed some promise of developing into a small but steady producer, but in June 1940 Mr. Richards dropped the option and the property has closed down. Another important development in 1939 was the bringing into production of two new placer gold dredges in Klondike district by the Yukon Consolidated Gold Corporation. In 1940 the development of the placer workings of Mr. E. Barker on Haggart Creek, Mayo district, was an important feature.

PLACER MINING

The production figures since 1936 are given below.

Placer Gold Production in Crude Ounces

—	Dawson	Mayo	Whitehorse	Total
1937	56,943·70	724·70	680·30	58,348·70
1938	87,620·87	775·85	731·85	89,128·57
1939	104,895·34	1,207·50	861·72	106,964·56
1940	97,031·19	1,952·00	897·53	99,880·72

The gold turned in at Dawson includes the production of the Klondike, Sixtymile, and smaller creeks along Yukon River and also probably Clear Creek. That turned in at Mayo is mined from the creeks in that district and comes mainly from Highet and Haggart Creeks and Dublin Gulch. Gold is brought into Whitehorse from a number of small, widely separated creeks from west of Kluane Lake to Livingstone Creek area.

SIXTYMILE RIVER DISTRICT

In 1939 and 1940 the Holbrook Dredging Company was under receivership and Mr. W. A. Williams managed the operations. The dredge was originally installed on Miller Creek in 1912 as a steam-powered, wood-burning unit, but was converted to diesel power in 1937. It has fifty-two cubic foot buckets, giving it a daily capacity of 2,000 cubic yards, but owing to its age and condition at present it is only able to handle 60 per cent of this quantity. In 1939 the dredge operated for 177 days between May 16 and November 18, and in 1940 for 170 days between May 18 and November 3. Ground close to the bench on the Miller Creek side of Sixtymile Valley was dug in 1939 and at the end of the season the dredge was on the line between claims Nos. 2 and 3 above Discovery. During 1939, 225,439 cubic yards were dug, yielding 3,024·54 crude ounces valued at $83,412.62. In 1940 approximately 270,000 cubic yards were dug, yielding 2,886·70 ounces valued at $83,422.59. During 1940 the dredge was moved through some old tailings, which took up 21 days' digging, and this is the reason that although the yardage of 1940 was greater than that of 1939, the recovery was less. The early freeze-up of 1940 brought the season to an abrupt close when normally some 2 weeks more operation might be expected. An average number of twenty men was employed during both seasons and a total of $33,439.17 was paid in wages. It is planned to continue the operation of the dredge as usual in 1941 and 3 months' supply of diesel oil is already on the ground (May 1941).

During 1939 prospect drilling was continued throughout the whole season on the ground at the mouth of Glacier Creek and on Big Gold Creek down into Sixtymile River Valley by the North American Mines, Incorporated, who formerly operated a dredge on Jack Wade Creek in the adjoining district of Alaska. It was reported that this company had turned over its interest in the option in Yukon to Mr. C. A. Whitney and that

preparations were made in the spring of 1940 for the building of a dredge at the mouth of Glacier Creek. It is now reported that Murphy Brothers of Portland, Oregon, operators of gold dredges in Idaho and Oregon, are negotiating with Mr. W. A. Williams for ground on Glacier Creek, Big Gold Creek, and Sixtymile River, and also for the dredge that is operated by the Holbrook Dredging Company but is the property of Mr. W. A. Williams and now under lease to the company.

In 1939 another company, of Toronto, was reported to have taken an option on claims Nos. 1 and 2 above Miller Creek on Sixtymile River, and also two 5-mile prospecting leases running from claim No. 2 above Miller Creek to the International Boundary on Sixtymile River. It was planned to drill this ground in 1940, but no further information has been received of the enterprise.

In 1939 Messrs. McCormick and Stewart continued their operations on Miller Creek. In 1940 (on the death of Mr. S. McCormick) operations were in charge of Messrs. Stewart and Campbell. During both seasons the operations on both the hydraulic and deep ground have been successfully carried on. In the earlier season the hydraulic operations were on claim No. 3 below Discovery on the north side of the creek on a low bench carrying 6 to 25 feet of gravel. There a number of cuts are worked in turn. The muck or frozen peaty material is stripped back with a bulldozer as it thaws, and then the gravel faces are worked in rotation as they thaw. This method has proved very successful except where the slope was too steep for the bulldozer. During 1941 it is planned to operate three hydraulic cuts near claim 16 below Discovery. In the deep channel below the old roadhouse drifting was continued during both years. In 1939 this work was on claim No. 30 below Discovery. It was carried out by deep shafts 50 to 100 feet deep with a steam hoist and automatic dumper. The channel is 50 to 100 feet wide. The bedrock surface slopes steeply, necessitating the construction of chutes and making the recovery of gold difficult. In 1939, 23,332 cubic yards of ground were mined by hydraulicking and 16,236 cubic yards by drifting. In 1940 the figures were 31,706 cubic yards by hydraulicking, 13,564 cubic yards by drifting, and 4,112 cubic yards by tunnelling and shaft work.

In addition to these operations five or six individual miners continued to work their claims on Miller, Glacier, Big Gold, and other creeks in the district.

FORTYMILE RIVER DISTRICT

No news was received in 1939 or 1940 of any prespecting in the Fortymile section.

KLONDIKE DISTRICT[1]

The Yukon Consolidated Gold Corporation now holds the greater part of the known placer ground in Klondike district. Its properties are in the valleys of Kondike River and its southern tributaries, Bonanza, Bear, and

[1] Two papers describing the operations of the Yukon Consolidated Gold Corporation, one by Mr. McFarland, General Manager, and the other by Mr. Troop, Director and Secretary Treasurer of the Corporation, have been published recently.

McFarland, W. H. S.: Operations of the Yukon Consolidated Gold Corporation; Can. Inst. of Min. and Met., Trans., vol. XLII, 1939, pp. 537–549.

Troop, G. R. F: Gold Dredging in the Klondike; Mine and Quarry Engineering, June 1939, pp. 1–11.

Hunker, and in the valleys of Indian River and its tributaries, Dominion, Gold Run, Sulphur, Eureka, and Quartz Creeks. The head operating office is in Dawson; the repair shops, gold room, etc., are at Bear Creek, 8 miles east of Dawson in Klondike Valley. During 1939 and 1940 the corporation operated ten dredges, four on the Klondike and its tributaries and six on the Indian River tributaries, but during 1940 one of the four on the Klondike side was reconstructed. Power for the operations comes from a hydro-electric power plant on Klondike River.

Since 1932 when the corporation operated only five dredges, extensive reorganization and development has taken place. The results of this are now showing in the production figures of the last few years, as given below.

—	Gold	Silver
	Oz. (fine)	Oz. (fine)
1937	36,849·65	8,814·02
1938	60,055·77	14,411·98
1939	74,272·42	17,394·63
1940	66,760·00	14,313·00

The decrease in production in 1940 was due to closing down of one of the largest dredges for reconstruction.

The chief developments that have given rise to the increase are: the reconditioning of four of the five dredges operating in 1932; the building of six other dredges; the addition of a third 5,000-horsepower unit to the hydro-electric power plant; the construction of many miles of canal supplying water to the power plant; the building of a number of new, modern camps; the installation of large stripping and thawing plants with miles of ditches; and the development of many services, including workshops and power and telephone lines. Another major development has been the proving of reserves. In 1932 there were virtually no proved gravel reserves. Since then extensive drilling was carried on, except during 1938 and 1939, and as a result the corporation had at the end of 1939, 86,042,000 cubic yards of proved gravel reserves containing $38,253,000 in gold (at $35). New proved dredging areas were added to this in 1940. Besides these proved reserves it has a vast yardage of probable and possible reserves, a large part of which may be expected to be of economic value. From 1933 to 1940, inclusive, 54,000,000 cubic yards were dredged. A large part of this was from ground known to carry gold, but not proved by drilling and not included in the proved reserves.

The operations are widely distributed along the creeks, so that most of the ten dredges have their own separate camps and constitute practically individual mines grouped under one control.

In the following account the interesting detail supplied through the courtesy of the corporation shows the comprehensive character of the activities of a large enterprise operating on a district isolated from normal sources of supplies, means of repair and replacement, affected by a complicated transportation system involving thousands of miles, and open only for 5 months in the year.

At the end of 1937 prospect drilling was dropped for 2 years, as the proved reserves were ample for the time being and the construction of new dredges, camps, etc., was absorbing much of the energy of the corporation. During 1939 a little exploratory work was done on Bonanza Creek to test frost conditions of the gravels. In 1940 prospect drilling was resumed and is to continue for 3 years. It is believed that at the end of that time the remaining areas owned by the corporation will have been tested sufficiently.

The corporation has taken up the whole of Bonanza Creek up to claim No. 44 above Discovery, and Eldorado Creek up to claim No. 62, and has purchased many claims held by individuals so that it now holds practically the entire creek. It was estimated in 1939 that at least 30,000,000 cubic yards of dredgable gravels are to be had on this ground on Bonanza Creek.

In 1940 two prospecting drills were operated continuously from early in April until the latter part of October. An area on Indian River at the mouth of Quartz Creek was prospected, with the result that a small addition was made to the gravel reserves. Montana Creek on the south side of Indian River, and the adjoining area at its mouth, were thoroughly prospected, but workable values were not developed so the area was dropped from reserves. Eureka Creek on the same side of Indian River, and the area adjoining its mouth, were also prospected, with the result that an area was added to the proved ground reserves. Some prospecting was done on Dominion Creek at the mouth of Gold Run Creek.

The hydro-electric power plant is in Klondike Valley. The water for this plant is brought from North Fork Klondike River by a canal approximately 6 miles long, and when the supply in the North Fork is not sufficient additional water is brought from the South Fork Klondike River from a point 14 miles above the junction. During 1939, 33,980,800 kilowatt-hours and 1940, 36,991,700 kilowatt-hours were generated. Approximately 85 per cent of this output was used by the corporation in its placer mining operations and the remainder sold to the Dawson City Utility Companies. During both seasons the power ditches, aggregating 22 miles in length, were maintained and additional gravel reinforcement and surfacing placed on the ditch banks at various points. In 1940 a large electric drag-line was operated for 8 weeks on the lower end of the South Fork ditch to restore its original grade and section. During 1940 the corporation added 2·7 miles of 33,000-volt primary transmission lines, and at the end of the year were maintaining 108 miles of primary lines and 29 miles of 2,300-volt secondary lines, of which 8 miles are carried on the same poles as a primary circuit. In addition, 85·4 miles of high tension telephone line parallelling the high tension transmission system and 68·5 miles of telephone lines connected to the Dawson exchange were operated.

During 1939 stripping operations performed by batteries of hydraulic monitors were conducted during the entire season by seven large plants, respectively, located in Granville, Lower Sulphur, Quartz Creek, Middle Sulphur, Upper Sulphur, Middle Dominion, and Middle Hunker areas.

In 1940 the operation of these plants was continued and in addition a new plant was installed and operated on the left limit benches on Lower Dominion Creek in preparation for drag-line mining operations, and a

hydraulic stripping plant was operated on Lower Bonanza Creek for levelling off old hydraulic tailing gravels that are too deep for dredging.

The plants at the Granville and Lower Sulphur areas used water from the Australia-Sulphur ditch and water from the same ditch was used through a booster pump for the Middle Sulphur area. In 1940 the Australia-Sulphur ditch system delivered 170,040 M.I.D.[1] during the season of 162 days. All the other plants used water from the local streams, the working pressure being developed by centrifugal pumps. At the beginning of the 1939 season a 12-inch Byron-Jackson rock pump was installed in the Upper Sulphur area to elevate the dirty water from the stripping plant and pass it through a pipeline to below the thawing plant and dredge pond. By setting the pump at depth it is possible to get an additional stripping depth of 10 feet below the natural drainage level. The by-passing keeps the dirty water from the thawing plant where it is apt to cause blockages in the points. The installation operated successfully all season and it was planned to establish a second pump in 1940. Whether this was done has not been reported.

In 1939, except at Upper Sulphur area where stripping began June 15, all the plants came into operation between May 4 and May 17, and the season of operation for all the stripping plants ranged from 141 to 154 days. A total of 3,762,824 cubic yards was removed and the average duty was 11·57 cubic yards per M.I.D. A sum of $187,865 was expended on the stripping operations during the year.

In 1940 the operating season was longer. All the seven original plants started between May 1 and May 6 except that at Upper Sulphur, which started on May 15. Quartz Creek plant closed on October 5 and the others on October 11 or 12. For these seven plants the average season was 157 days. The plant on the bend of Lower Dominion started on June 30 and ended on October 10, after operating 103 days. In all these operations 4,298,047 cubic yards of material was removed for an average duty of 12·98 cubic yards per M.I.D. and at a total cost of $229,530, or 5·34 cents a cubic yard. The yardage moved was 14 per cent greater than in 1939.

During 1939 cold water thawing was carried on at eight localities, Guggieville, Arlington, Granville, Lower Sulphur, Quartz Creek, Middle Sulphur, Upper Sulphur, and Middle Dominion. Except for the Guggieville plant, which is a new one installed to prepare the ground for dredging, all these plants were in operation formerly. Thawing began at Arlington May 5, and all the plants were in operation by June 1. In Quartz Creek area thawing was stopped on August 26, but the other plants continued until September 17 to 19. Excluding the plants at Guggieville and Quartz Creek, the average season for thawing was 131 days. The average water temperature was 46·26 degrees F. In all, 4,112,845 cubic yards were thawed, using 752,905 M.I.D. Thawing at the Arlington area was completed and preparations were made to install the plant at Middle Hunker ready for 1940. The total cost of thawing for the year was $242,082.

---

[1] 1½ cubic feet of water per minute for 24 hours.

In 1940 the operations of six cold thawing plants, Granville, Lower Sulphur, Quartz Creek, Middle Sulphur, and Middle Dominion, were continued and a new plant on Middle Hunker was operated for the entire season. Local streams furnished the water required at all locations except a small amount of additional make-up water furnished to the Granville plant from the Sulphur-Australia ditch. No thawing operations were required at the Arlington or Guggieville plants. A total of 6,174,169 cubic yards was thawed at a total cost of $259,182, or an average cost of 4·20 cents a cubic yard. For the seven thawing plants, excluding that of Quartz Creek for which information is not available, a total of 819,154 M.I.D. were used at an average temperature of 47·18 degrees F. A sum of $29,113 was spent on drilling holes with prospecting drills for thawing points in the Guggieville area, which will be dredged by Dredge No. 3. Water thawing points are inserted in the drill holes in this area as the formation is such that points cannot be driven by hand. This area contains approximately 4,000,000 cubic yards. The building of a bridge and road to serve the area cost $1,853.

Nine dredges were operated for the entire season of 1939 and Dredge No. 11[1] after its completion for a short period at the end of the season. Due to a combination of favourable conditions, Dredge No. 5 in the Granville area and Dredge No. 3 at the mouth of Bonanza Creek were able to operate until January 12 and 15, 1940, respectively. No dredge of size comparable to Dredge No. 5 (7½ cubic foot) had ever before been able to operate for such a long season.

Favourable conditions and early break-ups in 1940 made it possible to start earlier than usual in the spring and the last one started on April 29, which was a record for the district. There was a very rapid and hard freeze-up in the autumn that temporarily shut down the power supply and closed down all the smaller dredges.

Dredge No. 1, which had worked on Upper Dominion for many years, completed the digging of the area in 1938 and was shut down on October 26 (not October 2 as stated in "Mining Industry of Yukon, 1938"). It was dismantled during the winter and the area abandoned.

Dredge No. 2, on Klondike River area, is one of the three largest dredges. Its bucket line is composed of buckets of 16 cubic feet capacity. In 1939 the dredge began digging on April 30 and stopped on November 5, but was idle for 23 days in October. In the 164 days it handled 1,384,485 cubic yards of gravel. The yardage dug in 1938 was 2,071,824 cubic yards, not 207,824 as stated in "Mineral Industry of Yukon, 1938". During 1940 this dredge continued to dig in the same area. It started on April 23 and stopped on December 16, a digging season of 237 days during which it dredged 1,920,415 cubic yards.

Dredge No. 3 on the Lower Bonanza area also has buckets of 16 cubic feet capacity. It began digging on April 23 in 1939 and did not close down until January 15, 1940, when it had operated 267 days and dug 2,401,305 cubic yards of gravel. Up to the end of December 31, 1939, 2,346,415 yards were dug. In 1940 Dredge No. 3 continued to dig in Klondike River Valley near the mouth of Bonanza Creek. It started digging on April 10 and

[1]The dredges are now referred to by the corporation as Dredge No. 1, etc., instead of as Yukon No. 1, etc., as formerly.

closed down on January 1, 1941, after a season of 267 days during which it handled 2,772,814 cubic yards. During 1938 and 1939 this dredge has been digging ground in Bonanza Creek Valley that had already been at least partly worked by hand, and had also been dredged with small dredges of the Yukon Gold Company. This experiment in digging worked ground on Bonanza Creek showed that the old tailings had not frozen to any great extent since they were thawed and dredged and that they can be reworked at a profit by the big dredges, which not only have a larger capacity but dig deeper than the small dredges and remove several feet of undisturbed bedrock. As a result, the corporation has restaked most of Bonanza Creek and has tested 2 miles or more of the floor of the valley above the hydraulic tailings from Lovett and Trail Hills to determine the extent of frost in the gravels. It is planned to dredge the whole of Bonanza Creek again if conditions continue satisfactory. Dredge No. 3 worked up Lower Bonanza Creek Valley to where, below Lovett Gulch, the tailings became too deep to handle, and from there worked down the creek into Klondike Valley where it is digging toward the site of the Guggieville camp of the former Yukon Gold Company.

Dredge No. 4, the third dredge with 16 cubic foot buckets, began digging in 1939 on the Arlington area on April 28 and closed down on December 8 after digging 1,786,157 cubic yards in 223 days. This dredge started in 1940 on April 29, and completed the dredging of the reserves in the Arlington area on July 11, after 75 days operation during which it handled 464,636 cubic yards. It was then dismantled and reconstructed on Bonanza Creek on or near claim No. 65 below Discovery, or a short distance above Sourdough Hill. Here the pit was excavated and a construction camp built with all facilities and equipment needed for the reconstruction of the dredge. Machinery parts of the dredge that could be salvaged were overhauled and moved to the new construction site. The autumn weather favoured the construction and the hull and main trusses were practically completed when work ceased in November, the new hull being floated on October 31. New material is being used except for such machinery as was salvaged and could be repaired for use on the new dredge. The dredge will have a bucket capacity of 16 cubic feet and a digging depth of 52 feet below water level. Provision has been made in the hull for future extension of the digging depth.

Dredge No. 5 at Granville has buckets of 7 cubic feet capacity. This dredge in 1939 had a remarkably long season of 279 days, from April 8 to January 12, 1940, and established a new record for a dredge of this type. During that season 1,144,754 cubic yards of gravel was dug and up to the end of the year 1,119,717 cubic yards. During the season of 1940, from April 26 to November 20, 208 days, it dug 882,466 cubic yards.

Dredge No. 6 on the Lower Sulphur area also has 7 cubic foot buckets. It began digging May 6 in 1939 and closed down November 4. In this season of 183 days, 817,012 cubic yards were dug. In the season of 1940, from April 26 to November 2, 190 days, 988,238 cubic yards were dug.

Dredge No. 7, in Quartz Creek area, a smaller dredge with buckets of 5 cubic feet, started digging in 1939 on April 5 and closed down November 12, handling 568,648 cubic yards in 206 days. In 1940 it began digging on April 19 and closed down on November 4 after digging 511,457 cubic yards in 199 days.

Dredge No. 8, on Middle Sulphur area, has buckets of 7 cubic feet capacity. It began digging in 1939 on May 3 and finished on November 10 after handling 731,234 cubic yards in 191 days. In 1940 from April 27 to November 8, 195 days, it dug 731,875 cubic yards.

Dredge No. 9, on Upper Sulphur area, is a small dredge similar to Dredge No. 7. Digging began on May 5 in 1939 and ended on November 10 after handling 385,049 cubic yards in 189 days. In 1940 it began digging on April 27 and closed down after 191 days on November 4, having dredged 413,241 cubic yards. In 1938 this dredge started mining on the downstream end of creek claim No. 27 below Discovery on Sulphur Creek and will proceed upstream during its entire life, not downstream as stated in "Mining Industry of Yukon, 1938."

Dredge No. 10, on Middle Dominion area, was completed and started digging on claim No. 10 below Lower Discovery on Dominion Creek on May 8, 1939. This dredge has 7 cubic foot buckets. It ceased operating on November 10 that year after handling 724,365 cubic yards in 187 days. The construction of this dredge was begun in 1938 on creek claim No. 10 below Lower Discovery on Dominion Creek. It will proceed downstream during its entire life. An area of old dredge tailings will be re-dug between the point of construction and creek claim No. 18 below Lower Discovery, which was the lower end of the area dug by Yukon No. 1 dredge some years ago. In "Mining Industry of Yukon, 1938" it was stated in error that the dredge was constructed on claim No. 17 below Discovery and that the dredge would work upstream. In 1940 it began digging on April 25 and ended on November 11 after digging 778,411 cubic yards in 200 days.

Dredge No. 11, on Middle Hunker area on creek claim No. 57 below Discovery, has buckets of 7 cubic feet capacity. It was constructed during the spring and summer of 1939, started digging on September 18 and closed down on November 10, after handling 198,180 cubic yards in 53 days. In 1940 it began digging on April 16 and closed down on November 20 after digging 1,017,248 cubic yards in 218 days.

The total yardage dredged by the ten dredges during the dredging season of 1939 to January 15, 1940, was 10,141,189 cubic yards (up to the end of 1939, 10,061,262 cubic yards), yielding $2,742,000, an average of 27 cents a cubic yard.

In the 1940 season the mine dredges dug a total of 10,480,799 cubic yards, yielding $2,617,227, an average value of slightly less than 25 cents a cubic yard. In 1940, two additions were made to the ditch system that supplies water to the stripping and thawing plants. An old ditch that had not been used for years and carried water from the fork of Burnham Creek to Dominion Creek above Jensen Creek was cleaned out, regraded, and all its structures rebuilt to carry water for 9 miles for the benefit of the stripping operations on the bench on Lower Dominion Creek. A ditch 3,500 feet long with dams and control gates was constructed to carry water from Wounded Moose Creek to Australia Creek, and a pumping station will be located on Australia Creek below the outlet of the ditch to pump the water up to the Sulphur-Australia ditch system during dry seasons when Australia Creek alone does not furnish enough water for the Sulphur Creek operations.

During 1939 the corporation constructed a mess-house with accommodation for one hundred and twenty men at the Middle Hunker camp,

and a bunk-house for twenty men at the Quartz Creek camp. A gold room with complete equipment, a large storage warehouse with a 7-ton travelling crane, a timber shed for storing large and long pieces of lumber, a residence, and an extension to the tractor repair shop were built at Bear Creek.

During 1940 the camp facilities were further enlarged. A standard mess-house, accommodating one hundred and twenty men, two standard twenty-man bunk-houses, a foreman's office, and a stable building were constructed on Lower Sulphur for Dredge No. 6 operations. An eighteen-man bunk-house was constructed at No. 3 camp near the mouth of Bonanza Creek, and all the buildings at the same camp were improved for use during winter months. A two-story combined mess- and bunk-house building with dining room accommodation for eighty men, a two-story bunk-house, and an office building were constructed on Lower Bonanza for Dredge No. 4 operations. Four small cottages were constructed at various locations for dredgemasters, and several other minor buildings built. An oil storage platform with special facilities for handling oil and grease in drums was constructed at Bear Creek. The corporation constructed 3·9 miles of good gravelled road in Lower Bonanza Creek Valley for hauling construction material for the building of Dredge No. 4, as the old road could not be used on account of grades, sharp curves, and absence of surfacing. Power and telephone lines were also built to serve the new operations.

A new 900-ton wheel press was installed in the corporation's main shops at Bear Creek. This is one of the largest presses of its type in western Canada.

The machine and electrical repair shops and repair garage were operated throughout the year. In addition to the usual maintenance work, the machine shop handled some construction work for Dredge No. 4, including fabrication of miscellaneous structural steel work, reconstruction of the digging ladder, and major machinery overhauling. The electrical shop handled routine maintenance work, construction and upkeep of power and telephone lines, and all electrical work on construction work. The repair garage maintained all automotive equipment, diesel tractors, and other gas engine equipment. Among other items for transportation use, specially designed sleighs were constructed, each having a capacity of at least 50 tons.

The numbers of men employed during the years were as follows:

—	1939	1940
January 1 to March 31[1]	104	105
April 1 to October 31	566	625
November 1 to December 31[1]	195	206
Average for the year	387	430
Peak during the year	683	759
Man shifts worked	139,618	155,018

[1] For 1940 the dates are March 30, November 2, and December 28.

In addition, approximately thirty men were employed by woodcutters and others during the winter months on work performed for the corporation under contract. The total expenditures for salaries, wages, and board were $1,061,000 in 1939 and $1,193,000 in 1940.

Water supply during the summer of 1939 was sufficient for stripping and thawing operations at full capacity, with only minor exceptions. Dredging conditions were favourable until November 10 when a sharp reduction in power supply occurred causing the immediate shut-down of five dredges.

The winter of 1939-40 was unusually favourable for placer mining operations as early snow and exceptionally mild weather resulted in shallow seasonal frost. The spring months of 1940 were a little colder than usual, but the breakup occurred early so power was available for starting all the dredges about 2 weeks sooner than usual. For stripping and thawing operations the length of season was normal. The freeze-up was sudden, forcing most of the dredges to shut down before the usual date. Summer temperatures were above the average, but precipitation being considerably below normal curtailed stripping operations as they are entirely dependent on the amount and distribution of rainfall. Transportation conditions were excellent during the entire year, largely due to improvement of roads during the past few seasons.

A few miners continued to work on Bonanza, Hunker, Dominion, and Quartz Creeks during the seasons of 1939 and 1940.

Options were taken by Murphy Brothers of Portland, Oregon, on most of the claims on Gold Run Creek. During 1940 they prospected a large part of the creek, at first sinking shafts, and after the arrival of a power drill, by prospect drilling for the rest of the season, but it is now reported that the options have been dropped.

On Last Chance Creek Messrs. Bremner and Franich worked the Jack Day claims on the right limit and plan to enlarge their operation by pumping water. A number of miners have been working on Goldbottom Creek where they are reported to have been assisted by the information gained from the drilling done on the creek by Canadian Placers, Limited.

On Black Hills Creek, Mr. J. H. Carpenter has been working his ground with one or more others for the last 3 years. He reported that during the season of 1939 he had worked some very rich gravel, going as high as $5 to the bucket (about 12 cubic feet).

During 1939 Canadian Placers, Limited, took an option on the ground known as the Marsh and Carpenter group. The company had a crew of four men prospecting this ground. Twenty-seven shafts were sunk to bedrock starting at claim No. 5 above Discovery and extending upstream to No. 17 above. The claims and option have been kept up. No account of what was done in 1940 has been received, but it is reported that the company plans to prospect the ground further during 1941.

McQUESTEN DISTRICT

Canadian Placers, Limited, started prospecting on the left fork of Clear Creek in March 1939. Mr. E. N. Patty is general manager of the company and Mr. W. A. O'Neill is superintendent. Supplies and prospecting

equipment were hauled to the area by tractor from Dawson and from Barlow Lake, a small lake 2 miles west of the mouth of Barlow Creek. Leases cover 10 miles of ground on the north fork of Clear Creek and 6 miles of ground stretching from 2 miles below the fork on the main stream of Clear Creek to 4 miles up the east fork. Most of the season of 1939 was spent prospecting the north fork. The gravels average about 8 feet thick and are only partly frozen, but carry much water.

The first propecting was done by sinking steel caissons to bedrock and keeping the hole dry with a gasoline driven Rex pump. All gravels from the hole were sluiced by discharge water from the pump. As soon as river transportation opened, a power drill mounted on caterpillar treads was moved to the McQuesten landing field and taken overland across country to the property. Drilling was continued until November. The prospecting results were considered sufficiently encouraging to justify the purchase of equipment for developing the property.

The last steamboat in 1939 brought an International T.D. 18, 80-horse-power diesel tractor equipped with dozer plough. This tractor worked until November and constructed 9 miles of road from the mouth of Barlow Creek toward the north fork of Clear Creek. The road extends from the Whitehorse-Dawson road at Clear Creek northward along the west side of Clear Creek to cross Barlow Creek about 1½ miles above its mouth and 10 miles from the road junction. From there it will climb approximately 2,500 feet at an average grade of 6 degrees to the summit of the ridge between Barlow and Clear Creeks. It then follows the summit of the ridge, which is well drained, rounded in profile, and above timber, northeast and then east and finally descends into the valley of the north fork of Clear Creek. The total length of the road from the junction with the Whitehorse-Dawson road to its end in Clear Creek is approximately 25 miles.

A complete mining unit for this operation was landed by boat in 1940 on the north bank of Stewart River beside the Whitehorse-Dawson road at the McQuesten air field 5 miles below the mouth of McQuesten River. This equipment consisted of a Bucyrus Erie 37-B 1½-yard drag-line excavator, a Bucyrus Erie drag shovel, a second TD-18 International tractor, 6,000 feet of hydraulic pipe, steel sluice-boxes, and a complete assortment of accessory equipment. The machines were assembled at the river and used to complete the construction of the road 37 miles long begun the previous summer. This construction was carried out under an agreement with the Territorial Government whereby certain work was done by the company and other work by the Government. By July 1 the road was in satisfactory condition for truck hauling and the equipment was then hauled to the camp-site on Clear Creek, where seven buildings were constructed. A ditch 3 miles long was then built along the left limit of the left fork of Clear Creek. The ditch was put into service on September 10. Mining was then started and continued for a month until the operation was shut down for the winter. The method of mining proposed is unusual for Yukon. Steel sluice-boxes 40 inches wide and 60 feet long are set into bedrock and the gravel is to be moved to the boxes by hydraulicking and by a tractor with a dozer plough. The 1½-cubic yard

diesel drag-line scraper will be stationed at the lower end of the boxes to stack the tailings. The plant is expected to have a capacity of 1,500 cubic yards a day, and if it works successfully a duplicate unit will be added during 1941. The first unit will employ between fifteen and twenty men. The recovery from the period of operation in September exceeded the prospecting estimate. Production will be resumed in May 1941. During 1940 eighteen men were employed on the operation. In addition to the above, a prospecting crew operated a drill on the Gorgich claims on Clear Creek just below the forks. This drilling has developed a block of gravels of commercial grade and a second mining plant will be shipped in for this property early in 1941. In the meantime it is planned to strip off the muck overburden on this ground during the summer preparatory for production in 1942.

It is reported that a small dredge has been built at Dawson by the Rendell Brothers for use on the Stewart River bars in 1941.

Some placer claims are held and worked by miners on Clear Creek below the company's leases. The same is the case on Barlow Creek and also on Squaw Creek, a northern tributary of Clear Creek about 7 miles above Barlow Creek.

MAYO DISTRICT

In Mayo district the placer gold production has come from Highet, Ledge, Steep, Owl, Duncan, Haggart, and Davidson Creeks, and Thunder and Dublin Gulches.

On Highet Creek, Mr. Elmer Middlecoff, who has been working on the creek for nearly 30 years, continued his placer operations during the two seasons. His camp is a little below the old dredge and 11½ miles from Minto Bridge. An old wagon road extends up the north side of Minto Creek and turns up Highet Creek. In dry seasons it can be used by trucks up to Mr. Middlecoff's camp. Mr. Middlecoff has developed a system of mining in which the gravels are forced by a monitor into and up an inclined box whose bottom is a grating through which the gold and fine materials fall into the sluice-boxes. This method has proved successful at this locality where a great head of water is available, but it is admitted that the percentage of gold lost is probably high. Mr. Middlecoff employed six men from May 15 to October 1 in 1939 and four men for approximately the same period in 1940.

A little over 2 miles below Mr. Middlecoff's camp at the lower end of the canyon on Highet Creek, Mr. Harvey Ray continued working an hydraulic cut in a bench of silt with gravel at the base during both seasons.

The Haggart Creek Mining Company, managed by Mr. E. H. Barker, has been operating for the last two seasons on Haggart Creek approximately 2 miles above the mouth of its tributary Lynx Creek. Here the company holds twenty-two claims and is working upstream from the lower end. The ground is being worked by means of a caterpillar tractor with a small shovel on the front of it to scrape up and raise the gravel to the sluice-boxes, which are raised about 6 feet at the upper end. The gravel goes through the sluice-boxes and owing to the lack of sufficient water and grade to carry the tailings away a drag-line scraper is used to clear

the tailings from the lower end of the boxes. The system requires one man for the tractor, one man to watch the sluice-boxes and remove boulders, etc., and one man to operate the drag-line scraper. The system is proving a great success. The ground worked in 1939 was reported to average 55 cents a bedrock foot, and to have an average depth of 9 feet of gravel. During that year 9,500 cubic yards were handled and 439 crude ounces of gold were recovered. The operations employed seven men from April 15 to October 1.

In 1940 approximately 1,100 crude ounces of gold were recovered and eight men were employed from May 15 to October 1. A new large caterpillar tractor with bulldozer has been purchased by the company in the hopes of trebling the production in 1941.

It is reported that 12 miles of prospect leases below the holdings of the Haggart Creek Mining Company have been staked by Messrs. E. H. Barker, Irvin F. Ray, and Hugo Seaholm, and that they have interested outside capital in forming the Mayukon Gold Mines, Limited, to prospect the leases. A heavy duty drill was brought in for this purpose during the winter.

These two operations are expected to employ about twenty men all summer in 1941.

On Dublin Gulch, a tributary of Haggart Creek, Mr. Fred Taylor, with three men, continued placer operations during the 2 years. Here a broad open-cut is being worked up the creek by ground sluicing and using a gasoline hoist to remove the large boulders. The cut has an average depth of 20 feet and is 150 feet wide. In 1939 about 10,000 cubic yards were handled and 325 crude ounces of gold recovered. During 1940 over 8,000 cubic yards were moved and about 245 ounces of crude gold were recovered, but the last clean-up of the season could not be made and had to be left in the sluice-boxes. Mr. Taylor plans to continue his operations in the coming season. Mr. Jim Gibson was working on Dublin Gulch about half a mile above the mouth.

Four placer miners worked on Mr. Martin Malesich's claims on Thunder Gulch, a tributary of Lightning Creek, during 1939, but their returns proved disappointing and the ground was dropped in 1940. In the winter three claims on the same ground were purchased by Mr. John Backe, who intends to work them in the coming season.

Mr. George Reynolds continued his operations on Ledge Creek. He has been working just below the fork of the creek and progressed up the creek.

Mr. Gagnon is on Steep Creek. During the last few years he has been improving the conditions in his cut and in 1939 recovered 25 ounces of crude gold. About May 25 that year a sudden thaw led to a flood on the creek, which did much damage to his workings. Mr. Hester is reported to be working on Owl Creek. One or two miners are on the upper part of Davidson Creek.

Mr. C. E. Fisher has been working ground on Duncan Creek above the bridge. He has developed a method of working the hard-packed, bouldery ground with a bulldozer and toothed plow. He is not down to bedrock, but reports that the ground carries about 50 cents a cubic yard. He plans to continue in 1941 and to bring in a large drag-line scraper.

Mr. Ellis Johnson has been working on claim No. 54 above Discovery on Duncan Creek. He has reached bedrock at 92 feet and is reported to have good prospects in the shaft.

During 1940 there was a marked increase in placer mining in this district. Nineteen new placer prospecting leases covering 40 miles of creek were issued in the district during the year and the gold turned in from the district was more than double that of any year for probably 20 years.

OTHER DISTRICTS IN CENTRAL YUKON

South of Stewart River in central Yukon, a little placer mining has been done on a number of creeks. Two men are reported to be working on Thistle Creek. On Kirkman Creek four miners are reported to have been working during the last 2 years and to be getting satisfactory results. Two men were reported to be on Ballarat Creek during 1940. Some placer work is also believed to have been done on Brewer, Barker, and Scroggie Creeks. Some placer prospecting has been in progress for a number of years on Selwyn River and its tributaries, and during 1940 three miners were reported to have been working there. Four or five miners are reported to have been working on Nansen and Victoria Creeks during both 1939 and 1940.

SOUTHERN DISTRICTS

For a number of years one or two men have worked during low water on Lewes River bars near Cassiar bar above Big Salmon and on Gold Point a few miles below Big Salmon. During 1939 there was a little work at both these localities. It is reported that in 1939 a small dredge was built in Whitehorse for Messrs. A. H. McCurdy and H. Hays for use on these and similar river bar localities. In 1940 a similar dredge was built for Messrs. Boyd Gordon and Laurent Cyr. The first dredge started at a bend on Lewes River about 8 miles below Hootalinqua and worked downstream. The second started at the mouth of Teslin River and worked downstream. The two dredges worked together for part of the season. At the end of 1940 the first tied up for the winter near Bayers wood camp and the second in Hendrickson's Slough, a few miles below Gold Point. The season was unfavourable for these operations as the water level remained unusually high. It is planned to operate one of these dredges in 1941.

In the Teslin-Big Salmon district a number of placer miners have been working on different creeks for many years. The most important are those of the Livingstone Creek camp. Here Mr. T. Kerruish is mining on Lake Creek, where during the past several years he has been working on a development scheme including the construction of a dam to form a large reservoir on the creek for the hydraulic work. The developments are completed and he expects to increase his production in future. Four or five more miners are working on the other creeks of the camp. In the last few years a landing field has been completed in the South Big Salmon Valley and all supplies are now taken to the camp from Whitehorse by plane at any time of year. Previously they were taken by dog sled in winter or by river boat to Mason Landing and thence by wagon 18 miles over a climb of nearly 2,000 feet.

In southwestern Yukon there was a considerable increase in activity in 1939. Messrs. McCaulay and Vass, who have prospected in this part of Yukon for a number of years, hold a large placer property on Shorty Creek near Dezadeash Lake, which was examined during the summer of 1939 by an engineer from Seattle, Washington. It was reported that he had optioned the ground and was planning work for 1940. It is now reported that the property and some adjoining properties have been taken over by Mr. Burnell from Cœur d'Alene, Idaho, and that he is making plans for development.

The chief development in southwestern Yukon in 1939 was that on Bullion Creek, a tributary of Slims River, which runs into the south end of Kluane Lake. On this creek the Kluane Mining Company, Limited, of New York, which was formed in March 1938, took over 5 miles of placer leases along the creek.

Bullion Creek was discovered in 1903[1] and Discovery claim was approximately 4 miles up the creek. Small, rich pockets of coarse gold were found on a few of the claims, but though some gold was found on all the claims from near claim No. 40 above Discovery to the Fifties below, the claims rarely proved rich enough to pay wages under the conditions of the early days in the camp. In 1904 a company took over most of the lower part of the creek with a view to working it as a large scale hydraulic operation. Much was spent on buildings and equipment, but little actual mining was done. A few years after 1906 most of the creek was abandoned, and except for short periods of renewed interest and restaking most of it has remained open until recently.

Bullion Creek is about 10 miles long and heads in small glaciers in the mountains south of Kluane Lake. It has a very variable flow, but ordinarily has about 2,000 miner's inches of water. Its grade averages over 200 feet a mile. The creek runs in a deep, steep-sided valley, narrow in its upper part but widening somewhat toward its mouth and floored by a bare, gravel flat. Midway in its course the creek runs through a canyon approximately ¼ mile long. During the glacial period the valley was filled with boulder clay and other glacial deposits to a depth of 1,000 feet. Since the ice receded the stream has re-excavated its old channel, cutting down through the glacial deposits and into the bedrock except at the canyon where it has cut into bedrock on the north side of the old channel. The gravels in the stream bed are coarse and intermingled with numerous granite boulders. The bedrock of the creek includes a variety of types, schists, slates, limestones, diorite, rhyolite, and dyke rocks. The gold is coarse and worn and occurs mainly in flattened pellets. Nuggets up to an ounce in weight have been found and some fine gold is also present. The grade of the crude gold is high, averaging about $18 an ounce at $20.63 an ounce of fine gold. The creek is reached from Whitehorse by a wagon road extending to Kluane Lake, there crossing to the southwest shore on the west side of Slims River mouth and continuing thence by trail up Slims River Valley and Bullion Creek. The lake shore west of Slims River may also be reached directly by aeroplane.

---

[1] McConnell, R. G.: The Kluane Mining District; Geol. Surv., Canada, Sum. Rept. 1904, pt. A, pp. 1–18.
Cairnes, D. D.: Exploration in Southwestern Yukon; Geol. Surv., Canada, Sum. Rept. 1914, pp. 10–33.

During 1939 the Kluane Mining Company organized its camp at Bullion Creek, tested the creek valley just below the canyon, and examined the machinery available. The old buildings of the former company were made use of for the camp. The machinery on the property consists of a drag-line scraper with a ½-yard bucket capacity, a 28-horsepower gasoline engine to operate it, and a 4-inch Stirling pump and gasoline engine. The work was started on a virgin section of the shallower part of the ground. Overburden carrying no gold was first stripped with the drag-line, then a drainage ditch 330 feet long was dug with an open-cut at the head. Thirteen sluice-boxes, each 12 feet long and 20 inches wide, were put in and later, as the open-cut progressed upstream, fifteen more boxes, each 10 feet long and 12 inches wide, were added and the 20-inch boxes narrowed to 15 inches. The water was supplied to the head of the boxes by hose and carried the tailings into the creek. Plenty of water was available all season. The drag-line proved successful in the loose surface gravels, but was not powerful enough for the hard, packed, lower material, which was handled by shovel. Work was continued for 122 days, of which 52 days were spent on production, and during which 1,825 cubic yards of gravel were moved that yielded approximately 68 crude ounces of gold, an average of $1.19 a cubic yard. The results of the work as reported indicate the presence of rather more than 1,500,000 cubic yards of ground 10 to 30 feet deep in the 2½ miles of creek valley below the canyon and a large stretch of unestimated ground extending down the creek valley and out into Slims River Valley. Seven men were employed during the summer of 1939. It was planned to continue the prospecting work during the summer of 1940, but during the winter one of the chief financiers died and, so far as is known, nothing was done in 1940.

During 1938 gold was discovered on Goat Creek, which runs into Kathleen Lake, and twenty-five claims were staked, but what progress has been made with this strike since then is not known. A discovery of coarse gold was made in the spring of 1939 on a tributary of Victoria Creek, which also runs into Kathleen Lake.

In 1941 Mr. B. Belond, who has been prospecting on the creeks near Kathleen Lake, is reported to have brought an examining engineer and some prospecting equipment to this area.

One or more placer miners are reported to have been working on Arch Creek, a tributary of Donjek River. Some prospecting on Squaw Creek has also been reported.

LODE MINING

In 1939 the production of silver and lead from Mayo district increased considerably, and the first substantial contribution from lode gold mining was made from Carmacks district, but the production of 1940 fell back considerably. Since lode mining became prominent in 1907 with the production of copper in Whitehorse district, over $25,500,000 in silver, lead, copper, and gold have been produced from lode sources in Yukon. Prior to 1920 lode mining consisted of copper mining in the Whitehorse copper belt, which was productive for only a few years. From 1920 to

1938 lode mining was almost entirely silver-lead mining in Mayo district. Until 1930 the price of silver remained fairly constant; since then it has been very uncertain and low. The district, however, has continued to produce due to the discovery of high-grade ore either in the older developed mines or in new properties on Keno and Galena Hills. The chief producer, the Treadwell Yukon Corporation, Limited, has closed down the Silver King mine as the ore in sight has been exhausted, but in the Elsa and Calumet (formerly known as the Hector) mines the corporation has considerable reserves of ore in sight and there are many properties on Galena and Keno Hills with good showings that await only a return of confidence for their development. The advent, in 1938 and 1939, of producing lode gold properties in Carmacks district promised to put lode mining and the mining industry as a whole on a more stable basis. Unfortunately, however, with the closing down of the Laforma mine, June 1940, the silver-lead mining in Mayo District is again the only lode mining in Yukon Territory.

KLONDIKE DISTRICT

It is reported that a little surface work was done on the Lone Star property on the ridge between upper Bonanza and Eldorado Creeks during 1939, but no further word of work on it has been received. This property has been described in several previous reports, the most recent of which is "Mining Industry of Yukon, 1935".[1]

MAYO DISTRICT

During 1939 and 1940 some prospecting for silver-lead ore was done on Keno and Galena Hills. The only production was from Galena Hill where the Treadwell Yukon Corporation, Limited, continued operations at the Silver King, Elsa, and Calumet Mines, and Mr. C. H. Bermingham mined on the Arctic group.

GALENA HILL

Mining operations in the Silver King mine were continued by Treadwell Yukon Corporation, Limited, until the end of May 1939, when the ore in sight was exhausted and the mine closed down. Much of the machinery and some of the buildings have been moved to other properties. The Elsa mill was operated steadily into December 1939. During that year the ore at first came mainly from the Silver King mine and was supplemented by a somewhat smaller tonnage from the Elsa mine. On June 1, 1939, the aerial tramway from the Calumet mine was put into operation, and since then the ore from that mine has taken the place of the Silver King ore and the Elsa has continued to produce a considerable tonnage. In 1939 the mill handled 54,294 tons of ore averaging 62·70 ounces of silver and 8·26 per cent lead, yielding 7,229 tons of wet concentrates. Not all this tonnage left Mayo, there being at the end of 1939, 1,773 wet tons of concentrates on the waterfront and 40 tons still at the mill. Production from all

[1] Geol. Surv., Canada, Mem. 193, p. 7 (1936).

properties during 1939 as given by the corporation in their report is as follows:

Silver shipped and sold	3,842,583 ounces
Lead shipped and sold	7,633,055 pounds
Gross value, including gold	$2,002,338.43
Tons shipped	8,392

During 1939 the average number of men employed by the corporation in all branches of their operations in the district was one hundred and eighty. After the closing down on December 23, twenty-six men were left working on development in the Calumet mine. Though the Elsa mine has never had a large tonnage of reserves in sight, new bodies of ore have always been discovered in time to obviate any necessity of closing the mine. During the early part of 1939 and again in December some pockets of ore running several thousand ounces of silver to the ton were found and were hand picked and sacked for shipping. At the end of the year it was estimated that there was enough ore in sight for half a year's operation, and this was mined between April 15 and September 15, 1940.

In June 1939 the adit of the Calumet mine was approximately 3,000 feet long. It reaches the vein at approximately 1,400 feet from the portal and follows it for 1,600 feet. It has now been continued to the limit of the property, approximately another 500 feet. Four good ore shoots were discovered in the 1,600-foot drift. The ore in at least one of these shoots reaches from the surface to the adit level 400 feet below, which is a record depth for mining in the district. This ore, after being hauled out of the tunnel, goes by aerial tramway, 14,000 feet to the Elsa mill. Early in July 1939 the tramway started running 8 hours daily and delivered 60 tons a day to the mill. The balance of the mill capacity came from the Elsa mine. Later the production from the Calumet was increased. The Calumet ore contains less oxidized material and is higher in lead than the Silver King ore, and this has resulted in a marked increase in the lead production compared with that of 1938. New bunk-houses and an addition to the power-house have been built at the Calumet mine. During the winter of 1939-40 exploration and development work were continued in the Calumet mine, but the mine and mill at the Elsa camp were closed down.

During 1940 a small crew doing development work was kept on from January 1 to April 15, when mining was again started at both the Elsa and Calumet mines and the Elsa mill was put into operation. The mines and mill continued operation until September 15. They were then closed down except for a development crew of thirty men who were kept on at the Calumet mine until February 1, 1941, when the operations were closed down and the former plan to start mining and milling again when navigation opened was postponed indefinitely. A report was received in April that the corporation was going to reopen operations in May. During 1940 the average number of men employed was eighty-six, and in all two hundred and eight persons were given employment during the year; 23,604 tons of ore were mined and handled at the mill, giving 2,538 tons of concentrates and 37 tons of high-grade crude ore. In addition, 98 tons of high-grade crude ore in the mines were sacked for shipment. A total of 4,267 tons were shipped by the company from Mayo before navigation

closed, and in contrast with former years no ore or concentrates were left over on the river bank for shipment in 1941. The difference in the figures of production and shipment are made up by the tonnage left at Mayo at the close of navigation in 1939.

Mr. C. H. Bermingham continued underground development and mining on the Arctic group in 1939 and 1940. A raise 40 feet to the surface to facilitate hoisting and ventilation was made in 1939. Eighty-five tons of high-grade ore averaging 230 ounces of silver and 75 per cent lead were mined, hand picked, sacked, and shipped. The ore shoot is cut off by a fault believed to have a throw of about 50 feet. In the latter part of the season some work was done on another area 300 feet northeast of the ore, where another section of the vein was picked up. The work was greatly hampered by the wet season.

During 1940 a new shaft 37 feet deep was put down to reach a part of the workings near where an earlier drift had caved. The shaft was in ore all the way. A drift was driven at the bottom of the shaft along the vein for 57 feet south and some stoping was done from this. In the summer of 1940, 40 tons of ore were shipped. In December 1940, and the first 3 months of 1941, stoping was continued and about 100 tons of ore averaging about 230 ounces of silver and 70 per cent lead have been sacked and hoisted to the surface. It is planned to continue operating this property throughout 1941.

In 1939 on the north and northeast side of Galena Hill a number of claims were prospected. Messrs. C. Brefalt and F. Strom drove an adit on the Ajax claim. Mr. Angus McLeod sank a shaft on his ground near the Calumet and Mr. Oscar Miller put down some prospect holes on his ground. Mr. J. Sugiyama prospected his ground below the Rio group. The option on the Rio group owned by Mr. W. Sime, and which was held by the Treadwell Yukon Corporation, Limited, last year, was dropped. Mr. J. Hawthorn prospected his ground near the Silver King mine. Messrs. White and Sandquist prospected near Nigger Bend on Duncan Creek on the slope of Galena Hill. They were reported to have driven some crosscuts to a vein from which some picked samples assayed 1,200 ounces of silver.

Very little silver-lead prospecting was reported from the district in 1940 and no new silver-lead discoveries were made.

KENO HILL

In 1939, Messrs. Corp and Ryan continued prospecting their ground on the southwest part of Keno Hill. Mr. W. Williamson leased the Sadie claim near Wernecke camp. Mr. Conrad Carthum did some exploration on the Shamrock group and sacked a small quantity of ore. During the last few years the Treadwell Yukon Corporation has moved much of its machinery and some of the buildings from Wernecke camp to its properties on Galena Hill. The corporation holds a large number of claims on Keno Hill and lately increased its holdings there by buying everything owned by Keno Hill, Limited.

During 1940, a new shaft 37 feet deep was put down to reach a part of the workings near where an earlier drift had caved. The shaft was in ore all the way. A drift was driven at the bottom of the shaft along the

vein for 57 feet south and some stoping was done from this. In the summer of 1940, 40 tons of ore were shipped. In December 1940, and the first 3 months of 1941, stoping was continued here and about 100 tons of ore averaging about 230 ounces of silver and 70 per cent lead have been sacked and hoisted to the surface. It is planned to continue operating this property throughout 1941.

Very little silver-lead prospecting was reported from the district in 1940 and no new silver-lead discoveries were made.

The construction, in 1939, of an all-year road from a point on the old road about 3 miles north of Minto Bridge has greatly facilitated transportation between Galena Hill and Mayo. The road follows the valley directly northeast of the Siver King mine and extends to the Elsa camp. The road is gravelled and has easy grades. It avoids the climb up Williams Creek Valley from 2,660 to 3,520 feet and all other unnecessary climbs. The highest summit is 2,630 feet above sea-level east of Corkery Creek, from where the road runs with little rise or fall on to the Silver King and Elsa mines. This road has now become the main route and has been extended as a winter road over Galena Hill to Keno city. This extension follows the switch-backs of the old road on the east side of the head of Flat Creek, whence it leaves the old road and follows the hillside on a 6½ per cent grade for 3 miles to the Calumet mine camp. From there it continues at a 2½ per cent grade to the Rio group and thence round the north and east side of Galena Hill downward on a 7 per cent grade for 4 miles to join the old road near Crystal Lake close to Keno city. Much of the original side hill cutting and grading of this road was done in 1939.

The road renders the prospects on the northeast side of Galena Hill, which include some of the best in the district, much more accessible and easier to work. It will also make the town and hill of Keno and its properties more accessible, particularly in the winter.

In 1940 a rough road was made from near Sullivan's Roadhouse to the summit southwest of Mount Haldane on the route to Haggart Creek. During the summer this road was used by trucks.

CARMACKS DISTRICT

FREEGOLD MOUNTAIN AREA[1]

Lode gold deposits were discovered in Freegold Mountain area by Mr. P. F. Guder in 1930. Mr. Guder's discovery was followed by a stampede and much staking, and during the next 2 or 3 years prospecting resulted in the discovery of many metalliferous deposits of various types. Many of the prospects had promising gold showings and on the Laforma group of Mr. W. J. Langham and his associates a vein of considerable length carried particularly high gold values.

In 1934 the N. A. Timmins Corporation acquired the Laforma group and at once began operations. During the winter of 1934-35 the corpora-

[1] Bostock, H. S.: The Mining Industry of Yukon, 1931; Geol. Surv., Canada, Sum. Rept. 1931, pt. A, and for subsequent years to 1933: Sum. Rept. 1932, pt. A, Sum. Rept. 1933, pt. A. For the years 1934 to 1938: Mems. 178, 193, 209, 218, 220.

Bostock, H. S.: Carmacks District, Yukon; Geol. Surv., Canada, Mem. 189 (1936).

Johnston, J. R.: Geology and Mineral Deposits of Freegold Mountain, Carmacks District, Yukon; Geol. Surv., Canada, Mem. 214 (1937).

tion built a winter tractor road about 26 miles long, with a number of bridges, into the locality and began underground development on the Laforma group. In the summer of 1935, however, the corporation dropped its holdings, which were taken over almost immediately by the Yukon Consolidated Gold Corporation. Throughout the winter of 1935-36 this corporation continued the development of the Laforma group, but in May 1936 dropped its option and withdrew from the area. During the following winter funds were raised by some of the owners and associates to develop the Brown Fairclough group adjacent to the Laforma group, and a 10-ton mill was built on it but was closed down after running for a few days only. In the summers of 1936 and 1937 interest in the area in general decreased and many claims were allowed to lapse. A few prospectors remained in the area and continued to find over a widening area new showings yielding gold values.

In the summer of 1937 Mr. W. Teare, prospecting on Caribou Creek, a southern tributary of Seymour Creek, found a boulder of vein quartz in which free gold was visible. Later a showing of numerous, closely spaced, small stringers of similar quartz, believed to be the source of the rich quartz, was discovered and staked by Mr. Teare with the assistance of Mr. Guder.

In 1938 Messrs. T. C. Richards and E. F. Keobke of Whithorse secured from Mr. Teare and his partner, Mr. C. Miller, an option on the Caribou Creek property and mined approximately 60 tons from an open-cut on the side of the valley. Out of this 14 tons of hand-picked ore were put through a 2-ton mill and a brick of 84 ounces of crude gold carrying 20 per cent silver was made. The crushing was not very fine and considerable gold must have been lost in the tailings for the assay value of the ore was considerably higher than the production figures suggest. This was said to be the first gold brick made from a lode gold deposit in the southern part of Yukon. The deposit seems to have consisted of a network of small veinlets of quartz so closely spaced as to resemble a breccia cemented by the vein filling. The veinlets were up to 2 inches thick, but thicker at junctions. The wall-rock varies from a black, siliceous argillite to black quartzite, in which numerous, coarse, rounded quartz grains and a few feldspar grains are crowded in a black, argillaceous groundmass. When the showing was exposed by an open-cut it was found to cover an area approximately 50 by 20 feet, all of which was a mass of veinlets. Fine gold was visible in the quartz almost everywhere, and, assuming that the ore continued downward for only 10 feet, the prospect could be regarded as a paying proposition even when worked on so small a scale. Subsequent work showed, however, that these veinlets went down only 1 to 3 feet, and when this thickness was cleaned off no further ore was found. A considerable area was laid bare and a short adit driven under the open-cut without success. The open-cut shows several fractures, one of which is more pronounced than the others, and is a fault. This fracture strikes and dips so that it intersects the slope of the hillside at a steeper but an oblique angle and forms the under surface of much of the open-cut. The lower wall of the fault is slickensided and seams of gouge lie upon it. The ore seems to have been on the upper side of the fault, but in the open-cut and in the adit there are a few small veinlets in the rock below the fault.

Within 50 feet to the west along the hillside the country rock changes to quartz porphyry and granodiorite. The black sedimentary rock continues up the hill and to the east for some distance. A few similar veinlets have been found in one or two other places in this rock farther up the hill.

Late in 1938 this property was abandoned and Mr. Richards obtained an option on the Laforma group and at once began to develop it. Mr. Richards purchased the mill that the Yukon Gold Mining Syndicate had erected on the adjacent Brown Fairclough group and moved it to the portal of No. 2 adit on the Laforma group. The rebuilding of the mill was begun in November 1938 and production was started on January 16, 1939. During 1939 development went on steadily despite curtailment due to shortages during the summer in oil, gasoline, and other supplies caused by lack of transportation facilities after the spring thaw.

The underground workings on the Laforma group consist of a main level at an elevation of 3,650 feet, called No. 2 adit level. No. 1 adit is a short adit in the vein on the hillside, 290 feet above No. 2 adit level. No. 3 adit is 80 feet below No. 2 adit. No. 2 adit, the present main level, runs into the hillside in a northwest direction for 150 feet where it strikes the vein. There a short drift extends to the southwest and the main drift extends northeasterly along the vein for 850 feet to a point a little beyond where it would be directly down the dip from No. 1 adit. Short crosscuts extend on both sides of No. 2 adit and a raise has been driven coming out at the surface at 150 feet above No. 2 adit. A number of stopes have been made in the vein above No. 2 adit. The workings along this adit show a zone in the granodiorite along which there has been considerable faulting, shearing, and crushing. The zone is followed by a quartz porphyry dyke, quartz veins, and sulphide vein material, all much fractured. The gold occurs in the quartz and sulphide. The quartz forms one to three veins in different places, the chief of which is the central part of the fractured zone. In places there are hanging-wall and foot-wall veins. The quartz veins are up to 3 feet wide, but average considerably less. The general dip is over 80 degrees to the west, but locally is steep to the east. The quartz is fine-grained and grey, and carries gold, pyrite, arsenopyrite, and other sulphides scattered through it in small particles. Patches of tourmaline are common. The sulphide vein material is crushed and is mainly pyrite. Both quartz and crushed sulphide carry gold, the sulphide holding 2 to 8 ounces a ton and some of the quartz even more. The bands of vein material are separated by seams of gouge and bands of crushed and altered granodiorite. Bodies of gouge often parallel adjoining quartz and sulphide vein material and in places are present in the middle of the vein material. The gouge carries up to about $1 a ton. At the face of the main drift the vein material holds its width and value. At the time of the writer's visit in July 1939, No. 3 adit had just reached the vein 350 feet from the portal and directly down the dip from where No. 2 adit reached the vein. The extent of alteration, fracturing, and crushing was the same as in No. 2 adit, but the vein showing was the best in the mine. Six channel samples taken by the management, each 22 to 34 inches long taken across three faces of vein material of quartz and sulphide, carried over 1·5 ounces of gold to the ton. The 34-inch sample carried 7·58

ounces to the ton. It has been reported that drifting along the vein on No. 3 adit level gave better values than those in No. 2 adit.

The mill is at the level of No. 2 adit and was originally designed for 10 tons a day. It consists of a small, coarse crusher and 3 by 3 ball-mill, seven flotation cells with a classifier, and a jig. Power is obtained from two 18-horsepower Diesel-Petter engines. Although the quartz is slightly higher in grade than the sulphide ore, it is so much harder to crush with the equipment available that careful selective mining must be followed. In mining, also, much difficulty has been met in keeping the gouge from falling in with the ore and lowering the grade. The ore is hand sorted before going into the coarse crusher and large pieces of quartz removed. The gulch in which the mill is located carries only an intermittent stream, but in spite of this the mill was run for a part of every month except October and perhaps December. It was reported in July that the returns from the mill were more than balancing running expenses.

During 1939, 892 tons of ore were mined and yielded 45 tons of concentrates and 847 tons of tailings. The heads assayed 1·46 ounces of gold to the ton and the tailings 0·19 ounce of gold to the ton; 531 ounces of gold and 50 ounces of silver were recovered as bullion and 615 ounces of gold and 25 ounces of silver were recovered from the concentrates. This gave an average recovery of 88 per cent and a concentration of 1:20. The low average recovery is due to the fact that at first the mill had no flotation cells but only tables, and for the first 2 months about 35 per cent of gold was lost. With the installation of the flotation plant the recovery has risen to 96 per cent of the gold. During 1939, twelve to twenty-two men were employed in this operation.

During the latter part of the summer of 1939 a road for all-year motor traffic was built from the main Dawson-Whitehorse road up Crossing Creek to the mill, a distance of 25 miles. The road, though it still requires improvement in some places, made a great difference to the operation of the mine and prospecting in the area generally. In July the mine was short of gasoline, repair parts, and many supplies, but the operation was kept going by bringing such things as were essential from Carmacks by pack-train. The pack-train available was less than ten horses and only one round trip was made a week.

At the end of 1939, a road had been built to the mine, the No. 3 adit level offered a new source of ore, steps had been taken to correct the water shortage, and the mill equipment had been improved.

The mine continued to operate up to June 1, 1940, when the option on the property was dropped by Mr. T. C. Richards and the property reverted to the owners. Final production figures are not available; 291·51 fine ounces of gold were recovered at the property and 52 tons of concentrates shipped during 1940, but some of these concentrates were produced in 1939.

The mine appears to have closed down, due partly to a shortage of ore of the high grade demanded by the mill to meet expenses and partly disagreement between the owners and the management. The property is now open.

A number of promising veins are exposed on claims owned by Mr. P. F. Guder, on the west slopes of Freegold Mountain. During 1939, Mr. Guder prospected his ground near the head of Cabin Gulch. By ground sluicing the hillside, he found a new vein, which he believes provided the high-grade, gold-bearing float found in the area. The vein was exposed for a width of several feet.

During 1940 Mr. Guder continued to prospect in the neighbourhood. In the same year, Mr. McLeod prospected about 3 miles southeast of the Laforma mine on the south side of Seymour Creek and exposed a large, well-mineralized showing. A specimen sent the writer is of grey quartz with very fine particles of galena, pyrite, and arsenopyrite. Assays from the showing are said to run as high as $15 a ton.

On Tinta or McDade Hill, Messrs. M. Ross and W. Teare restaked and are prospecting a large vein discovered in 1930. This vein has been traced for several thousands of feet, is several feet wide, and had been found to carry silver and some gold. During the 2 years Messrs. Ross and Teare have discovered new veins of various sizes, some being very large. They have done much surface trenching, have put down two shafts 50 and 35 feet deep, and driven an adit 52 feet crosscutting one vein, 22 feet wide.

It is reported that Mr. Orloff King, who for many years has been prospecting in the country south and west of Carmacks, has located a promising showing southwest of Freegold Mountain.

WHITEHORSE DISTRICT

No discoveries have been reported since 1938. In 1939, Mr. Thomas Brooks continued to prospect his ground on the Hidden Ore group on Wheaton River[1]. He reported that he had exposed some veins on the claims of the group. During the autumn of that year the Hidden Ore group was bonded by Mr. John B. White of Spokane. More recently it has been reported that the adjoining Midnight group has been optioned, but nothing further has been heard of these properties.

Some prospecting work has been done during the last two seasons on the Jean mineral claim a mile southwest of the Big Thing[2] property, 5½ miles south of Carcross. It is stated that the lead has been further exposed and proved to be at least 5 feet wide. A sample from 2 feet of the lead is reported to have assayed $50.40 in gold to the ton. A number of other samples assayed considerably lower.

COAL MINING

The Tantalus Butte coal mine near Carmacks remained closed in 1939. The good coal readily mineable from the entry that has been in use since the mine started production in 1923, has been exhausted and expenditure of capital is necessary either to extend the present workings or to drive a new adit at a lower level, but the present limited market and difficulties of transportation have prevented the necessary expenditure. The coal is a good grade of bituminous coal and probably at a lower level

[1] Bostock, H. S.: Mining Industry of Yukon, 1938; Geol. Surv., Canada, Mem. 220, pp. 16, 17.
[2] Cockfield, W. E., and Bell, A. H.: Geol. Surv., Canada, Mem. 150, p. 39 (1926).

would prove considerably better. Practically all the production to date from this mine has been from shallow depth within the zone of permanent frost.

The shortage of coal in Dawson has led to attempts being made to find other sources of coal. Some coal has been brought up Yukon River from Alaska and attempts have been made to reopen a coal mine on Rock Creek, 7 miles upstream from Klondike River and about 20 miles from Dawson.[1] The mine was reopened in 1937, but closed again in 1938. It is now reported that it has been opened again (in the latter part of 1939) under Mr. D. W. Ballentine of Dawson. The gently inclined shaft has been extended and a few tons are reported to have been sold in Dawson during the winter of 1939-40, but no further word has been received of this enterprise.

SPECIAL WAR MINERALS

Tin, tungsten, mercury, and antimony are among the metals of importance in war industries that might be discovered in commercial deposits in Yukon. A number of tungsten- and antimony-bearing deposits were visited by the Geological Survey party in the latter part of August and in September 1940. The results of this work are given in later paragraphs.

Tin is very scarce in North America, but it has been found in small amounts in places in British Columbia and Yukon. It has been reported from a number of placer streams in Yukon. All of these, so far as the writer knows, with the exception of Canadian Creek, lie northeast of Lewes-Yukon River. In some instances well-polished pebbles of hematite have been mistaken for stream tin or cassiterite, which they resemble. Cassiterite does occur, however, in a number of places, as for instance in the gravels of Klondike River.

Mercury in the form of cinnabar has been reported from some of the placers in Yukon, including Miller Creek in Sixtymile district, where a few pounds have been distilled from cinnabar, recovered in the heavy sands of the gold placers. This locality and indeed all those the writer has heard of are within a few miles of areas of Tertiary volcanics, and this is also true of most of the mercury discoveries in British Columbia. Yukon contains the northwestward continuations of the geological belts in British Columbia and, therefore, may hold similar mercury deposits.

In North America no large source of tungsten is known, though a number of small deposits have been found. Scheelite ($CaWO_4$) is the chief mineral from which tungsten is recovered, but ferberite ($FeWO_4$), wolframite ($(Fe,Mn)WO_4$), and huebnerite ($MnWO_4$) are also important ore minerals. Occurrences of scheelite have been reported from a number of places in Yukon, including Dublin Gulch from which some hundreds of pounds of scheelite have been recovered in the heavy sands of the gold placers and shipped. Ferberite[2] has also been reported from a number of places and some hundreds of pounds recovered from placers on Canadian Creek have been shipped in the past.

---

[1] Bostock, H. S.: Geol. Surv., Canada; Mining Industry of Yukon, 1937, pp. 13-16.

[2] Formerly this mineral has always been reported as wolframite, but an analysis in 1940 by H. V. Ellsworth of the Geological Survey shows the mineral from Canadian Creek to be ferberite and in this report where the presence of wolframite has been reported it is regarded as being in all probability ferberite.

TUNGSTEN DEPOSITS

SUMMARY AND CONCLUSIONS

Of the scheelite and ferberite deposits reported to date in Yukon none has been explored or developed. At present a placer deposit at the head of Canadian Creek believed to carry several pounds of ferberite, in addition to $1 or more in gold to the cubic yard, might be put into production in a relatively short time and at a moderate cost. A rough estimate made from the little information available suggests that this deposit contains 400,000 cubic yards of ground holding 2,000 tons of crude ferberite. So little prospecting has been done on this deposit that these figures cannot be taken as more than an indication that the deposit is worthy of investigation.

In the Dublin Gulch area of Mayo district, scheelite was found in the placer gravels and in lode veins prior to 1918, and a few thousand pounds of stream scheelite were recovered and shipped at that time. Brief examination suggests that a few tons, perhaps 10, of marketable scheelite sand might be produced each year from the Dublin Gulch gravels. No lode prospecting has been done since 1918 and the possibilities of developing a lode deposit remain unknown. Scheelite has also been found at the head of Highet Creek in Mayo district, but none has been produced there and little prospecting has been done.

INTRODUCTION

Three localities in Yukon known to contain tungsten prospects were examined during 1940. One is on the head of Canadian Creek and the other two are in Mayo district. All are readily accessible, but will require some road construction for development.

CANADIAN CREEK PROSPECTS

The Canadian Creek deposit was examined by A. R. Allen, the writer's chief assistant. The following account is based on his notes.

Canadian Creek is a tributary of Britannia Creek, which enters Yukon River about 50 miles below Fort Selkirk or 325 miles from Whitehorse railhead by direct river steamboat navigation. The area was visited and mapped by D. D. Cairnes[1] in 1916. At that time five or six prospectors were working the head of Canadian Creek for placer gold and recovered 500 to 600 pounds of ferberite concentrates containing 64·42 per cent WO_3 that year. Ferberite had been reported in the gravels of several creeks in the area, but its presence was only proved on Canadian Creek. At that time the small amount of water available limited the production to only a few thousand pounds a year. Though promising indications of ferberite in place were found on a hill that is drained by the south head of Canadian Creek little or no lode prospecting appears to have been done.

A number of placer claims at the head of Canadian Creek are held by prospectors, including Mr. J. Meloy who has been working on the

[1] Cairnes, D. D.: Klotassin Area, Yukon; Geol. Surv., Canada, Sum. Rept. 1916, pp. 21–33.

creek for several years. Mr. Meloy's workings greatly facilitated the making of a rough evaluation of the ground. The placer material is more of a residual soil than a washed gravel. The locality is in the unglaciated country on the old Tertiary upland, which the headwards cutting of Canadian Creek has not yet reached. The main tungsten mineral of the locality is ferberite; a little scheelite is also present, but does not appear to amount to 1 per cent of the crude ferberite concentrate from the placers. To test the ground in the short time available 180 pounds of soil was washed from the ground where Mr. Meloy was working. This yielded a heavy black sand concentrate of 3·5 pounds. A test was then made of 20 or more pounds of Mr. Meloy's black sand. This was screened through a 10-mesh screen and the two lots were each separated into magnetic and non-magnetic lots with a hand magnet. The coarser, non-magnetic material was determined in the field to contain 60 per cent ferberite and 40 per cent other non-magnetic minerals, mainly hematite, and the whole of the coarse material contained 40 per cent ferberite. Unfortunately this coarse concentrate was not assayed. The finer material contained 37 per cent non-magnetic minerals. This was seen to be mainly ferberite and assayed 63·3 per cent WO_3. These rather disconnected tests were made from the part of the creek carrying the highest gold values, but are the best available. From them the following evaluation of the ground has been made. Taking the black sand at 37 per cent crude ferberite running 63·3 per cent WO_3 the soil runs 21 pounds of crude ferberite a cubic yard (3,000 pounds).

Bedrock has not been reached anywhere in the placer workings, though Mr. Meloy reports that a shaft was put down 42 feet. Most of the workings show 12 to 15 feet of soil. Mr. Meloy reports that most of his ground carries $1 to $2 in gold to the yard and that this summer it proved richer, most of it being $7 to the yard. Allen sent in a number of small samples of soil. These were panned and found to contain gold approximating the figures given above. One sample was perhaps richer than $7. Mr. Meloy states that the ground is richer in gold and ferberite with depth. He also reported that gold and ferberite continued along the west fork of Canadian Creek. This may be, but two samples from that branch of the creek sent in by Allen are of a different kind of soil, contained much less black sand than the others, and had no gold and very little ferberite. Those along the south fork were all of the same sort of soil and all carry fair quantities of gold and ferberite, though some are much richer than others. Thus it is considered probable that only a belt on either side of the main creek and up the south fork can be expected to carry ferberite in quantities suggested above, though a considerably larger area, including the head of Casino Creek where it drains the hill mentioned at the south head of Canadian Creek, holds possibilities. An area 300 feet wide and 4,000 feet long is taken as holding possibilities. With an average assumed depth of 9 feet, this area holds 400,000 cubic yards and should it carry an average of 10 pounds of ferberite concentrate running 60 per cent WO_3 it would contain 2,000 tons of concentrates. Taking the ferberite concentrate at 75 cents per pound and the gold at $1 per cubic yard the ground would have a possible value of $8.50 per cubic yard in ferberite and gold.

To the present, lack of water has discouraged any attempt to work this deposit on a large scale for gold or ferberite, and no attempt had previously been made to estimate the quantity of the ferberite. It would seem that if prospecting of the ground shows values and yardages approaching these figures a system can be found to mine it economically. Two points should perhaps be noted here. It is believed that a proper system of washing and of magnetic separation would yield a higher grade concentrate than the crude concentrate assaying 63·3 per cent WO_3. The ground is frozen solid in winter, but being above timber line, open and unforested, it thaws sufficiently by midsummer for the present gold placer cuts 12 to 15 feet deep. The exploration and development of this property are problems requiring special experience in the drilling of placer deposits, and in the handling of frozen ground.

There are two possible road routes from Yukon River at 1,400 feet in elevation to the deposit at 4,100 feet. Both are about 15 miles long. One follows closely the present trail up Britannia Creek and would climb about 2,100 feet in 3 miles near the head of the creek. The other would follow the ridge west of Canadian Creek, and though not explored is believed to offer a more steady grade and to be sunnier and drier. The total climb for both is the same.

This 15-mile truck haul would bring the concentrates to Yukon River. From there they would go by river steamboat to Whitehorse and thence by rail to tidewater at Skagway.

MAYO DISTRICT PROSPECTS

The most important locality in this area is Dublin Gulch, where scheelite is reported both in placer deposits and in veins. Dublin Gulch is a tributary of Haggart Creek, which runs into the South Fork of McQuesten River. It is reached by truck road from Mayo to Mount Haldane summit, 21 miles, and thence by winter tractor road 17 miles. The whole route could readily be made into a continuous all-year truck road with bridges over McQuesten River and Haggart Creek.

In 1904 J. Keele[1] noted the presence of scheelite in the Dublin Gulch placers, and during the last war the locality was examined by D. D. Cairnes[2] and W. E. Cockfield[3] as a source of tungsten. The locality was visited by the writer in 1940.

DUBLIN GULCH TUNGSTEN PLACER DEPOSITS

During 1939 Mr. Fred Taylor working a gold placer with three men and a gasoline hoist moved 10,000 cubic yards of gravel recovering 325 crude ounces of placer gold, and with this about 300 to 500 pounds of heavy sand. In 1940 he accumulated about 1,000 pounds for trial shipment. A 2¼-pound sample was taken from the heavy sand just as it was shovelled out of his sluice-boxes and then panned with mercury to recover such fine gold as might be in it. Nothing had been done to clean it and it

[1] Keele, J.: Geol. Surv., Canada, Sum. Rept. 1904, pt. A, pp. 18-42.
[2] Cairnes D. D.: Geol. Surv., Canada, Sum. Rept. 1916, pp. 15-19.
[3] Cockfield, W. E.: Geol. Surv., Canada, Sum. Rept. 1918, pt. B, pp. 10-15.

contained some small pieces of country rock and hematite. This was assayed and found to carry 66·28 per cent WO_3. The tungsten is mainly in scheelite, but a considerable amount of ferberite is also present. In the placer operation no pains had been taken to catch the heavy minerals other than gold, and only those were saved from which the gold could not be readily separated in the sluice-boxes.

The ground about 1,000 feet below Mr. Taylor's was found in 1918 to carry 0·8 to 1·2 pounds of scheelite a cubic yard. In a working about a mile above Mr. Taylor's the surface ground carried " as much as one-quarter of an ounce of scheelite to the pan near the surface and the amount probably increases as bedrock is approached" (Cockfield). One-quarter ounce a pan is close to 2 pounds a yard or more according to the number of pans per yard.

Above Mr. Taylor's workings there is 1½ miles of creek that is judged to be workable in one way or other with modern appliances. In this stretch, the valley floor narrows and the gravels probably become shallower giving a smaller yardage, but as scheelite grinds away readily it is likely that the gravel as suggested by Cockfield's figures contains higher values in scheelite farther up stream near the source. Cockfield also says that prospecting in 1918 showed that the scheelite and wolframite continued up Dublin Gulch and its tributary Olive Gulch, and scheelite is present in quantities fully as great as in the working below. Cockfield estimated that there was in 1918 only 2,500 feet in the lower part of Dublin Gulch (presumably the first mile) remaining to be worked, and that this would only yield 20 to 30 tons of scheelite and wolframite concentrates. This seems a fair estimate of the yield, but it seems likely to the writer that there may be much more, perhaps 7,500 feet, of the gulch that may now be workable with the improved methods. The 7,500 feet might then yield 60 to 90 tons, but the rate of production is limited by the small volume of water in the gulch. Even with the assistance of mechanical equipment it does not seem that more than 20,000 cubic yards, yielding perhaps 1 pound of scheelite concentrate a yard or 10 tons, could be worked per year without expense out of all proportion to the yield. As long as the placer mining continues on the gulch a small production can be maintained.

DUBLIN GULCH TUNGSTEN LODE DEPOSITS

From 1916 to 1918 Mr. Robert Fisher prospected around the head of Dublin Gulch and found a number of lode deposits carrying scheelite, probably the original source of the placer scheelite. After 1918 except for a little assessment work on these prospects nothing more was done and in 1939 Mr. Fisher died. No one else knew much of his finds and his excavations have now caved in. The best information on these prospects is given in the report of 1918 by Cockfield. Cockfield found that the deposits seemed to be centred around a small body of Mesozoic granite at the head of Dublin Gulch. The surrounding, older rocks are metamorphosed sediments consisting of schist, quartzite, limestone, and gneiss. The lode deposits included veins in the granite, veins in the surrounding metamorphic rocks, and pegmatite dykes. Most of the prospects are veins in the granite. The veins follow three sets of fissures,

approximately at right angles to one another, and vary from 1 to 6 inches in thickness. None of them had been traced far. Scheelite is present as crystals in the veins and in the adjacent wall-rock. Quartz is usually the only gangue mineral. Calcite and white mica in some instances afford a transition between these veins and the pegmatite deposits. Only one pegmatite dyke carrying appreciable amounts of scheelite has been found. It is about a foot thick and consists of a mass of white mica and quartz with some feldspar and hornblende. The scheelite is in the pegmatite and in quartz veinlets cutting it.

Assays show that the veins carry 1·70 per cent to 10·10 per cent WO_3, and two assays across widths of 5 feet of adjacent wall-rock, 2½ feet on each side of the veins without including veins, carried 0·85 per cent and 1·80 per cent WO_3. Two other assays similarly taken only carried a trace.

Two veins were found in the metamphoric rocks overlooking Lynx Creek. The veins are alike and only one is described. It is 4 inches wide and carried 1·25 per cent WO_3. A sample of mineralized wall-rock gave 3·40 per cent WO_3.

One pegmatite having a width of 1 foot was assayed, giving 6·35 per cent WO_3.

In no case had any work been done to trace the continuity of any of these deposits. The writer believes that the area escaped glaciation. Cairnes regarded the area as having been subjected to glaciation. The lack of glaciation, however, may be very important. Cockfield notes the remarkable depth and completeness of weathering of the wall-rock. It suggests that the scheelite in Cockfield's assays from the wall-rock adjacent to the veins may be residual concentration and hence only exist for a few feet in depth. It also suggests that there may be a considerable quantity of easily available scheelite concentrated in the form of residual placer. In support of this is the fact that in 1940 by panning soil from the old trenches appreciable amounts of scheelite were picked up in every case. No gold was found in any of these prospects.

It seems probable that with more prospecting a workable deposit might be found. The lack of a road is not such a problem as it was in the past. In the last few years the road has been improved a little for the gold placers on Haggart Creek and Dublin Gulch and there is now suitable mechanical equipment in Yukon for construction.

SCHEELITE AND JOHNSON CREEKS

Placer miners found scheelite in the heads of Johnson and Highet Creeks, and an account of these discoveries is given by Cockfield in his report of 1918. The area was visited by the writer in 1940. No workable quantity of scheelite has been found in any of the placers, but the presence of scheelite has been proved in Johnson Creek, its tributary Swede (Sabbath) Creek, and in Scheelite Gulch, a tributary of Swede Creek. A little was also found in the tributaries of Highet Creek. Where the scheelite has been found there are small stocks of granitic intrusives like that of Dublin Gulch. In 1940 Mr. R. Rosmusen, a prospector who has worked in this area many years, showed the writer where small veinlets in

the granite had been found carrying scheelite. They appear to be of the same type as those of Dublin Gulch, and there are also thin pegmatites along joint planes ¼ to ½ inch wide of white mica and quartz similar to those of Dublin Gulch. Some specks thought to be scheelite were obtained from crushing and panning pieces of the pegmatite. The area is accessible and certainly has some promise, but lacks prospecting.

ANTIMONY PROSPECTS

In Yukon antimony has been reported from a great many localities, including Wheaton River area, Mayo district, and north of Dawson. During August and September 1940 the writer visited those of Wheaton and Mayo areas.

ANTIMONY IN MAYO DISTRICT

Deposits carrying stibnite and other antimony sulphides have been reported in several parts of the district. Antimony minerals have been found in the silver-lead ores of Keno and Galena Hills, but in no part of these mines has concentration of antimony minerals been found sufficient to be of interest as a source of antimony. In 1938 Mr. R. Rosmusen showed the writer some veins he was prospecting for gold at the head of Highet Creek. These were noted to carry unusual amounts of stibnite and in 1940 Mr. Rosmusen reported that he had found some better showings of stibnite.

A large number of prospects have been found in the vicinity of the head of Highet Creek. They include veins bearing arsenopyrite, stibnite, and pyrite from which assays carrying more than an ounce of gold and also silver have been reported, and other deposits of the replacement type containing pyrrhotite, chalcopyrite, and arsenopyrite also carrying gold. The area contains a number of small, granitic, intrusive bodies protruding up through the surrounding quartzites, schists, and gneisses. Though gold placers have been worked on Highet Creek almost steadily for over 45 years and lode prospects have been known to exist there, no work has been carried beyond the initial stage of exposing the discoveries to view and the tracing of a few of the veins along their strike by cross trenches. The geological features of the area, the presence of the placer gold, and the prospects found to date all encourage the belief that the area is a promising one to prospect.

The chief antimony showings examined are in the basin of Harvey Gulch on the north side of the head of Highet Creek. On the northeast side of a small draw coming down from the northwest into Harvey Gulch a quarter of a mile above the mouth Mr. Rosmusen has discovered a showing of stibnite. The working consisted of a cut running into the hillside about 12 feet on the horizontal and about 4 feet wide. In this he had discovered large slabs up to 18 inches by 12 inches by 8 inches of yellow-brown schist, which proved to be mainly stibnite in their interiors. The stibnite is in small veins and bunches impregnated through the quartz mica schist. The slide material at the face of the cut was composed largely of this material, showing that the lead must be at hand though none of the material was actually in place. The extension of the

lead had been traced by stibnite float northeastward over 700 feet. It is apparent from the large abundant slabs of stibnite that the vein is probably of a workable size. It is very favourably placed to prospect and to work. A considerable height of ore could be developed by adits lower down the steep slope. A sample hand picked as typical of the richer slabs was assayed and gave:

Antimony	30·08 per cent
Arsenic	2·71 per cent
Bismuth	Nil
Lead	3·73 per cent
Zinc	Nil
Copper	0·09 per cent
Gold	0·05 ounce a ton
Silver	13·31 ounces a ton

A large number of other showings carrying stibnite were visited, including a large vein on the northeasterly side at the head of Harvey Gulch. This vein was exposed in place by a number of sidehill cuts for over 600 feet. One of the cuts shows it to be 3½ feet wide or more. The main gangue is quartz in which crystals of stibnite and arsenopyrite are embedded. Gold assays are reported from this vein as high as $50. A sample of vein matter more richly mineralized with stibnite than the average carried 3·89 per cent antimony.

WHEATON RIVER ANTIMONY PROSPECTS

The antimony prospects of Wheaton River[1] were discovered in 1893, but the original discoverers died and left no record of where they had found their rich antimony ores. It was not until 1906 that the prospects were rediscovered when a stampede took place in the vicinity, during which the more important properties along Wheaton River were discovered. Antimony-bearing prospects are now reported to have been found from near Millhaven on Lake Bennett, in the east along a belt stretching west across Wheaton River at Carbon Hill and over the watershed to the head of Watson River. The more important and better known properties are concentrated on the slopes of Carbon Hill and on the east face of Chieftain Hill, which lies opposite across Wheaton River. This area is reached from the railway station at Robinson by a road that is commonly used by cars in good weather as far as Wheaton River, a distance of 16 miles from Robinson. The route is a good one and the road could be developed for all-year service. At Wheaton River the old wooden bridge of three spans has collapsed and it is necessary to ford the river, which is a turbulent stream fed by glaciers. It is often impassable in spring and summer. At lower stages of water it can be forded by packhorses and light wagons, which then follow the old road up the valley and in the river where the road has been washed out. The road branches at Becker Creek, 5 miles from the old bridge. One branch extends up the

[1] Cairnes, D. D.: The Wheaton District, Yukon Territory; Geol. Surv., Canada, Sum. Rept. 1909.
Cairnes, D. D.: The Wheaton River Antimony Deposits, Yukon Territory; Jour. Can. Min. Inst., vol. 13, 1910.
Cairnes, D. D.: Wheaton District, Yukon Territory; Geol. Surv., Canada, Mem. 31, 1912.
Cairnes, D. D.: Wheaton District, Southern Yukon; Geol. Surv., Canada; Sum. Rept. 1915. Supplement to Mem. 31 with geological and topographical maps 1 mile to 1 inch.
Cockfield, W. E., and Bell, A. H.: Whitehorse District, Yukon; Geol. Surv., Canada, Mem. 150, 1926.

creek to the old Becker-Cochrane property a little over 4 miles and the other branch follows up Wheaton River another 9 miles to Berney Creek. At 7 miles it is opposite the prospects on Carbon and Chieftain Hills.

In 1940 Mr. Walter McAlister acquired the old Becker-Cochrane property. The cabins of this property are 1¼ miles up the southwest branch of Becker Creek. The property itself is at 5,100 feet elevation in the south or smaller of the two draws that run from Carbon Hill into this branch of Becker Creek at the cabins. A good trail climbs up the nose westward from the cabins and leads up the draw to the workings. At the time the property was visited the workings consisted of an old adit 100 feet long and two sidehill surface cuts. The adit runs into the hill northwestward and is in a steeply dipping shear zone 8 feet or more wide, neither wall being exposed, and striking approximately north 60 degrees west. The zone is made up of gouge with seams and patches of solid vein matter. The vein matter is composed of quartz and stibnite in varying proportions, from quartz with large scattered crystals of stibnite to relatively solid masses of stibnite. In the face of the adit across 4 feet there were three vertical seams of vein matter, two a few inches wide on the south side and one 10 inches wide on the north side. A channel sample across this face gave 5·72 per cent antimony and a hand-picked sample from the seams of vein matter carried 13·28 per cent antimony. A hand-picked sample of the richer sulphide vein matter on the dump outside the tunnel gave:

Bismuth	Nil
Arsenic	0·18 per cent
Antimony	30·13 " "
Lead	Nil
Zinc	0·10 " "
Copper	0·06 " "
Gold	0·005 ounce a ton
Silver	0·19 " "

The shear zone is also exposed by two sidehill cuts, one 45 feet, and the other 200 feet, southeast of the portal of the adit. These cuts show the same kind of shear zone and seams of vein matter rich in stibnite up to 8 inches thick. Near the workings the steep slopes of the draw are covered by slide rock of fine-grained quartz porphyry and granophyre believed to be of Tertiary age. During much of the summer two to four men were employed fixing up the old cabins and timbering and clearing out the old tunnel. With the present market conditions for antimony the ore appears to be too low in antimony and to carry too much arsenic and lead to make it saleable even after hand picking. The shear zone and vein material with it appear to be of a strong persistent character and it is probable that the deposit might prove to be large.

A prospect known as Goddell's property lies on the steep northwest side of Carbon Hill, facing Wheaton River. It is reached by climbing up the bottom of a steep, rock-walled draw a little over a mile northeast of Antimony Creek. The draw, even in September, was partly filled with last winter's snow. At 4,000 feet the draw forks and a branch comes into it from almost due east. This branch follows up a shear zone that reaches to the top of the mountain at over 5,700 feet. On the south side of the

branch draw about 100 feet above the forks, the shear zone is bounded by a clean-cut rock cliff of granodiorite. Here about 3 feet of gouge and sheared wall-rock lies next to the cliff and then 13 inches of vein material. The vein material consists of quartz gangue with abundant stibnite and other sulphides. A channel sample of this 13 inches gave 14·19 per cent antimony. The vein material is uncovered for 50 feet down a steep slope and for 30 feet upward, but for most of this distance of 80 feet it is 3 to 6 inches wide. Following up the draw to the east vein material is again exposed in a number of places. At 4,450 feet elevation 2 to 3 inches of quartz and antimony sulphide are exposed for a length of 3 feet.

A picked sample of the vein matter from here gave the following results:

Bismuth	Nil
Arsenic	0·11 per cent
Antimony	7·74 per cent
Lead	Nil
Zinc	Nil
Copper	0·03 per cent
Gold	0·09 ounce a ton
Silver	0·28 ounce a ton

At 4,500 feet elevation about 4 feet of similar vein material is exposed. At 4,850 feet 9 inches of vein is exposed and a sample carried 5·49 per cent antimony.

The old workings are all gone except the beginning of an adit on the north side of the draw. This seems to have been driven in to crosscut that side of the shear zone, but exposed no sulphide vein matter. Cairnes[1] speaks of two parallel veins not more than 30 feet apart, but from the exposures, which are scattered far up the draw, seen by the writer there seem to be three or perhaps four approximately parallel veins in the shear zone across a width of more than 50 feet. At the forks on the southwest side of the main draw opposite the branch draw the continuation of the zone appears to be represented by a part of the canyon wall filled by drift, suggesting that it continues to the west out to the Wheaton Valley.

Almost directly west of this property on the other side of the Wheaton Valley the property of the Morning and Evening claims lies on the face of Chieftain Hill in the second gulch south of that shown on the Wheaton map as Chieftain Gulch. The property is reached by climbing up the steep, canyon-like gulch. At an elevation of 4,700 feet a zone of parallel fractures striking approximately north 85 to 90 degrees east on the east side and north 80 degrees east on the west side and dipping vertically crosses the gulch. The most marked fracture is on the south side of the zone, which is approximately 40 feet wide. Vein material appears in this fracture on each side of the gulch, but the whole zone is now covered in the gulch for about 75 feet. On the southwest side of the gulch the zone forms a small tributary gulch, about 150 feet up which a vein a few inches wide is exposed. The vein matter here consists of lumps of quartz containing stibnite in a mass of fractured rock and gouge. At a short distance above this locality the shear zone is covered by conglomerate

[1] Cairnes, D. D.: Wheaton District, Yukon Territory; Geol. Surv., Canada, Mem. 31, p. 116 (1912).

and volcanic rocks. On the northeast side of the gulch the vein material is exposed in two small notches in the rocky sides of the gulch. In the one nearest the gulch, there is 3 feet of oxidized vein matter and gouge, and in the other, 100 feet from where the vein crosses the gulch, there is 4 feet of vein material and gouge consisting of ground-up vein quartz with lumps of quartz and stibnite. The stibnite seems to form only a small percentage of the material. A hand-picked sample of the better material from a small, high-grade dump containing lumps as large as 2 by 3 by 8 inches of relatively solid stibnite assayed 49·90 per cent antimony. The shear zone continues over the rim of the gulch and is then buried under slide rock as it goes down the slope into Wheaton Valley. Low on the mountain side similar fractures appear in the cliffs along the strike, but contain no vein matter.

There is a distinct resemblance between these three properties, all in shear zones striking approximately east along a line 5 miles in length.

A number of antimony-bearing veins have been discovered on the west face of Carbon Hill where it slopes steeply to Antimony Creek, and on the spur of the hill on the north side of the creek. These veins are those of the claims designated at different times as the Empire, Porter, or Fleming groups. These properties and the Goddell and Chieftain Hill properties are reached by following the route up Wheaton River past Becker Creek. From near the east side of the mouth of Fenwick Creek a trail leads up to the foot of the spur of Carbon Hill at the north side of the mouth of the deep gulch of Antimony Creek. A group of ruined cabins stand here and the trail, now in poor condition, starts up the spur as shown on the Wheaton map. The Porter group adit, which comprises about 1,100 feet of underground workings, is reached by following the trail to its southernmost end, but at present it is completely lost in the slide rock that covers almost the entire slope into Antimony Creek as it rounds the nose shown on the map between the two tributary draws to Antimony Creek and again as it rises above 4,800 feet on approaching the workings. The adit is at 5,250 feet and runs into the hill at north 12 degrees east. It runs straight for about 400 feet, with short crosscuts on both sides. About 350 feet from the portal a longer crosscut heads northwest and a long and winding crosscut heads off in a southwesterly direction. The workings are in a body of granite. A vein 3 to 8 inches wide carrying quartz, stibnite, and small amounts of other sulphides is crossed a short way inside the long southwest crosscut. A hand-picked sample from this assayed 28·39 per cent antimony. A number of slips and shears are intersected by the workings, but no other vein was found and there is practically no vein material on the dump. On the slope near the adit a number of old surface sidehill cuts that had been filled in by slide rock were cleaned out. These showed a number of small quartz veins, singly and in groups of veins cutting the granite. The best showing of these is near the adit and contains 5½ feet of vein material and wall-rock made up of 8 inches of stibnite, 12 inches of granite, 4 inches of quartz and stibnite, 30 inches of granite, and 12 inches of quartz and stibnite. A channel sample across this gave 9·61 per cent antimony. The 8 inches of stibnite pinched out in 2 feet. These veins seem to have a general strike approximately east and to dip about 60 degrees north.

No old workings were found on the hillside between those near the adit and those directly up the nose of the hill from the cabins. On this nose a great deal of surface prospecting had been done between 4,200 and 4,800 feet.

On the south face of the nose where it faces into Antimony Creek at approximately 4,650 feet a vein of quartz, stibnite, and barite had been traced by a number of trenches. The vein strikes north and dips about 25 degrees west. This brings its trace on the hillside northward to the top of the nose and then northwestward down the slope toward Wheaton River. The trenches cannot have traced it for more than 250 feet and it appears that the extensive trenching on the west side was to find its continuation. The vein is well exposed on the south face of the nose in one trench. Here the whole vein is 6 feet 7 inches thick. On the hanging-wall side it shows 2 feet of vein material with no stibnite, then 3 feet of wall-rock in the centre, followed by 1 foot 7 inches of vein material in which there is a seam 5 inches thick of relatively solid stibnite. A channel sample across the foot-wall part of the vein, 1 foot 7 inches thick, gave 16·68 per cent antimony, and a hand-picked sample of the best stibnite-bearing vein matter gave:

Bismuth	Nil
Arsenic	Nil
Antimony	31·36 per cent
Lead	0·76 " "
Zinc	3·40 " "
Copper	0·05 " "
Gold	Trace
Silver	1·52 ounces a ton

On the west face the workings consist of a mass of trenches stretching across and up and down the slope. The trenches were all partly filled. In three or four places small piles of stibnite vein material had been thrown up along the rim of the trenches. Where this had been done the trenches were cleaned out to bedrock, but only in one place did this succeed in exposing a vein. This is a small vein of stibnite ½ inch to 1½ inches thick, striking approximately east and dipping vertically. A hand-picked sample of chips of the stibnite-bearing vein material from the best pile assayed 37·80 per cent antimony.

Besides the antimony prospects mentioned, the late Mr. Ernie Johnson, who has prospected all over this district for many years, reported that an antimony prospect was discovered about 4 miles up Berney Creek on the north side, and that another had been found on the south side of Skookum Creek approximately the same distance up that creek. Both prospects are high on the mountain sides. Horses can be taken up both these creeks. In the case of Skookum Creek the trail starts by going steeply up the north side opposite the junction of the creeks and crosses the creek about 2 miles up. Mr. Johnson also reported finding stibnite on the west side of the head of Watson River.

MANGANESE DEPOSITS

Much of the gangue of the silver-lead mines on Keno Hill is manganiferous siderite. A great tonnage, probably reaching into the hundreds of thousands of tons, of this mineral is known to be present in these veins. A sample of the siderite was obtained for assay through the courtesy of Mr. A. K. Schillinger of the Treadwell Yukon Corporation. This sample, which came from a vein near Crystal Gulch, 1 mile from Keno city along the road to Wernecke and ¼ mile up the hill from the road, carried 12·65 per cent manganese.

RECENT PUBLICATIONS

The following is a list of recent reports and maps of Yukon. In many instances other reports and maps have been published covering some part or parts of the areas dealt with in those mentioned. References to them will be found in those given below, but many of the older reports are now out of print.

Whitehorse district (latitudes 60° to 61°, longitudes 134° to 136°).

Cockfield, W. E., and Bell, A. H.: Whitehorse District, Yukon; Geol. Surv., Canada, Mem. 150 (1926). A description of the general geology and lode prospects, accompanied by a geological map, scale 4 miles to 1 inch.

Teslin-Quiet Lake-Big Salmon area.

Bostock, H. S.: Prospecting Possibilities of Teslin-Quiet Lake-Big Salmon Area, Yukon; Geol. Surv., Canada, Paper 36-2, 1936. Mimeographed and accompanied by blue-print map of the country from latitude 62 degrees along the west face of Big Salmon Mountains southward to Teslin River as far as Teslin Lake and eastward to Quiet Lake.

Teslin-Quiet Lake area (latitudes 60° to 60° 15′, longitudes 132° to 134°).

Lees, E. J.: Geology of Teslin-Quiet Lake Area, Yukon; Geol. Surv., Canada, Mem. 203 (1936). Describes the geology and lode and placer prospects. Accompanied by a map, scale 4 miles to 1 inch, 500-foot contours, showing the geology of the part of the area north of the north end of Teslin Lake.

Carmacks district (latitudes 62° to 63°, longitudes 136° to 138°).

Bostock, H. S.: Carmacks District, Yukon; Geol. Surv., Canada, Mem. 189 (1936). Deals with general geology and prospecting. Accompanied by geological and topographical map, scale 4 miles to 1 inch, 500-foot contours.

Freegold Mountain, Carmacks district.

Johnston, J. R.: Geology and Mineral Deposits of Freegold Mountain, Carmacks District, Yukon; Geol. Surv., Canada, Mem. 214 (1937).

Pelly River (Selkirk to Hoole Canyon). For lower part, to longitude 136 degrees, *See* Memoir 189. For part from longitude 136 degrees to Hoole Canyon, *See* Johnston, J. R.: A Reconnaissance of Pelly River between Macmillan River and Hoole Canyon, Yukon; Geol. Surv., Canada, Mem. 200 (1936). Description of general geology accompanied by geological map, 8 miles to 1 inch, with topography shown by form lines.

Klondike and country stretching to Los Angeles and Rosebud Creeks.

Ogilvie sheet (latitudes 63° to 64°, longitudes 138° to 140°), topographical map, scale 4 miles to 1 inch, 500-foot contours.

Mayo district (latitudes 63° to 64°, longitudes 134° to 136°).

Topographical map, scale 4 miles to 1 inch, 500-foot contours. Preliminary blue-print copies available.

McQuesten district (latitudes 63° to 64°, longitudes 136° to 138°).

Topographical map, scale 4 miles to 1 inch, 500-foot contours. Preliminary blue-print copies available.

Mining developments in Yukon are described in short annual reports published by the Geological Survey: Memoir 178 for 1934; Memoir 193 for 1935; Memoir 209 for 1936; Memoir 218 for 1937; Memoir 220 for 1938.