

# **ANTIMONY**

## Development of an antimony deposit in the Yukon Territory



Looking in a southerly direction across Wheaton River valley. The western face of Carbon hill occupies the centre and left hand portion of the view, and it is here, and particularly on the steep face as shown in approximately the centre of the picture, that the greater number of the antimony-silver veins occur.

The above photograph was published in Memoir No. 31, Dr. D. D. Cairns, 1912,  
by the Department of Mines and Geological Surveys, Ottawa, Canada.

**INFORMATIVE HISTORY, SURVEY AND ECONOMIC ANALYSIS OF ANTIMONY PREPARED AND ISSUED BY  
YUKON ANTIMONY CORPORATION LTD. (NON-PERSONAL LIABILITY) FOR ITS SHAREHOLDERS AND OTHER  
INTERESTED PARTIES.**

**092545**

# YUKON ANTIMONY CORPORATION LTD.

(NON-PERSONAL LIABILITY)

Incorporated under the laws of British Columbia

**Registered office:**

515-475 Howe Street,  
Vancouver 1, B.C.

**Directors:**

Drake L. Cummings - - - President  
Kamloops, B.C.

Dr. Earle B. Gillanders - - Vice-President  
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James C. Ralston - - - Secretary  
Vancouver, B.C.

J. Larry Northey - - - Director  
Calgary, Alta.

Lawrence M. Snaychuk - - Director  
Edmonton, Alta.

**Consulting Mining Engineer:**

Allan P. Fawley, Ph.D., P.Eng.

**Solicitor:**

James C. Ralston

**Auditors:**

Griffiths & Griffiths

**Transfer Agent:**

The Canada Trust Company  
Vancouver and Edmonton

**Shares Listed:**

Vancouver Stock Exchange

**Authorized Capital:**

5,000,000 shares of the par value of 50¢ each.

**Issued Share Capital:**

|                         |                     |
|-------------------------|---------------------|
| To Vendors              | 700,000 (in escrow) |
| On Account of Royalties | 270,000 (in escrow) |
| To Cash Shareholders    | 930,005             |

In the last 100 years Canada and the United States, from their vast mineral producing regions, have produced gold, silver, copper, lead, zinc and most other minerals and metals worth billions of dollars. The one metal which has been missing from this vast storehouse is antimony. Canada and the United States are **HAVE NOT COUNTRIES.**

From the evidence available, based on exploration and development work carried on by Yukon Antimony Corporation Ltd. (Non-Personal Liability) on its 172 mineral claims blanketing the known antimony-silver deposits on Carbon and Chieftain Hills in the Yukon Territory, it would appear that Canada now has an important antimony-silver discovery.

Antimony is a metal which has never been mined in worthwhile quantities as a permanent mining operation in Canada or the United States and, except for importers, smelters, refiners and industrial dealers and users of antimony, its economic and strategic importance is not generally understood or realized by the people of North America. It is the purpose of this brochure to make known to our shareholders and the enquiring public the history and current economic importance of antimony to the industrial economy of Canada and the United States.

## **HISTORY**

**ANTIMONY** is one of the so-called "wonder metals" of the twentieth century and its presence as a useful material of the earth has been known for centuries. The Egyptians first used it as a copper coating as early as 400 B.C. The Romans called it "stibium", while the Greeks gave it the name it bears today.

Despite its long history, antimony was a quite unimportant commodity until it was discovered by the war makers. The Russo-Japanese War of 1905, followed by World War I, launched the metal into a position of prominence. It found its use as a chemical compound, as a prime ingredient in the production of ammunition primers, smoke screen chemicals, tracer bullets, flame thrower fuel and flame-proofing compounds.

### **Expanding Industrial Uses of Antimony**

Henry Ford, as a result of his conception of mass production of the automobile, created a permanent and expanding demand for antimony—in every car there is a battery, and every battery must have antimonial lead grids. While antimony is essential for batteries, modern metallurgy and science have increased its use in numerous industrial fields. It is essential as a metal for bearing-metal alloys, type-metal alloys, and other alloys requiring its hardening, strengthening and solidification and non-expansion characteristics. Antimony oxide and sulfide enter a wide range of industrial applications such as enamels, paints, plastics, rubber, and glass manufacturing. Military uses of antimony are in ammunition primers, tracer bullets, shrapnel alloys, smoke generators, paints and signal pyrotechnics. High purity antimony metal is used in increasing amounts in intermetallic compounds by manufacturers of electronic semiconductors and thermoelectric devices.

Antimony oxide is added to paints for flame retardation and anti-chalking. In plastics, usually a low hiding power grade is used for flame proofing. With most new building and fire codes demanding flame-proof plastics, this is a potential boom market for antimony oxide producers.

### **LIMITED WORLD SUPPLY**

There are few commercial deposits of antimony in the world of sufficient magnitude to permit development of significant ore reserves in advance of mining. The deposits found in China, Bolivia and Mexico are individually of small extent, and production is conducted as a small scale enterprise. The Consolidated Murchison Antimony Mine in the Republic of South Africa is the only antimony mine with an appreciable reserve of antimony ore. World reserves are therefore mainly estimated and classified as inferred reserves on the basis of past production and knowledge of area geology.

### World Production of Antimony

The 1964 report on antimony issued by the Department of Mines and Technical Surveys, Ottawa, sets forth world production for 1962-1963 as follows:

|  | 1962          | 1963          |
|--|---------------|---------------|
| China .....                              | 18,500        | 16,500        |
| Republic of South Africa (exports) ..... | 11,697        | 12,410        |
| Bolivia (exports) .....                  | 7,323         | 8,337         |
| U.S.S.R. ....                            | 6,600         | 6,700         |
| Mexico .....                             | 5,254         | 5,320         |
| Yugoslavia .....                         | 2,966         | 2,933         |
| Turkey .....                             | 1,962         | 1,981         |
| Czechoslovakia .....                     | 1,800         | 1,800         |
| Canada .....                             | 966           | 801           |
| Other Countries .....                    | 2,932         | 4,318         |
| <b>TOTAL</b> .....                       | <b>60,000</b> | <b>61,100</b> |

While the United States is not shown as a producer, the United States does produce, as a by-product of smelting, approximately the same quantity of antimonial lead as Canada.

Of the total world production, it will be noted that China is the leading producer, the free world contributed about 60% in 1963, and the Sino-Soviet block the remaining 40%. This supply is augmented in the industrialized countries by reclamation of antimonial scrap. Of the countries in the world which produce antimony ores, only a few have exportable surpluses. Few approach self-sufficiency, whereas others must supplement their domestic output with imports of varying quantities of ore, metal and oxide.

### United States Antimony Imports

Many countries produce little or no antimony. The United States, the world's greatest industrial nation, with its insignificant antimony production, requires and must import over 20% of the world's primary output of antimony.

About 88% of the U.S. smelter output of primary antimony is derived from imported antimony ores and concentrates. An additional 6% is recovered from foreign imported ores and intermediate smelter products at domestic lead refineries. Thus, it is evident that domestic smelters of the U.S. are over 93% dependent for antimony on foreign ores. Moreover, U.S. dependency does not end with the acquisition of smelter feed. In 1963 45% of the domestic supply of metal, oxide and sulfide, was imported.

### CANADA'S FORTUNATE REDISCOVERY

The only sizeable deposits of antimony ores so far discovered on the North American Continent are located on Carbon and Chieftain Hills, in the Wheaton River District of the Yukon Territory, situate approximately 55 miles south-west of Whitehorse. This deposit is accessible by a 30-mile truck road to Robinson, the station on the White Pass and Yukon Railway as shown on the centre page sketch.

Yukon Antimony Corporation Ltd. (N.P.L.) is now the recorded owner of some 172 mineral claims (approximately 8500 acres) which are believed to cover the antimony ore bodies located on Carbon and Chieftain Hills. The history of these deposits on Carbon and Chieftain Hills is unique and interesting.

### YUKON MINING REVIVAL — ANTIMONY

Following the rush of thousands of miners to the Klondike in 1898, many miners found they arrived too late to secure gold producing placer ground at Dawson. These disappointed miners then proceeded to prospect throughout the Yukon and some of them found, instead of gold, the antimony-silver bearing veins on Carbon and Chieftain Hills.

Some time prior to 1912, Dr. D. D. Cairns, one of Canada's remarkable early geologists, with the dedication of his famous predecessor, Dr. Dawson, made a complete examination and survey of the antimony-

silver deposits found by the Klondike miners on Carbon and Chieftain Hills. In Memoir No. 31 of the Canadian Geological Survey published in 1912 by the Department of Mines and Technical Surveys, Ottawa, Dr. Cairns, at pages 113 to 129, made a full and comprehensive report on the unique antimony-silver deposits he found on Carbon and Chieftain Hills. The following quotations are taken from Dr. Cairns' report: —

“These antimony-silver veins belong to an unusual type of ore-deposit, known in but few localities in the world, and occupy a somewhat unique place in the classification of antimony ores.

**Summary Description.** — These antimony-silver ores occur distributed throughout a westerly-trending belt about 5 miles long by 1½ miles wide, which includes all the southern portion of Carbon hill and extends to the west across Wheaton River and embraces the central portion of the eastern face of Chieftain hill.

Assays running over 500 ounces of silver to the ton have been obtained, but they are very exceptional. Samples of the better class of ores containing galena and grey copper often carry from 100 to 200 ounces. The better grades of the stibnite (antimony) ores contain 50 per cent to 65 per cent of antimony.

**Metallic Minerals.** — Of the various metallic minerals, stibnite (antimony) is much the most common, and is the only one found making up any considerable portion of the vein-fillings. In places in a number of veins, such as the ‘big vein’ on the Porter claim, the Morning and Evening vein, some on the Empire and one found on the extreme easterly portion of Carbon hill, stibnite (antimony) constitutes nearly the entire vein-filling. The ores of these veins which run high in antimony tend to be low in silver.

It is thus seen that the mineral content of these veins varies considerably, and ranges from chiefly stibnite (antimony), to entire quartz, galena, and grey copper. In most places, if not everywhere, both the galena and the stibnite (antimony) are silver-bearing.

**Persistency and Probable Vertical Extent.** — Considering the shallow zone of oxidation, the apparently slight amount of leaching that has taken place, and the improbability of any secondary zone of enrichment being encountered with depth, it appears probable that these veins should maintain, for a considerable portion of their vertical extent, the characteristics and mineralization which distinguish them near the surface. Generally veins do not extend downward for a greater depth than their extent on the surface, and in all probability this will be found to hold true in Wheaton district; so that the veins that are the most persistent at the surface may be expected to extend the farthest downward.”

Reporting on the Porter claims, now held by Yukon Antimony Corporation Ltd. (NPL), but not as yet explored, Dr. Cairns reports as follows: —

“The most promising looking of these veins, the ‘big vein’ ranges from 14 inches to 3 feet in thickness, and can be traced for at least 200 feet on the surface, and probably continues much farther, but superficial materials cover the remaining portions. The vein consists chiefly of quartz and stibnite (antimony), with sphalerite and Jamesonite in minor amounts; and portions of it 12 to 14 inches thick consist of almost pure stibnite (antimony).”

In referring to the Goddel claims, now owned by Yukon Antimony Corporation Ltd. (NPL), Dr. Cairns reported: —

“The claims referred to in this report as ‘Goddell’s claims’, constitute a group situated on the Wheaton River slope of Carbon hill, about one mile to the north of the Porter claim.

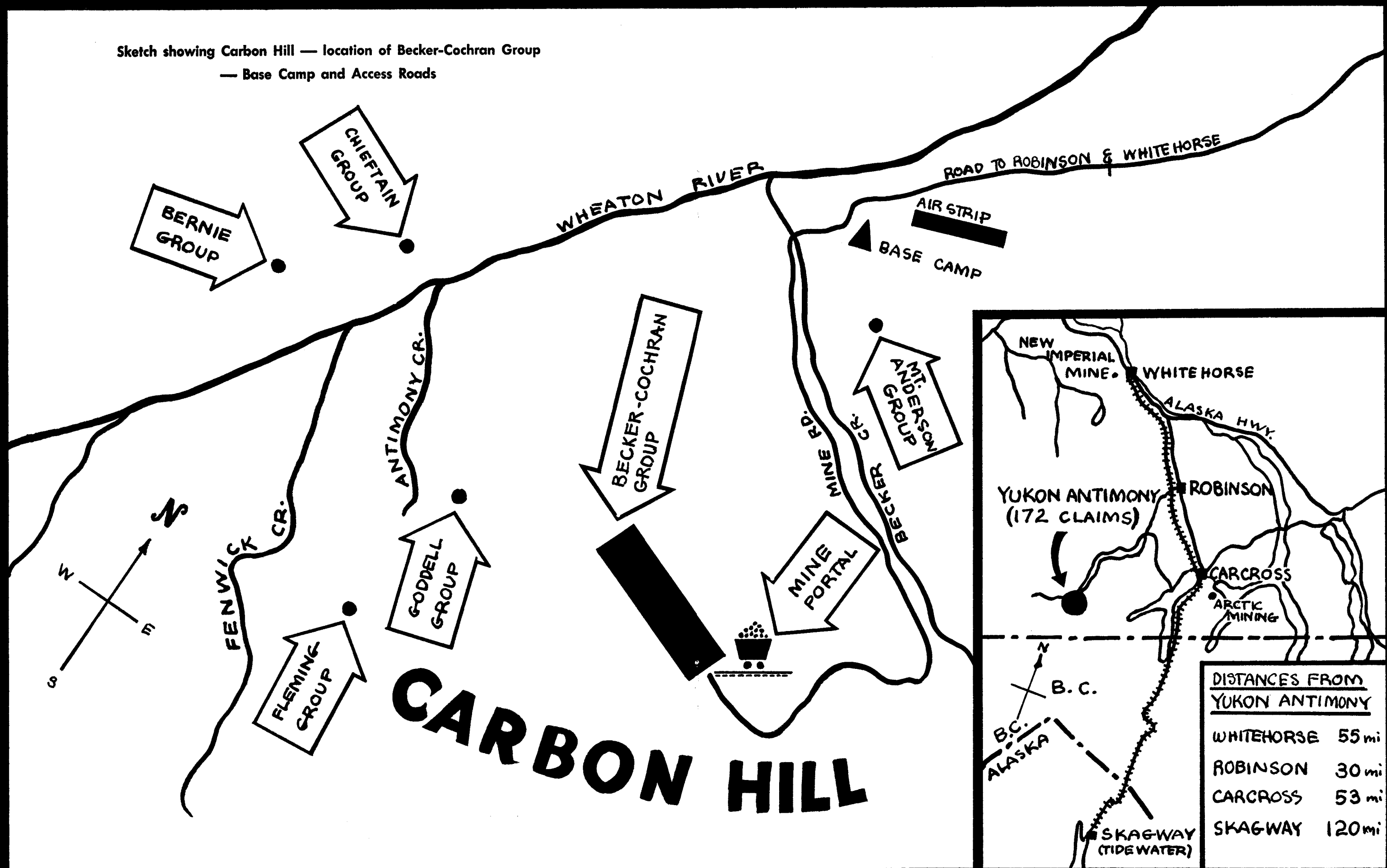
Two parallel veins, not more than 20 or 30 feet apart, outcrop in a gulch on these claims, and are distinctly exposed to view, extending up the mountain side for a distance of over 2,000 feet. The veins are fortunately situated on the rugged mountain side, so that nature has done considerable surface stripping, and so exposed them for a much greater distance than any other veins in the locality.”

#### DEVELOPMENT OF YUKON ANTIMONY DEPOSIT

At the time Dr. Cairns examined the mineral deposits on Carbon and Chieftain hills, antimony was not of economic importance. In fact, the silver ores shipped to smelters were penalized when such ores

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Sketch showing Carbon Hill — location of Becker-Cochran Group  
 — Base Camp and Access Roads



contained more than a permissible percentage of antimony. Up to 1963 China had been a major world producer of antimony. In the latter part of 1963, the Chinese mysteriously cut back their offerings of antimony. A United States government intelligence report attributed the decline in Chinese production and sale of antimony to withdrawal of Russian technical aid. The report indicated that inefficient hand methods of mining only high-grade ore were used prior to the Russians' arrival. The withdrawal of the Chinese from the world market, and the developing shortage of antimony metal throughout the free world then initiated a succession of price increases to a quoted price of 45.75¢ per lb in early October, 1964. From that date the price of antimony metal has remained high and is presently 44¢ per lb for the metal.

Yukon Antimony was incorporated on July 30th, 1964, for the purpose of acquiring the mineral claims covering the deposits on Carbon and Chieftain hills. The initial work by Yukon Antimony in 1964 was more than encouraging. Bulldozer stripping on the company's Becker-Cochran group, located as indicated on the sketch map, exposed an antimony showing on the surface 265' in length, 7 to 22' in width, at a depth of 25'.

Before closing down operations in the fall of 1964, a representative bulk sample of approximately 8 tons of ore was taken from the stripped showing and trucked to Kamloops, B.C., for mill testing and analysis. In November, 1964, 730 pounds of this ore was sent to the Mineral Processing Division, Department of Mines and Technical Surveys, Ottawa, and a similar bulk sample delivered to Britton Laboratories Limited, Vancouver, B.C., for assaying and testing under the supervision of Wright Engineers Limited. The preliminary chemical analysis by the Department of Mines and Technical Surveys made on the bulk sample gave an antimony content of 9.52%, and Wright Engineers Limited reported that a chemical analysis by Britton Laboratories Limited gave an antimony content of 11.78%.

The Mineral Processing Division in Ottawa completed its investigation, and on the 6th day of July, 1965, furnished the company with its concentration report, as follows:

"In our best flotation test, 92.8% of the antimony content was recovered in a concentrate analysing as follows:

| Sb<br>(Antimony) | S<br>(Sulphur) | Cu<br>(Copper) | Ni<br>(Nickel) | As<br>(Arsenic) | Pb<br>(Lead) | Zn<br>(Zinc) |
|------------------|----------------|----------------|----------------|-----------------|--------------|--------------|
| 60.7%            | 23.2%          | 0.015%         | 0.002%         | 0.12%           | 0.21%        | 0.28%        |

In a few cases, it was possible to obtain higher grade concentrates, but only with lower recovery. For example, 87.2% of the antimony was recovered in a concentrate assaying 64.2%. However, improvement in recovery should be achieved in plant practice by recirculation of middling products containing appreciable antimony."

Dr. Allan P. Fawley, Ph.D., P.Eng., the company's Consulting Mining Engineer and Geologist, after sampling the showing on the Becker-Cochran group, in his report on the 30th of September, 1964, set forth five analyses as follows: —

|   |          |         |
|---|----------|---------|
| 1. Representative sample of the soft rock, mostly gouge, from the shear zone for a length of 70 ft., average thickness 18 ft.                   | Antimony | Arsenic |
|   | 2.50%    | 0.85%   |
| 2. Representative chip sample of the hard rock through entire exposed section of the shear zone   | 11.23%   | 0.45%   |
| 3. Chip sample of hard rocks from the shear zone that have been pushed onto the dump (rejects after hand-sorting). Most appears to be low grade | 7.75%    | 0.25%   |
| 4. Chip sample of high-grade ore (hand-sorted) from the shear zone  | 27.50%   | 0.53%   |
| 5. Sample of soft, bright red to orange to yellow material that makes up about 1 to 2% of the shear zone  | 11.23%   | 0.29%   |

Further sampling is necessary before stating the average grade, but on the basis of the above assays and assuming the proportion of 70% of soft rock to 30% of hard rock will remain constant, then the indicated grade of the shear zone where trenched is 5.13% antimony and 0.72% arsenic.”.

### 1965 DEVELOPMENT

During the 1965 season, after completing the construction of all necessary access roads to the Becker-Cochran group, and carrying out a program of detailed surface mapping and sampling, and extending the bulldozer stripping of the showing on the Becker-Cochran group from 265 ft. to 1,150 ft., a program of underground development was begun in September.

This underground program was carried out under the supervision of R. G. Hawley, Geologist with Alrae Exploration Ltd., Vancouver, B.C., and in his report to the company in November, 1965, he stated:—

“A large number of veins and shear zones that contain massive or disseminated stibnite (antimony) have been located on Carbon and Chieftain hills in the Wheaton District of Southern Yukon. In some places high silver values are reported. Due to the rise in price of both antimony and silver, all these veins and shear zones warrant a thorough examination to determine size and grade.

The only deposit which has been developed to any extent is the Becker-Cochran deposit on Carbon Hill. Underground development and surface stripping and mapping have proven a length of at least 1,000 ft. excluding cross-dikes, and an average width of 5 ft. over the sampled sections underground, though surface widths are as high as 23 ft. Antimony showings are known nearby at over 1,000 ft. below the Becker-Cochran, and therefore a 500 ft. vertical range of mineralization below the drift level seems feasible. This indicates, to date, a minimum probable tonnage of 350,000 tons of ore at an average grade of about 5% antimony.

The shear zone appears to be a strong one and probably continues much farther than is so far proven.”.

Dr. Fawley, in his progress report to the company on October 30th, 1965, stated: —

“The underground work has been extremely encouraging as the vein, in general, has a higher grade underground than at the surface and the vein is continuing strong at the limits of the present workings.

The present value of antimony is 44 cents per pound but it is more practical to estimate the value of the ore by the selling price of the concentrate that can be produced. Experiments have indicated that a high rate of recovery can be obtained by flotation and that the impurities in the antimony concentrate so produced do not exceed permissible limits. The flotation concentrate would be worth approximately \$400.00 per ton; and the ore, if 5 percent antimony, would be worth about \$30.00 per ton after allowing for losses during flotation.”

The above described development on the Becker-Cochran group confirms Dr. Cairns' general evaluation of the deposits of antimony on Carbon hill. While the development work on the Becker-Cochran group has been very successful, Dr. Cairns, in Memoir 31, describes numerous other claims and showings containing important antimony deposits, and states that the Porter group, which Yukon Antimony has not as yet examined or prospected, presents the most promising surface indication in the vicinity. Yukon Antimony is keenly aware of the potential value of these well-reported-on groups of mineral claims, and while it is the intention of the company to concentrate on developing additional proven tonnage of antimony ore in the Becker-Cochran group, it is also intended to explore and develop the remaining groups on Carbon and Chieftain hills which were so favourably reported on in the Dominion Government Memoir 31.

### 1966 DEVELOPMENT PROGRAM

When Yukon Antimony suspended operations owing to winter conditions in the Fall of 1965, the face of the tunnel on the Becker-Cochran group was still in ore. It is the intention of the company to continue this tunnel for the purpose of increasing the present antimony ore reserves.



Yukon Antimony has made all necessary plans to carry out a full exploration and development program, to commence as early in April as weather permits. While the company's development work to date on the Becker-Cochran group has proved highly successful, Yukon Antimony is intensely alive to the fact that Dr. Cairns' report recorded other groups of antimony bearing claims on Carbon hill that were of equal importance. While this brochure does not emphasize silver deposits, Dr. Cairns' report, and the miners of the time were looking for silver, and the company is therefore very hopeful that in the coming season prospecting and development work on the remaining groups on Carbon hill owned by the company will disclose most interesting and possibly valuable antimony/silver occurrences.

The 1966 program to be carried on under the supervision of the company's Consulting Engineers and Geologists will consist of:—

- (a) Extending the tunnel presently in ore on the Becker-Cochran group;
- (b) Locate and drive tunnels and cross-cuts below the antimony ore body on the Becker-Cochran group to prove ore at depth;
- (c) To prospect, map, explore and diamond drill the remaining showings on Carbon hill reported by Dr. Cairns;
- (d) To make all necessary arrangements and installations to enable continuous exploration and development work to be carried on during winter weather conditions;
- (e) As development work progresses, and on the establishment of satisfactory ore reserves, to institute an evaluation and plan, under the supervision of Wright Engineers Limited, for the installation of milling facilities.

Unlike numerous rich mineral strikes in Northern British Columbia and the Yukon Territories, which are situate in inaccessible locations, Yukon Antimony is fortunate that its mineral claims on Carbon and Chieftain hills are served by 30 miles of good truck road, without adverse grades, connecting the company's mineral properties to Robinson station on the White Pass and Yukon Railway, and a further 25 miles via the Alaska Highway to Whitehorse.

From the foregoing, it would appear that the deposit of antimony situate on Carbon and Chieftain hills is the most promising showing presently being developed in either Canada or the United States.

As exploration and development proceeds during the 1966 season, Yukon Antimony will continue its practice of issuing to the shareholders periodical Progress Reports.

The quoted material in this brochure has been accurately extracted from Dr. Cairns' report in Memoir No. 31, and the 1964 Report on Antimony issued by the Department of Mines and Technical Surveys, Ottawa, and the 1964 and 1965 Bulletins and Reports on Antimony issued by the Bureau of Mines of the United States, Washington, D.C., and the reports made to and by Yukon Antimony's technical mining consultants. All facts and statements herein set forth, while not guaranteed, are believed to be true and accurate, and Yukon Antimony Corporation Ltd. (N.P.L.) will be glad to furnish all further technical and economic material in its possession to any shareholder or other party upon request.

*Recent exploration and development work in the Yukon has confirmed the vision and dreams of the early pioneer miners so graphically portrayed by Robert W. Service in his ballads and stories. Modern machines and techniques that were not available to the pioneers will in many cases make their dreams come true.*

*We salute the pioneers.*