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Yukon Territory

REPORT ON

GEOLOGY AND FIBRE DISPERSION SURVEY

CONDUCTED MAY 26 TO AUGUST 27, 1980

090788

TJOP 1-44 CLAIMS - YA32682-725
45-46 CLAIMS - YA50038-37
47-130 CLAIMS - YA50117-200
131-196 CLAIMS - YA52601-66

DAWSON M.D., YUKON

CLAIM SHEETS 116B/5 & 116C/8

LATITUDE 64°22'N LONGITUDE 140°00'W

J. Scott Murray R.J. Cathro, B.A.Sc., P.Eng.

December, 1980

090788

This report has been examined by the Geological Evaluation Unit and is recommended to the Commissioner to be considered as represenlation work in the amount of

$ 89,850.00

Resident Geologist or
Resident Mining Engineer

Considered as representation work under Section 53 (4) Yukon Quartz Mining Act.

B.R. BAXTER
Supervising Mining Recorder

Commissioner of Yukon Territory

TABLE OF CONTENTS

	PAGE
Summary and Recommendations	1
Introduction	2
Property, Location and Access	2
History and Previous Work	3
Geology	4
Mineralization	6
Magnetometer Survey	10
Fibre Dispersion Survey	10
Conclusions	18

ILLUSTRATIONS

Figure No. (All in pocket)

1 Tjop Claims: Geology SW - scale 1:5000

2 Tjop Claims: Geology NW - scale 1:5000

3 Tjop Claims: Magnetic Survey SW - scale 1:5000

4 Tjop Claims: Magnetic Survey NW - scale 1:5000

5 Tjop Claims: Fibre Dispersion Survey SW - scale 1:5000

6 Tjop Claims: Fibre Dispersion Survey NW - scale 1:5000

7 Tjop Claims: Anomaly A, Geology and Fibre Dispersion Survey - scale 1:2500

8 Tjop Claims: Anomaly A, Magnetic Survey - scale 1:2500

9 Tjop Claims: Anomaly C, Geology, Magnetic Surveys and Fibre Dispersion Survey - scale 1:2500

SUMMARY AND RECOMMENDATIONS

The Tjop property covers a new asbestos deposit that was discovered in 1978-1980 by Teslin Joint Venture (Cassiar Resources Ltd., Cominco Ltd. and Exploram Minerals Ltd.). This project was conceived and managed by Archer, Cathro & Associates Limited and was directed in the field by J. Scott Murray. The discovery, which is the first in the Clinton district in the past fifteen years, was made by careful prospecting of soil anomalies obtained with a pioneering exploration technique. These anomalies measure the dispersion of fibre (length and quantity) in soil and stream sediment away from buried asbestos deposits. This technique, which is still in an experimental stage and confidential pending patent applications, is invaluable in the search for asbestos because the host serpentinite is a soft, fractured rock that weathers quite recessively and is often obscured by overburden and vegetation.

A total of nine separate fibre occurrences have been found in outcrop and float on the property. They occur in a cluster of small irregular serpentinite bodies that are separated by faulting and by dykes or patches of diorite but which are collectively the largest serpentinite body identified between Dawson and the Alaska border to date. This ultramafite is enclosed in a metasedimentary assemblage of schist, quartzite and marble that has been assigned to the Nasina Series or the Anvil Allochthon of Paleozoic age. Some of the mineralization found on the property has important similarities in fracture pattern, fibre lengths and alteration to ore from the nearby Clinton and Caley Mines.

The fibre dispersion survey outlined three large soil anomalies, each associated with at least one fibre occurrence. Several smaller anomalies were also outlined that lack outcrop or showings. Bulldozer trenching is recommended to evaluate the economic potential of these anomalies.

INTRODUCTION

The Tjop (pronounced "chop") claims were staked in June 1979 and June 1980 by Teslin Joint Venture (Cassiar Resources Ltd., Cominco Ltd. and Exploram Minerals Ltd.). The program was conceived and managed by J. Scott Murray of Archer, Cathro & Associates Limited, under the general supervision of R.J. Cathro.

The 1980 field work consisted of grid soil sampling, stream sediment sampling, linecutting, test pitting, detailed prospecting and geological mapping. Work was conducted from a camp located on Cassiar Creek near the Caley Mine and from a flycamp located on the claims. Transportation was mainly by 47G3/B2 helicopter on contract from Trans North Turbo Air, Whitehorse. Contract linecutting was by Voisine Holdings Ltd. of Whitehorse.

The crew consisted of party chief J.S. Murray, senior assistants L. Cymbalisty and I. Talbot, soil samplers D. Aikman, M. Clayton, and M. Luxmoore, and cook S. Paish. Supplementary limited geological mapping was provided by geologist T. Stokes.

PROPERTY, LOCATION AND ACCESS

This property is situated on the north bank of the Yukon River, approximately midway between Dawson City and Clinton Creek, at 64°22'N, 140°00'W, straddling claim sheets 116B/5 and 116C/8. It consists of 196 contiguous mineral claims that were recorded in the name of Archer, Cathro & Associates Limited in the Dawson Mining District as follows:

Claim Names	No. Claims or Units	Record Numbers	Expiry Date
Tjop 1-44	44	YA32682-725	19 Mar/81
45-46	2	YA50038-37	11 June/81
47-130	84	YA50117-200	26 June/81
131-196	66	YA52601-66	26 June/81
	196		

Access to the property is by helicopter.

HISTORY AND PREVIOUS WORK

The earliest exploration on the property was associated with a sulphide occurrence that is located on the southeast boundary of the Tjop claims, low on the hillside near the riverbank. Known as the Roal occurrence, it was first staked in March, 1927 by F. Envoldsen, L. Roal and P. Rost, who drove a short adit later in the year. The showing was examined by W.E. Cockfield of the GSC, who reported in the 1927 Summary Report that two areas were explored. The uppermost showing consists of weakly disseminated galena and sphalerite in a limestone bed about eight inches thick that is part of the enclosing schist sequence. It occurs close to a porphyry dyke and is apparently a skarn showing. The porphyry dyke is probably Tertiary in age and is apparently quite local in extent. The adit was driven at a lower elevation in quartz-carbonate alteration of the schist walls. No sulphides are present at the old workings and it is possible that the prospectors may have mistaken green mariposite in the quartz-carbonate alteration for malachite.

The details of the subsequent history are incomplete, in spite of a fairly thorough search of old files. Old hand pits have been found at two locations on the property but it is not known who did the work.

The fibre occurrence was apparently first staked in June, 1964 by Willy and Robert DeWolfe as the Esther 1-2 and Edith 1-2 claims. The prospect was examined by Cassiar Asbestos Corp. Ltd. a few days later and rejected. The visit was prompted by a report from a company geologist at the Clinton property that fibre up to 3/8 inch grading 8% was present. The claims were optioned in 1965 to Topazios Mining Co. but no work was filed and they were allowed to lapse.

A Cassiar Asbestos Corp. crew led by J. Scott Murray returned to the target in 1978 and grid sampled it at a wide spacing. Initial soil sampling results were inconclusive due to the crude laboratory methods used, but a weak fibre occurrence was located in outcrop at the eastern end of the main ridge. Also, the large extent of the host ultramafite was first indicated at that time. Follow-up work by Murray during 1979 led to a staking decision by Teslin Joint Venture.

GEOLOGY

(See Figures 1 & 2 in pocket)

The property covers a large, complex mixture of well serpentinized ultramafites and dioritic volcanic rocks that are more or less centered on the main east-trending ridge that crosses the middle of the property. Bastites are common, suggesting that the serpentinite is probably derived from peridotite.

Outcrop is virtually absent except on the ridge crest, in scattered small exposures near the ridge, and in extensive cliffs near the base of the south-facing, north bank of the Yukon River. The river has cut a distinct canyon approximately 300 m deep through the Yukon Plateau between Dawson and the Alaska border, probably caused by regional uplift since the Pleistocene glaciation. This has resulted in sharp changes in slope from the subdued, mature topography of the unglaciated plateau to the rejuvenated, V-shaped stream valleys related to the downcutting of the Yukon River. These contrasts are well displayed on the Tjop claims.

Most outcrops on the property are composed of relatively resistant rocks such as diorite and siliceous schists. Since rock exposure on the property is so poor, geological mapping has been based primarily on identification of rock

chips collected from soil sample pits. This technique is quite reliable but has local limitations in defining contacts when more resistant float is transported by solifluction downhill over relatively recessive rock units. Since serpentinite is probably the most recessive rock type in the district, rock chip mapping probably underestimates the true areal extent of serpentinite that is present. Geological contacts should be considered approximate.

The Tjop ultramafite, a contiguous cluster of small irregular bodies cut by faults and separated by dykes or patches of diorite, is collectively the largest serpentinite body identified between Dawson and the Alaska border to date. This ultramafite is enclosed in a metasedimentary assemblage of light brown sericite schist, pale green chlorite schist, brownish black graphitic schist and cream coloured marble, which have been assigned to the Nasina Series or the Anvil Allochthon of Paleozoic age.

Highly sheared serpentinite outcrops often contain small, mineralized, blocky lenses of serpentinite up to 2 m across, particularly on the eastern side of the property. Metadiorite dykes are found throughout the property. On the western side, the serpentinites contain many picrolite veins, which have healed most of the fractures and give the rock a massive appearance with a lensy, sheared texture.

Well mineralized, blocky fractured serpentinite bodies have only been seen in outcrop at occurrences #3 and #7. Blocky serpentinite is normally associated with economic fibre concentrations. The blocky serpentinite on this property differs only in fracturing characteristics from the sheared and massive serpentinite and all types are probably derived from a common ultramafic source. Quartz-carbonate alteration and occasional talc-silicate alteration that are present near some serpentinite-schist contacts are probably late alteration derivatives of the same ultramafite body.

The Tjop ultramafite is apparently intruded by diorite, although contact relationships are obscured. The diorite ranges from a fine grained chloritized volcanic (greenstone) to gabbro and is usually light to dark grey-green. Small dyke-like bodies of diorite are common throughout the ultramafite body and many of these have been highly carbonated and altered to greenish brown metadiorite, which resembles rodingite.

MINERALIZATION

(See Figures 1 & 2 in pocket)

A total of nine fibre occurrences were located on the Tjop claims during 1980, of which seven contain mineralized outcrops, one consists of a high grade float boulder and one is a fibre mat containing fibre up to 11.5 m long in a hand pit. Two of these were known prior to 1980. The nine are tabulated on the following page.

Showing #3 was found early in the field season and was the first evidence of economic mineralization on the property. The showing consists of scattered float boulders and four small outcrops in a grassy area about 25 m square. The showing occurs on a steep south-facing hillside about 670 m above the Yukon River. It is surrounded by moss and brush containing occasional fragments of sheared serpentinite and diorite. Fibre up to 8 or 9 mm long occurs in compound veins up to 15 or 20 mm wide. The fibre veinlets have weathered as much as 15 or 20 mm into the rock, producing deep and easily recognizable cracks that accentuate the joint system. The host rock is a classical blocky serpentinite.

The outcrops contain fibre veins that occur in at least 4 fracture sets. Veins are normally spaced 10 to 20 cm apart within each set. Occasional veins are continuous for up to 100 cm but most are bent or crosscut by other veins

Showing	Description	Grid Location (Metric) Line E	Station N
1	1964 (?) nemalite showing	76 + 00	108 + 00
2	1978 showing	99 + 00	99 + 50
3	June 1, 1980 discovery	95 + 60	95 + 00
4	Old hand pits found June 6, 1980	88 + 00	85 + 00
5	Found June 16, 1980	74 + 00	96 + 50
6	Found June 19, 1980	99 + 00	96 + 00
7	Found July 20, 1980	95 + 50	96 + 00
8	Float	93 + 00	94 + 00
9	Fibre mat in soil pit	76 + 00	103 + 00

over shorter distances. A visual grade estimate of these outcrops is better than 5% to Group 5 fibre. A wall reading across an outcrop about 0.3 m wide gave a grade of 10.9%.

There are several similarities between the mineralized rock at Showing #3 and the ore at the Clinton Mine. The type of fracturing and vein compounding is similar to ore mined from the footwall of the Porcupine pit. In addition, the colour of the rock and bastite content is reminiscent of these features in the original outcrops on Snowshoe Hill. As at Clinton, larger veins have parallel walls and terminate by merging with or crosscutting other veins, rather than lensing out.

Showing #7 is located about 150 m northeast of Showing #3. Two outcrops of partly sheared, blocky serpentinite occur in a small, heavily vegetated ravine beside a grassy slope underlain by highly sheared serpentinite talus. Fibre veins in the outcrops tend to follow some of the shear foliations in the rock but also crosscut adjoining fibre veins. The rock is semi-blocky and may

represent a transition between the sheared serpentinite in the talus slope and more blocky serpentinites toward Showing #3. Fibre up to 8 mm long was found in compound veins up to 15 mm across. A visual estimate of the grade of the outcrops is about 4% to Group 5.

Showing #6 is an outcrop discovered while cutting a helicopter pad 400 m ENE of Showing #3. It consists of blocky serpentinite and is about 5 m by 10 m in area. It is bounded to the east by a flat, heavily vegetated terrace 150 m by 200 m in area. The serp is dark to medium green, soft and splits easily along a well-developed joint system. From three to five fracture sets are present, all straight or slightly curved, and most contain fibre although a few barren (curved and slickensided) fracture surfaces were also seen. Compound fibre veins up to 10 mm wide are present but most have multiple partings. The longest fibre seen was 5 mm and the average is probably only 3 mm. Fibre veins average 5 to 7.5 cm apart in a horizontal orientation and 7.5 to 10 cm apart in a vertical orientation. Overall grade of the outcrop is about 2.5 to 3.5% to Group 5.

Showing #4 consists of blocky to sheared serp with a grade of 1.5 to 2.0% and fibre length up to 5 mm. Three old shallow hand pits were found but no claim posts were seen and the history is unknown. Second growth around the pits suggests that they are at least 10 to 15 years old.

Showing #5 consists of boulders of sheared serp with fibre up to 5 mm long below an outcrop composed of both sheared and fish-scale serpentinite.

Showing #9 consists of a strongly developed fibre mat in a soil pit dug at the site of an anomalous soil sample in Anomaly C. The area around the pit is gently sloping to the west and overgrown with buckbrush and black spruce. An outcrop of barren, massive serpentinite and metadiorite occurs about 50 m north

of the pit. No source locality for the fibre was found. Fibre to 11.5 m was found in the fibre mat beneath about 30 cm of B horizon soil. The C horizon consisted of fish-scale-like rock fragments. It shows a strong resemblance to a layer that overlies ore-grade mineralization at the Caley Mine.

Showing #8 is a single float boulder similar to those in Showing #3 that is situated 300 m to the southwest. No source was found.

Showings #1 and #2 were found previous to 1980. Showing #1 consists of three old hand pits that expose mainly long fibre nemalite mineralization in a medium green serpentinite. The pits were constructed about the same time as those at Anomaly #4. Showing #2 consists of a few fibre veins with lengths up to 8 mm in a sheared serpentinite outcrop. The showing was discovered by Cassiar Asbestos Corp. Ltd. during 1978 grid sampling.

Chrysotile occurs in several vein types on the property that are related to (a) the amount of shearing present, (b) position with respect to contact stresses, and (c) position of heat sources such as diorite dykes. The most highly sheared serpentinites on the east side of the claims contain only thin chrysotile veinlets sheathed by antigorite. On the southwest side of the ultramafite, hairline ribbon veins commonly occur within a few metres of schist contacts. Isolated cross-fibre veins up to 8 mm wide occur parallel to metadiorite dykes in some, essentially barren, sheared serpentinites near Showing #2. At Anomaly "C", slip fibre sometimes forms along fractures in the massive serpentinites. However, networks of long cross fibre such as Showings #3 and #6 seem to occur only where the rock is somewhat protected from violent shear stresses and where heated fluids can slowly mineralize fracture openings. The best fibre found to date occurs in areas of blocky serpentinite that are surrounded by fish-scale serpentinite near diorite contacts.

MAGNETOMETER SURVEY

(See Figures 3 & 4 in pocket)

A ground magnetic survey was carried out between baselines 80N and 110N using a Scintrex MF-1 magnetometer to define ultramafite contacts in areas of extensive soil cover. However, no significant magnetic contrast was found between rock types. Several small magnetic anomalies were found over areas assumed to be underlain by ultramafite but for the most part ultramafic rocks are indistinguishable from dioritic rocks. Metamorphic rocks are only slightly less magnetic than either of these.

A scintillometer was used to test the radiometric responses of the diorite rocks and ultramafic rocks at the Tjop claims. No significant radiometric difference was indicated during a traverse which crossed known geological contacts. The results were not found useful and the program was abandoned.

FIBRE DISPERSION SURVEY

(See Figures 5 & 6 in pocket)

Theory

Asbestos fibre forms in serpentinized ultramafites, which generally weather recessively because of their low hardness and associated fracturing and shearing. In the Northern Cordillera, where erosion is accelerated by frost action, serpentinite outcrops are uncommon except in areas with steep relief. Consequently, most of the potential asbestos-bearing rocks are partially or completely covered by overburden, particularly those portions most likely to be mineralized. This, combined with the observed tendency of wider fibre veinlets to break away and separate from the wallrock during erosion, has made conventional exploration very difficult. As a result, asbestos exploration in the Northern Cordillera

has lagged far behind metal exploration.

Prior to 1978, asbestos exploration in the Dawson area consisted only of outcrop examinations and prospecting of aeromagnetic anomalies. As the ineffectiveness of these methods gradually increased, exploration became limited to chance discoveries by prospectors searching for other commodities.

Early attempts to develop indirect methods of detecting fibre deposits met with little success. Modern geochemical techniques were unsuccessful because chrysotile fibres are chemically identical to host serpentine minerals. Even trace element studies have failed to detect any chemical criteria that would suggest the presence of chrysotile fibre.

Asbestos fibres are more resistant to erosion than serpentine itself and fibre accumulates in overburden over a deposit in what is known as a "fibre mat". The existence of these mats was first recognized near the major deposits. At the Cassiar (B.C.) Mine, for example, the mat was reported to be over 3 m thick. Although much thinner, the mat at the Clinton Creek and Caley deposits was still very distinctive. However, asbestos fibre is difficult to recognize in overburden because fibres are usually coated with clay and cannot be easily distinguished from plant fibres in moist soil. As a result, fibre mats covered by a mantle of loamy soil could not easily be identified and a viable method of detecting trace fibre was not available.

History

The initial efforts to develop a field technique for detecting and measuring the fibre content of soil was undertaken by Cassiar Asbestos Corp. Ltd. in the Clinton Creek district in 1978 under the direction of J. Scott Murray. Murray experimented with screening of dried samples and was able to show that anomalous concentrations of fibre were associated with known targets. However, the use of this technique as an exploration tool was only marginally successful due to

the tendency of the fibre to concentrate into small clay balls that could not be pulverized and screened without damaging the fibre.

The 1978 Cassiar program indicated that an improved laboratory technique might be successful but this initiative was terminated when the Clinton Mine closed late that year. Murray continued to work on the problem privately after leaving Cassiar and subsequently designed and built the first prototypes of a machine, which he named the Fine Particle Separator (FPS), between November 1978 and February 1979. Further improvements to meet full-scale production requirements were made by Murray through his private company, Geotor Services Incorporated, at Kamloops, after March 1979, when he joined Archer, Cathro. All samples collected on the Tjop property were shipped to this laboratory for analysis.

Sampling Techniques

Field sampling procedures for asbestos are identical to those for standard geochemical sampling. Soil samples were collected with a large mattock equipped with a pick for digging through permafrost. Stream sediment samples were collected without the use of tools. The samples were placed in prenumbered kraft paper bags and were shipped by air express from the field to the laboratory in cardboard boxes. Delivery time to Kamloops was usually about one week.

During 1980 about 30 km of baseline were cut by TJV personnel and a contractor to establish grid control for soil sampling. Approximately 1585 soil samples were collected at a 50 m by 200 m spacing between baselines 80N and 120N. In addition, approximately 137 soil samples and 100 silt samples were collected outside the grid area during reconnaissance traverses. A large, heavy mattock complete with a pick for breaking up permafrost was used to dig deep sample pits. However, in many places on the property, extreme soil depths or frozen soil prevented the samples from reaching the fibre mat. This problem

may explain in part the relatively low quantities of fibre found in many samples from the Tjop property.

Laboratory Techniques

The laboratory treatment of each samples requires about 2/3 of a normal kraft sample bag (about 70 grams). The remaining 1/3 is retained for back-up and for future geochemical analysis, if required. The whole sample is treated as received and no delays for drying are necessary before testing begins. Initial treatment consists of screening the sample to remove coarse rock particles, leaves, roots, etc. The fine material passes directly into the separation apparatus.

All laboratory equipment is still experimental and details must remain confidential pending patent applications. However, the basic technique for separating fibres from soil involves cycloning the sample to extract certain low density particles such as chrysotile. In addition, clay particles are stripped from fibres and partings are broken between fibres to allow accurate measurement of fibril length. The process is completely mechanical and requires no chemical reactions. Chrysotile is collected along with other fibrous materials separated from the soil.

Chrysotile fibres are distinguished from other fibrous substances present in samples such as animal hairs, plant fibres and other mineral fibres, using a 7.5 to 22.5 power zoom microscope. Black filter papers are used to give maximum contrast between light coloured asbestos fibres and the background field. To aid identification and to break any partings remaining in fibres, all fibrils are manually tested with a sharp, needle-like instrument. Identification of chrysotile is done visually by experienced laboratory personnel.

Because length is such an important parameter in asbestos economics, the length of the longest fibre present in each sample is the main criterion

measured. Fibre quantities, on the other hand, indicate the total number of separate fibre bundles present, regardless of lengths.

Interpretation

The longest fibres are usually found where quantities are highest since the probability of finding longer fibres increases with the number of fibres available for measurement. However, even over an economic deposit, only a few fibres may be present in a sample if the fibre mat is deeply buried beneath thick layers of soil and the sample was collected near the surface. However, samples collected over such a deposit will have significantly longer fibres at each respective quantity than corresponding samples collected where only subeconomic fibre lengths are present at depth.

Three anomalous areas (A, B and C) were outlined that contain consistent fibre lengths above 2 mm over significant areas. Each anomaly contains at least one fibre showing. Several other small sample clusters and individual samples also returned fibre lengths exceeding 2 mm, particularly west and north of Anomaly A.

Anomaly A is an irregular northeast-trending area about 1000 m x 200 m in size that is situated on the east side of the property. The anomaly occurs on a relatively steep, southeast facing hillside below the main ridge that is thickly vegetated with black spruce and buckbrush. Several small outcrops were found by careful prospecting in the steepest parts of the area. The geology and analytical results and the magnetic survey results are plotted on Figures 7 and 8 respectively (in pockets) at 1:2500 scale. Five showings occur within the anomaly (#2, 3, 6, 7 and 8). Showings #3 and #7 show the best fibre development seen in outcrop on the Tjop property.

The longest fibre was obtained from soil samples collected within 100 m of the diorite contact that forms the western boundary of the anomaly. Close

study of the values shows that a strongly anomalous cluster of samples, with fibre lengths up to 6.2 mm, occurs about 300 m north of Showing #3 in an area where no outcrop has been found. A second strong anomaly with fibre up to 6.0 mm long occurs near Showing #3.

Anomaly B is situated about one km southwest of Anomaly A. It is about 600 m x 400 m in area with a crude northwesterly trend. The anomaly is on a west facing hillside and is essentially free of permafrost. Topography varies from a moderate slope with spruce trees on the east ridge to a very steep, buckbrush covered slope near De Wolf Creek. Soils are generally thin and small talus patches occur throughout the area.

The soil anomaly extends across three sample lines spaced 200 m apart. Fibre up to 5.5 mm long was found in soils at the southeast part of the anomaly but most fibre is less than 3 mm long.

Three old hand pits found on the northern boundary of the anomaly expose a blocky serpentinite containing fibre to 5 mm long in wide spaced joint sets (Showing #4). The pits were dug into thin serpentinite talus on the hillside overlooking De Wolf Creek.

An outcrop of blocky serpentinite containing dense hairline veins of ribbon fibre was found about 100 m south of the pits. Schist outcrops nearby strike southwest. However, more serpentinite outcrops occur south of the schist, suggesting that several thin slices of ultramafite are enclosed in the schists at this location.

About 100 m east of the pits, gabbro outcrops are surrounded by serpentinite talus containing a few small fibre veins. The gabbro is grey-green and appears altered to mainly tremolite. These rocks are probably another phase of the volcanic rocks that form the core of the hill at the center of the claims.

Anomaly C is located on the west side of the property. It is about 1000 x 500 m in size and covers the northwestern side of a ridge at the head of Esther Creek. Most of the anomaly is covered by thick moss and buckbrush, although some massive serpentinite outcrops occur along a ridge in the southeastern corner. Soils are generally quite deep and the ground remains frozen for most of the summer. The geology and analytical results are plotted on Figure 9 (in pocket) at 1:2500 scale.

Two showings occur within Anomaly C. Showing #1 consists of old hand pits containing long nemolite fibre with minor chrysotile. The pits are situated at the northern end of the anomaly. Showing #9 is a fibre mat containing lengths up to 11.5 mm that was discovered by soil sampling. The mat is located on the southeastern side of the anomaly.

Outcrops in the area contain many metadiorite dykes. Some slip fibre has formed along fractures in the serpentinite near the dykes. The extent of this type of mineralization is unknown but it is assumed that the slip fibre is only local and that cross fibre predominates in the ultramafites away from the dykes.

Fibre lengths in soil Anomaly C are particularly consistent. The highest values occur along the eastern edge of the anomaly and gradually decrease downhill toward the valley bottom to the west. Fibre lengths over 6 mm occur at 3 locations and fibres over 5 mm are common.

Several soil pits were dug in Anomaly C. The pits at Anomaly #9 revealed the presence of a strongly developed fibre mat in an area with extensive vegetation cover and no geological evidence of a fibre showing. These also provided valuable information on interpretation of soil anomalies. The pits were dug to depths of up to 1.5 m on anomalous soil samples. They encountered

highly weathered serpentinite rock chips with some cobble-sized blocky pieces. However, no bedrock was encountered in any of the pits. Some soil movement was indicated by layering of the soil chips.

At Anomaly #9, where the original soil samples has shown a high quantity (5) of fibre up to 4.1 mm long, a well developed fibre mat was encountered to a depth of 30 m. Sampling of the soil profile in this pit revealed an interesting increase in length with depth.

Depth	Soil Horizon	Length	Quantity
5-15 cm	top of B	3.1	3
about 20 cm	lower B	4.1	5
15-30 cm	base of B	6.1	5
30-60 cm	fibre mat	11.5	5

The decrease in length above the fibre mat probably results from filtering by plant roots and the low degree of solifluction on a gentle slope. The source of the fibre has not yet been found.

Many samples outside the areas previously mentioned contain fibre exceeding 2 mm in length. Some of these samples cluster into anomalies but none have supporting outcrop showings. For example, a sample with 9.3 mm fibre is located about 500 m west of Anomaly A but only a few surrounding samples contained fibre over 2 mm. Also, north of the main ridge on the property, fibre up to 4.5 mm long has been found. The best anomalies are located about 1 km north of Anomaly A and several other areas contain groups of samples containing fibre over 2 mm long.

CONCLUSIONS

Analysis of grid soil samples using the FPS method has outlined three large and intense anomalies and numerous smaller anomalies associated with serpentinite. Prospecting carried out in conjunction with the grid sampling and in the course of mapping the soil anomalies led to the discovery of seven new outcrop and float showings in addition to two known earlier. These are the first new prospecting discoveries in the Clinton district in the past fifteen years.

The Tjop results show conclusively that (a) substantial serpentinite bodies were missed in GSC 1:250,000 scale mapping, even when situated in conspicuous locations; (b) detailed prospecting in this district is still capable of finding new outcrop and float occurrences of commercial grade asbestos fibre; and (c) buried serpentinite and mineralization can be clearly outlined by grid soil sampling and FPS analysis.

Bulldozer trenching is the most effective means of investigating the soil anomalies to determine if sufficiently large areas of blocky fracturing are present to have economic potential. Anomalies A and C are considered top priority and Anomaly B and some of the smaller anomalies may also warrant trenching if early results are encouraging. Grid soil sampling should be completed over the north end of the claims.

Respectfully submitted,

ARCHER, CATHRO & ASSOCIATES (1981) LIMITED

J. Scott Murray

R.J. Cathro, B.A.Sc., P.Eng.

Association of Professional Engineers of the Yukon Territory
R. J. CATHRO
GEOLOGICAL
ENGINEER

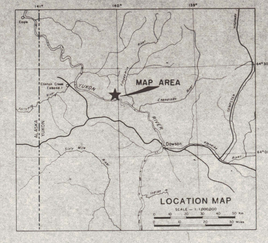
STATEMENT OF QUALIFICATIONS

J. Scott Murray

Scott Murray was raised at Abbotsford, B.C. and attended U.B.C., B.C.I.T. and Selkirk College. He was employed by Cassiar Asbestos Corp. from 1973 to 1978 as a geological technician at both the Cassiar and Clinton Mines. During this period he was engaged in all phases of mapping, surveying, grade control and exploration for asbestos fibre.

R.J. Cathro, B.A.Sc., P.Eng.

Robert J. Cathro was born at Dauphin, Manitoba in 1935 and raised at Chilliwack, B.C. He graduated from U.B.C. in 1959 with a degree in geological engineering. He is a registered professional engineer in B.C. and Yukon. Following mine geology experience with Eldorado Nuclear, Giant Yellowknife and United Keno Hill, he entered private practice with Archer, Cathro & Associates Limited in 1965 and has specialized in mineral exploration in Yukon and Northern B.C.



LEGEND

QUATERNARY

Q — Unconsolidated glacial and alluvial deposits

CARBONIFEROUS TO PERMIAN

CPub — Recessive, dark green serpentinite and quartz-carbonate rocks

CPv — Rusty-weathering grenatoire, felsic mafic volcanics and amphibolite gneiss, includes metabasite and gabbro phases.

ORDOVICIAN TO DEVONIAN

OSDqc — NASINA QUARTZITE: grey and grey-green Mississippian quartzite, grey quartz-mica schist, minor quartz biotite gneiss and graphitic or chloritic schist.

Geological contact (approximate only)

CPub — Ultramafic rocks

Test Pit Locations

Fibre Occurences

H — Helipad

Stream sediment sample locations

Rock sample locations

Soil sample locations

NW | NE | SW | SE

FIGURE 1

ARCHER, CATHRO & ASSOCIATES LTD.

GEOLOGY

TJOP CLAIMS

TESLIN JOINT VENTURE

SCALE - 1:5000

TJOP CLAIMS BOUNDARY

Creek

Frost Creek

Creek

Creek

ANOMALY 'C'

ANOMALY 'A'

ANOMALY 'B'

MINERAL SHOWING

70 E
80 E
90 E
95 E
100 E
102 E
71 E
80 N
90 N
100 N
110 N

64°20

140°

Ester Creek

De Wolfe Creek

Rose Creek

CABIN

TJOP CLAIMS BOUNDARY

YUKON RIVER

MAP AREA

LOCATION MAP

Whitehorse
Carmacks
Dawson
Mayo
Stewart Crossing
Klondike Highway
Robert Campbell Highway
Dempster Highway
Yukon Territory
British Columbia

LEGEND

- 7000-7999 gammas
- 6000-6999 "
- 5000-5999 "
- 4000-4999 "
- 3000-3999 "
- 2000-2999 "
- 1000-1999 "

2000 — Magnetic contour (gammas)

Test pit locations

Fibre occurences

H Helipad

Stream sediment sample locations

Soil sample locations

NW | NE
SW | SE

FIGURE 3
ARCHER, CATHRO & ASSOCIATES LTD.

MAGNETIC SURVEY

TJOP CLAIMS

TESLIN JOINT VENTURE

SCALE - 1:5000

TJOP CLAIMS BOUNDARY

Tjop Creek

Axe Creek

Front Creek

Canal Creek

Canyon Creek

70 E

80 E

90 E

100 E

110 N

120 N

140°

MAP AREA

LOCATION MAP

NW | NE

SW | SE

FIGURE 4

ARCHER, CATHRO & ASSOCIATES LTD.

MAGNETIC SURVEY

TJOP CLAIMS

TESLIN JOINT VENTURE

SCALE – 1:5000





LEGEND

- H — Helipad
- ★ — Fibre Occurence
- ▽ — Soil Pit
- > 2mm fibre length contour line
- Silt sample location
- Soil sample location
- Length of longest fibre detected (in mm) / Quantity of fibre found

Fibre quantity code:
1 < 5 fibres per sample approximately
2 5–25 " " " "
3 25–100 " " " "
4 100–1000 " " " "
5 >1000 " " " "

Note: Chrysotile content of soil samples measured with Fine Particle Separator at GEOTOR SERVICES INC., Kamloops, B.C.

NW	NE
SW	SE

FIGURE 5
ARCHER, CATHRO & ASSOCIATES LTD.

FIBRE DISPERSION SURVEY

TJOP CLAIMS
TESLIN JOINT VENTURE

SCALE 1:5000

TJOP CLAIMS BOUNDARY

Frost Creek

Lake

Scout Creek

Creek

70° E

80 E

90 E

100 E

120 N

110 N

140°

TJOP CLAIMS BOUNDARY

LOCATION MAP

MAP AREA

NW | NE

SW | SE

FIGURE 6

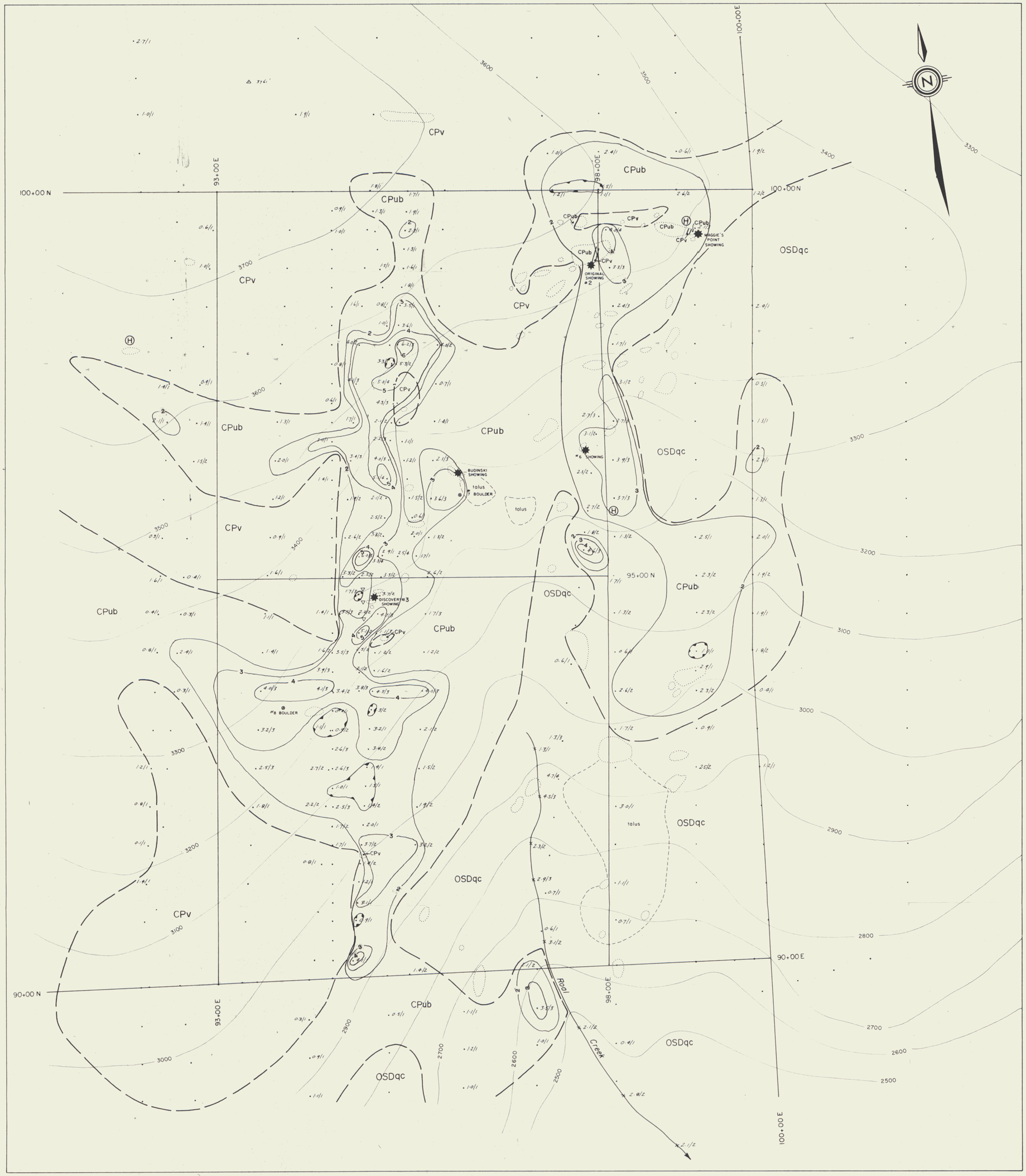
ARCHER, CATHRO & ASSOCIATES LTD.

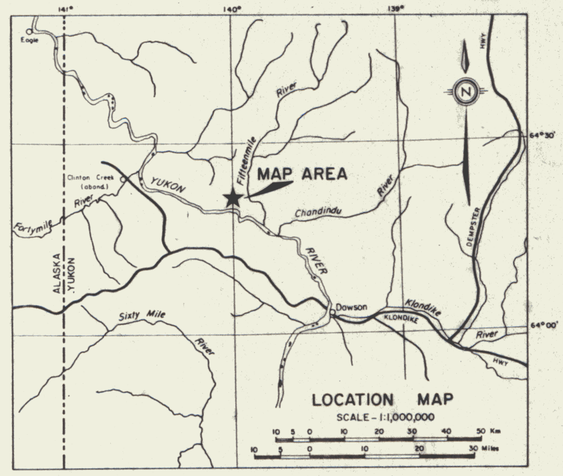
FIBRE DISPERSION SURVEY

TJOP CLAIMS

TESLIN JOINT VENTURE

SCALE = 1:5000





LEGEND

CARBONIFEROUS TO PERMIAN

- CPub — Recessive, dark green serpentinite and quartz carbonate rocks
- CPv — Dark-weathering greenstone, tuffaceous metavolcanics and amphibolite gneiss; includes metadiorite and gabbro phases

ORDOVICIAN TO DEVONIAN

- OSDqc — NASINA QUARTZITE: grey and grey-green micaceous quartzite, grey quartz-mica schist, minor quartz biotite gneiss and graphitic or chloritic schist

- —2— Fibre length contour (mm)
- Geological contact (approximate only)
- Fibre occurence
- Test pit location
- Outcrop
- Metadiorite dyke
- Stream sediment sample location
- Soil sample location
- (H) Helipad

1.8/1 — Length of longest fibre detected (in mm); Quantity of fibre found

Fibre quantity code:

1	<5	fibres per sample approximately
2	5-25	" " " "
3	25-100	" " " "
4	100-1000	" " " "
5	>1000	" " " "

Note: Chrysotile content of soil samples measured with Fine Particle Separator at GEOTOR SERVICES INC., Kamloops, B.C.

FIGURE 7

ARCHER, CATHRO & ASSOCIATES LTD

ANOMALY A
GEOLOGY, FIBRE DISPERSION
TJOP PROPERTY
TESLIN JOINT VENTURE

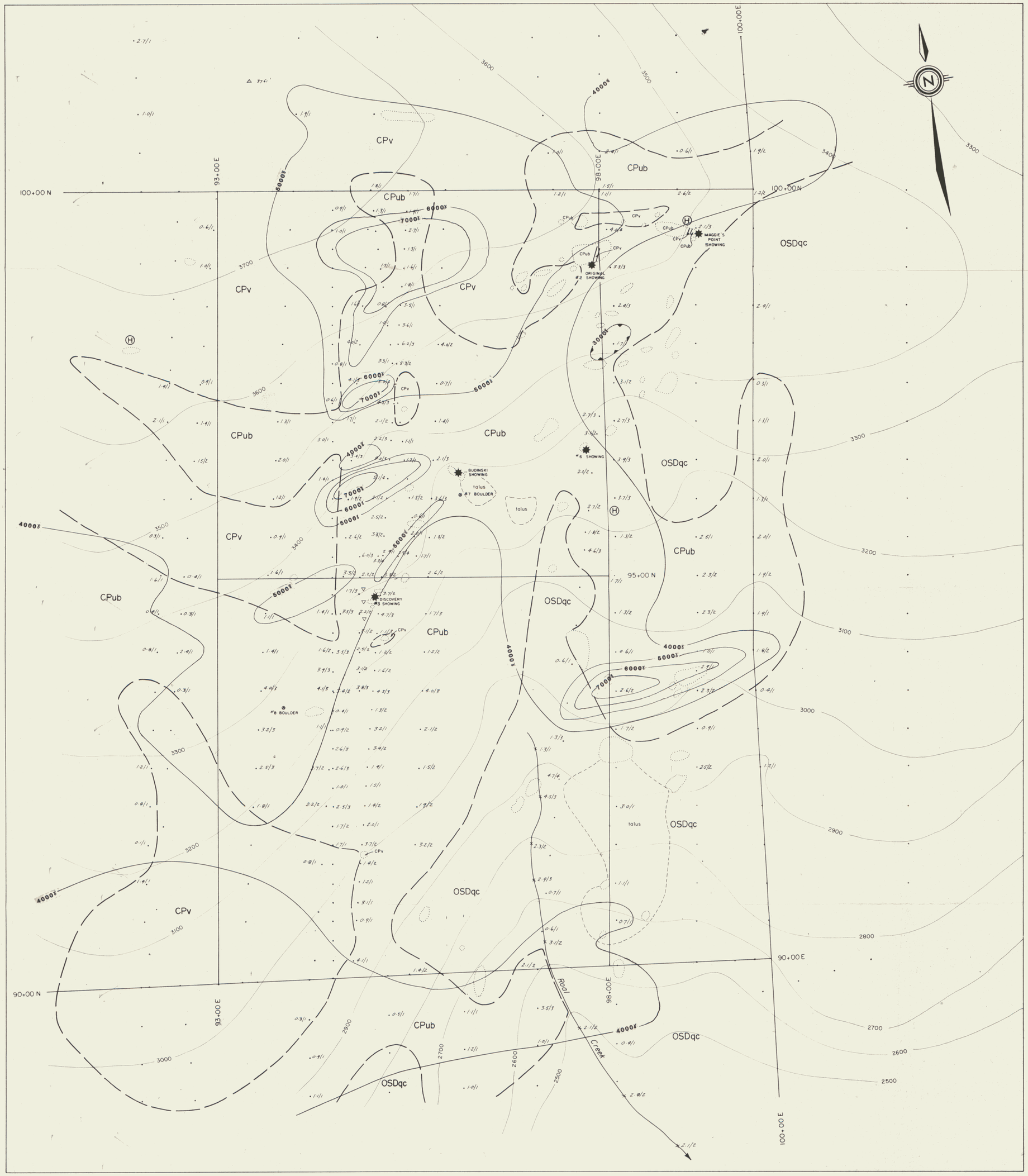
SCALE — 1:2,500

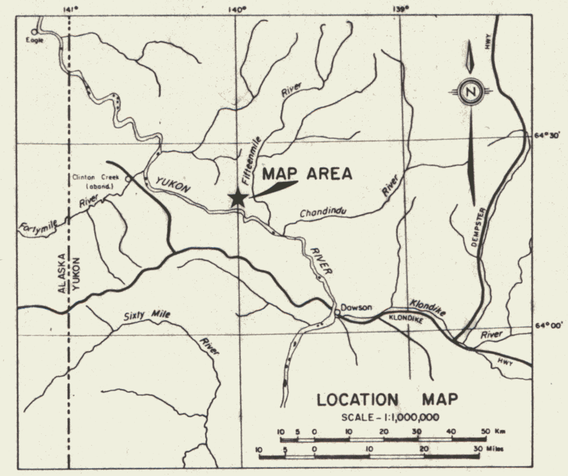
50 25 0 25 50 100 150 200 250 Metres

50 25 0 25 50 100 150 200 250 Yards

Association of Professional Engineers of the Yukon Territory — J. CATHRO — GEOLOGICAL ENGINEER

To accompany report dated December, 1980





LEGEND

CARBONIFEROUS TO PERMIAN

CPub — Recessive, dark green serpentinite and quartz carbonate rocks

CPv — Dark-weathering greenstone, tuffaceous metavolcanics and amphibolite gneiss; includes metadiorite and gabbro phases

ORDOVICIAN TO DEVONIAN

OSDqc — NASINA QUARTZITE: grey and grey-green micaceous quartzite, grey quartz-mica schist, minor quartz biotite gneiss and graphitic or chloritic schist

—2000γ— Magnetic contour (gammas)

Geological contact (approximate only)

Fibre occurence

Test pit location

Outcrop

Metadiorite dyke

Stream sediment sample location

Soil sample location

Helipad

Length of longest fibre detected (in mm)

1.8/1 — Quantity of fibre found

Fibre quantity code:

1	<5	fibres per sample approximately
2	5-25	" " " "
3	25-100	" " " "
4	100-1000	" " " "
5	>1000	" " " "

Note: Chrysotile content of soil samples measured with Fine Particle Separator at GEOTOR SERVICES INC., Kamloops, B.C.

FIGURE 8

ARCHER, CATHRO & ASSOCIATES LTD

ANOMALY A
MAGNETIC SURVEY
TJOP PROPERTY
TESLIN JOINT VENTURE

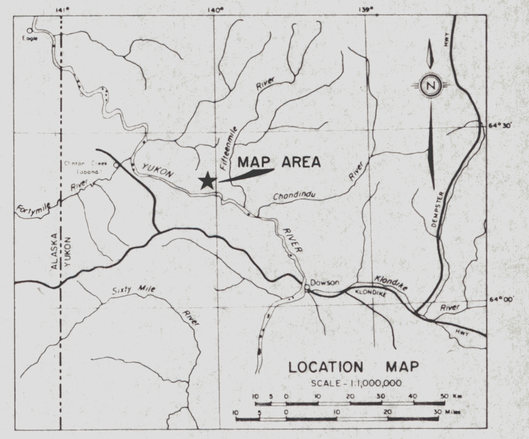
SCALE — 1:2,500

50 25 0 25 50 100 150 200 250 Metres

50 25 0 25 50 100 150 200 250 Yards

Association of Professional Engineers of British Columbia — R. J. CATHRO — GEOLOGICAL — ENGINEER — Dec 80

To accompany report dated December, 1980



LEGEND

CARBONIFEROUS TO PERMIAN

- CPub — Recessive, dark green serpentinite and quartz carbonate rocks
- CPv — Dark-weathering greenstone, tuffaceous metavolcanics and amphibolite gneiss; includes metadiorite and gabbro phases

ORDOVICIAN TO DEVONIAN

- OSDqc — NASINA QUARTZITE: grey and grey-green micaceous quartzite, grey quartz-mica schist, minor quartz biotite gneiss and graphitic or chloritic schist

- 2000γ — Magnetic contour (gammas)
- Geological contact (approximate only)
- Fibre occurence
- Test pit location
- Outcrop
- Metadiorite dyke
- Stream sediment sample location
- Soil sample location
- Helipad
- 1.8/1 — Length of longest fibre detected (in mm) / Quantity of fibre found

Fibre quantity code:

1	<5	fibres per sample approximately
2	5-25	" " " "
3	25-100	" " " "
4	100-1000	" " " "
5	>1000	" " " "

Note: Chrysotile content of soil samples measured with Fine Particle Separator at GEOTOR SERVICES INC., Kamloops, B.C.

FIGURE 9

ARCHER, CATHRO & ASSOCIATES LTD.

ANOMALY C
GEOLOGY, MAGNETIC SURVEY, FIBRE DISPERSION
TJOP PROPERTY
TESLIN JOINT VENTURE

SCALE - 1:2,500

50 25 0 25 50 100 150 200 250 Metres

50 25 0 25 50 100 150 200 250 Yards

To accompany report dated December, 1980