ARCHER, CATHRO
& ASSOCIATES LIMITED
CONSULTING GEOLOGICAL ENGINEERS

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VANCOUVER, B.C. V6B 1L8

REPORT ON
GEOLOGY, FIBRE DISPERSION SURVEY AND TRENCHING
CONDUCTED MAY 23 TO JUNE 4, 1981

TOC 1- 8 CLAIMS YA52667-74
9-16 CLAIMS YA50101-108
17-24 CLAIMS YA50109-16
25-28 CLAIMS YA55604-07

DAWSON MINING DISTRICT, YUKON

CLAIM SHEET 116B/5

LATITUDE 64°18'N; LONGITUDE 139°58'W

J. SCOTT MURRAY

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

This report has been examined by the Geological Evaluation Unit under Section 53 (4) Yukon Quartz Mining Act and is allowed as representation work in the amount of $ 12,900.

R. Watson

for Regional Manager, Exploration and Geological Services for Commissioner of Yukon Territory.

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ILLUSTRATIONS

SUMMARY AND RECOMMENDATIONS

The Toc property was staked in 1980-81 by Teslin Joint Venture (Cassiar Resources Ltd., Cominco Ltd. and Exploram Minerals Ltd.). This project was managed by Archer, Cathro & Associates (1981) Limited and directed in the field by J. Scott Murray. The claims cover the Woodchopper asbestos prospect that was first staked in 1963 and explored with a magnetic survey and bulldozer trenching in 1964 by Canadian Johns-Manville Company Ltd. The trenching was concentrated within a 400 by 100 m area on the east side of the claims where an ultramafite is partly exposed along the edge of a high cliff overlooking the Yukon River. Chrysotile fibre up to 12 mm long was uncovered by the trenching in zones of blackwall alteration (called black pods by TJV) up to 2 m across surrounding narrow diorite dykes or lenses. The mineralized zones were widely spaced and had little economic potential and no attempt was made to trench the overburden-covered areas west of the cliff edge by Johns-Manville Company Ltd.

In 1978, Cassiar Asbestos Corp. Ltd. (now Brinco Mining Ltd.) performed a grid soil sampling survey on the plateau region west of the trenches. About 490 of these samples were reanalyzed by TJV in early 1981 using a new analytical technique developed by Geotor Services Incorporated of Kamloops, B.C. in cooperation with TJV. It measures the length and quantity of fibres present in soils covering buried asbestos deposits.

Analysis of the samples from the Toc property showed that anomalous soils occur near the old trenches and over an area about 300 m square just to the north of the trenches. Anomalous soils were also indicated over a poorly exposed ultramafite body about 1400 m west of the trenches on the east bank of Woodchopper Creek.

Excavator pitting of these areas by TJV in 1981 showed that most of the best soil values were located near black pod-type asbestos zones that are similar to the original showings and have poor economic potential. However, the northwest portion of the property is covered by at least 5 m of frozen, clay-rich alluvium that could not be penetrated using the excavator. Anomalous patterns in this area are similar to those elsewhere on the property and further testing using expensive, deep sampling techniques is not justified at this time.

INTRODUCTION

The Toc 1-28 claims were staked in June 1980 and May 1981 by Teslin Joint Venture (TJV), composed of Cassiar Asbestos Company Ltd. (now Brinco Mining Ltd.), Cominco Ltd. and Exploram Minerals Ltd. The exploration program was managed by J. Scott Murray of Archer, Cathro & Associates (1981) Limited, under the supervision of R.J. Cathro.

Approximately 500 soil samples collected from the property in 1978 by Cassiar Asbestos were reanalyzed during early 1981 by TJV using new asbestos analysis techniques developed by Geotor Services Incorporated of Kamloops, B.C. 1981 field work consisted of excavator pitting, detailed prospecting and geological mapping. Work was conducted from the Clinton Creek townsite and daily transportation to the property was by Bell 206C helicopter on contract from Shirley Air Services Ltd. of Edmonton, Alberta. Contract excavating was performed by a Caterpillar 225 excavator operated by IBEX Construction Ltd. of Whitehorse. The Archer, Cathro crew consisted of party chief J.S. Murray, senior assistant B. Johnston and field assistant I. Talbot.

PROPERTY, LOCATION AND ACCESS

The Toc property is situated on the south bank of the Yukon River, approximately midway between Dawson City and Clinton Creek, at 64°18'N, 139°58'W, within NTS claim sheet 116B/5. It consists of 28 contiguous mineral claims that are recorded in the name of Archer, Cathro & Associates (1981) Limited in the Dawson Mining District as follows:

CLAIM NAMES	NO. CLAIMS	RECORD NUMBERS	EXPIRY DATES
Toc 1-8	8	YA52667-74	27 June, 1981
9-24	16	YA50101-16	26 June, 1981
25-28	4	YA55604-07	28 May, 1982
	28		

Daily crew access to the property was by helicopter during 1981. The excavator was brought to the property along an old bulldozer road that leads from the Top-of-the-World Highway to the claims. During 1981 a trail was built from the claims to the mouth of Woodchopper Creek.

HISTORY AND PREVIOUS WORK

The Toc claims were staked to cover the old Woodchopper prospect, which was first staked in 1963 by Canadian Johns-Manville Co. Ltd. A magnetic survey and bulldozer trenching program the following year exposed fish-scale serpentinite containing black pods with erratic fibre up to 12 mm in length. Except for an aeromagnetic survey flown by Sphere Development Corp. Ltd. in 1967, no further work was carried out until Cassiar Asbestos Corporation grid soil sampled the area in 1978. The Cassiar survey consisted of about 490 soil samples collected at 61 m by 122 m centers on the overburden-covered plateau between the old trenches and Woodchopper Creek. The survey was performed to test the soils for asbestos using a simple screening technique that proved to be unsuccessful.

GEOLOGY AND GEOMORPHOLOGY

Three small serpentinite bodies are located on the claims, two of which were investigated in 1981 with a total of 45 excavator pits. The third serpentinite was not pitted because it produced lower fibre dispersion values. The pitting uncovered rock similar to that in the Johns-Manville trenches. It consists of highly sheared serpentinites with occasional lenses of altered diorite enveloped by up to one metre of blackwall serpentinite alteration with associated fibre, called black pods by TJV. Surrounding rocks are mainly black graphitic argillite, graphitic schist, and chlorite schist.

Coarsely crystalline tan dolomite outcrops just south of the claim boundary and a thin quartz-feldspar-porphyry dyke was found on the east side of the property near a zone of poorly developed ribbon-fibre.

Between the 570 m and 600 m elevations, the property consists of a gentle terrace with cobbles, sand and clay. These were deposited on a former floor of the Yukon River. Excavator pits in these deposits to depths of up to 5.5 m failed to reach bedrock over an area 300 m square and showed that large parts of the grid are essentially unexplored.

A small but intense northeast-trending aeromagnetic anomaly is situated over the plateau between the showings.

MINERALIZATION

The main (discovery) showing is located on the east side of the claims on the edge of a high cliff overlooking the Yukon River. The serpentinite overlies pale green chlorite-mica schists. The showing consists of fibre up to 12 mm long occurring in black pods up to 5 m by 2 m that are surrounded by highly sheared and fish-scale serpentinite. The intense shearing was probably caused during the original emplacement of the ultramafite. Despite the excellent length, this fibre has poor economic potential because this type of mineralization rarely reaches significant size.

The second showing was found by Cassiar in 1978. It occurs about one km west of the trenched zone, on the east bank of Woodchopper Creek, and consists of a small outcrop of jointed but unsheared serpentinite surrounded by highly sheared serpentinites. Joints are spaced 2 to 10 cm apart and joint sets occur in at least 3 directions. The rock is well serpentinized, dark to medium green and bastites occur irregularly throughout. Graphitic argillite outcrops in a small creek 200 m northeast of the outcrop. Many of the joints in the serpentinite are filled by white carbonate but a few contain cross fibre veins with fibre up to 5 mm long. Post fibre movement has caused the fibre to be severely bent in the direction of movement. The outcrop grades far less than 1% fibre and trenching of surrounding serpentinites uncovered only black pod-type mineralization.

No fibre was found while prospecting the ultramafite that occurs along Woodchopper Creek north of the second showing and the ultramafite was not trenched.

FIBRE DISPERSION SURVEY

Introduction

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 effectiveness of these methods gradually decreased, 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.

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.

About 490 soil samples collected by Cassiar Asbestos in 1978 were reanalyzed in early 1981 at the Geotor Lab. The samples were collected at 61 m intervals along compass lines spaced 122 m apart using conventional soil sampling techniques. The 1978 base line was re-established during 1981 to provide survey control for the digging of 45 excavator pits.

Laboratory Techniques

The laboratory treatment of each sample 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 7.5X to 22.5X 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.

The Point Formula

The laboratory technique and interpretation methods used by TJV have been designed to identify samples that contain longer fibres and, by definition, have a better probability of having been derived from commercial mineralization. Most commercial deposits contain abundant 6.5 mm fibre. For example, Group 5 specifications stipulate that about 20% must exceed that length. Since 6.5 mm fibres are rare in TJV samples and have only been found in samples collected near important occurrences, that length has been chosen as an important threshold in fibre dispersion surveys.

Statistical analysis of soil data collected elsewhere by TJV showed that maximum fibre lengths tended to be longer as the number of fibres increased. Maximum fibre lengths in soil samples were found to cluster into three distinct sample populations, as summarized in the table below.

	Maximum Fibre Lengths	
Sample Populations	3 Fibres/Sample	10,000 Fibres/Sample
Serpentinite background	0.4 mm	1.0
Serpentinite containing non-commercial mineralization	1.7	4.6
Commercial mineralization	2.4	6.5

The statistical study further showed that the length and quantity of fibre in a sample could be combined mathematically according to the following formula so that each sample can be assigned a whole number (called a "point") for comparative purposes:

$$\text{POINTS} = \frac{500\ L^2}{[(\log x)^2 - 16 \log x - 17]^2}$$

where L = the length of the longest fibre, and log x = quantity (number of fibres)

The formula measures the relative probability that a soil sample was derived from the weathering of a commercially important source and is thus a powerful interpretative tool. For example, the probability of collecting a fibre 6.5 mm long in soil over a bedrock source containing fibre 6.5 mm long is high if the sample contains over 10,000 fibres (a fibre mat) but is poor if the sample contains only 10 fibres.

In the TJV sampling, it has been found that most samples contain less than 100 fibres and that quantities exceeding 10,000 fibres are only obtained when sampling has encountered a fibre mat. It is fairly uncommon to encounter a fibre mat in TJV sampling, either because the sample cannot be collected deep enough or because there is insufficient fibre in bedrock. Alternatively, some soils are too mixed by solifluction to permit the development of a mature profile. As a result, most samples do not contain enough fibres to be statistically representative of bedrock and the probability is therefore less than 1.0 that they will contain the longest fibre present in the source. By permitting the comparison of samples containing different quantities of fibre, the formula helps to overcome the field difficulty of collecting samples of uniform quality.

Using the example quoted above, the sample containing 10 fibres and a longest fibre of 3.2 mm would have the same point score (50 points) as the fibre mat sample with 10,000 fibres and a maximum length of 6.5 mm. A point score of 50 seems to be a good threshold value since nearly all soils tested from commercial-grade asbestos showings have scores of 50 or more.

Field testing of the formula in 1981 showed that it loses its statistical validity once the number of fibres in the soil falls to a low level. For example, a soil sample containing only three fibres will give a point score of 34 if the longest fibre is 2 mm long, but a much higher score of 75 if the longest fibre measures 3 mm.

To overcome this weakness, it was necessary to rate samples according to the number of fibres present by adding a suffix to the point number. Points with an "a" suffix have the highest reliability and those marked "d" the lowest, as shown below:

Suffix	Fibre quantity/sample
a	more than 100 fibres
b	10 to 99 fibres
c	4 to 9 fibres
d	1 to 3 fibres

Samples with quantity "a" are usually collected where soils are thinnest over ultramafites. Soils with "d" ratings generally fringe ultramafite bodies, contain spurious fibre because of contamination, or reflect deeper and more complex overburden profiles. For a given ultramafite, scores derived from "a" soils and from "d" soils will be roughly similar but the "d" scores will be more erratic. Statistics show that over 90% of all "d" scores were less than 50 points and fibres 3 mm or more in length seldom occur in "d" soils.

Interpretations

Like conventional geochemical surveys, interpretation of a fibre dispersion survey requires consideration of the origin of the overburden and geomorphic history of the target area. The interpretation becomes quite difficult if the nature of the overburden is unknown or misunderstood.

Experience has shown that thin residual overburden is an ideal material for fibre dispersion sampling because soils collected over or downhill from mineralization contain high quantities of fibre and produce statistically reliable point scores. The high contrast with background makes recognition of anomalies easy and the thin local nature of the overburden allows rapid and inexpensive discovery of the source. In addition, background quantities of fibre sometimes define the position of unmineralized serpentinite, which permits the survey to be used as a mapping tool as well.

Soil samples collected over a mineralized serpentinite will give consistent "a" and "b" scores (e.g. greater than 100 and 10 fibres per sample, respectively), provided the soil profile is not complex and the sample has been dug below the surface organic layer. Soil samples collected from the periphery of the mineralized zone can also contain fibre because of solifluction or surface runoff but they usually produce "c" or "d" scores (less than 10 or 4 samples, respectively).

Erratic high scores surrounded by low scores are often caused by slip fibre veins, widely-spaced shear veins or gash veins in sheared serpentinite. Slip fibre can be distinguished from cross-fibre under the microscope by its more feathery appearance. These types of mineralization are usually only locally developed and produce a patchy pattern of anomalies.

Economically important concentrations of fibre are usually associated with much larger bodies of blocky serpentinite and the dispersion of fibre in soils covering these deposits is extensive. To be economic, an ultramafite must contain at least 5% asbestos and 20% of this should be over 6.5 mm long. All residual soil samples collected to the proper depth over an economic deposit will give scores of over 50 points. The dispersion pattern outward from the deposit is marked by high point scores but decreasing quantity ratings. Fringe samples, which contain only a very few fibres, may exhibit extremely erratic point scores, perhaps even greater than 150 points, since some abnormally long fibres will likely be present.

Good quality chrysotile fibre can also occur in black pods or adjacent to rodingite dykes and can be dispersed in soils over a fairly wide area. Anomalies of this type cannot be distinguished from those produced by commercial blocky serpentinite and must be trenched.

On the Toc claims, soil sampling was done within two major types of overburden - residual and alluvial. Soil profiles can consist of only one type or a mixture of these and chrysotile occurs in both. The residual soils are present mainly on the east and west sides of the property and tend to be fairly thin (less than 5 m thick) and contain abundant fragments of rock reflecting the underlying geology. The alluvial soils are present on the plateau area near the central part of the claim and consists of frozen clay with some rounded rock fragments.

Point scores throughout the grid area were generally low. A small cluster of three soils with scores up to 66b occur at Anomaly A, about 700 m north of the main showing but excavator pits intersected only deep, frozen clay soil and did not reach bedrock. Trenching of an isolated soil value of 167b at Anomaly C on the west side of the property uncovered a black pod with fibre lengths up to 10 mm. Other excavator work was concentrated at Anomaly B near the old trenches in erratic point scores. Only black pod mineralization was found at this location.

Unexplained anomalies over the deep alluvium that covers the north-central part of the claims are erratic and are probably caused by fibre dispersion from black pod-type mineralization higher on the hillside.

Conclusions

The black pod-type mineralization present on the property does not represent an attractive chrysotile exploration target because these showings are characteristically very small and low grade. Analysis of the grid soil samples indicated that good quality fibre was erratically present in the soil on both the east and west sides of the property but excavator pitting of the best anomalies failed to locate a suitable host serpentinite for an economic deposit near the known showings. Unexplained anomalies over the alluvium are erratic and are probably caused by fibre dispersion from black pod-type mineralization higher on the hillside. The low economic potential does not justify the expense of deep sampling for buried targets on the terrace at this time.

Respectfully submitted,

ARCHER, CATHRO & ASSOCIATES (1981) LIMITED,

J. Scott Murray

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

/jjm

Statement of Expenditures
Toc 1-28 Claims
June 24, 1981

Contract Excavator

Ibex Contracting Ltd. - May 25-June 3, 1981 - 86 hours at $94/hr	$ 8,084.00

Helicopter

Shirley Air Services Ltd. contract 206B - May 25-June 4, 1981 - 11.5 hours at $365/hr	4,198.00

Assaying

Geotor Services Incorporated - 200 samples at $7.00/sample	1,400.00
	$13,682.00

090958

GEOTOR SERVICES INCORPORATED
485 – 12th AVENUE
KAMLOOPS, B.C. V2C 3Y6

INVOICE

066711

SOLD TO ARCHER CATHRO & ASSOC. LTD.
1016 – 510 W. HASTINGS ST.
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JUN 25, 1981
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DAWSON, Y.T.
I.A. & N.D.

Shirley Air

Shirley Air Services Ltd.
Hangar 6A, Municipal Airport
Edmonton, Alberta T5G 2Z3
Phone (403) 453 - 5121

78636

FLIGHT TICKET

DATE May 14/[illegible] A/C C-GA[illegible]

CHARTER ☐ CONTRACT Archer Cathro NON-REV. ☐

CUSTOMER Archer Cathro

ADDRESS PO Box 4127 Whitehorse Yukon

P.O. # T-1 PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.
Clinton Crk → TAC Claim		✓	1	0
Clinton Crk → Dawson City → Clinton Crk L.L.		✓	2	6
Clinton Crk L.L.		✓	0	7
TOTAL FLIGHT HOURS			4	3
TOTAL HOURS THIS CONTRACT TO DATE			35	0

A/F TTSOH

ENG. TTSOH

PILOT'S SIG. [signature]

CUSTOMER SIG. [signature]

MTCE. ENG.

N.W.T. ☐
YUKON ☑
ALBERTA ☐
B.C. ☐
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78637

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DATE May 25/91 A/C C-GRZL

CHARTER ☐ CONTRACT ARCHER CATHRO NON-REV. ☐

CUSTOMER ARCHER CATHRO

ADDRESS PO Box 4127 WHITE HORSE YUKON.

P.O. # T.J.V. PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.
CLINTON CRK → (TOC) → CLINTON CRK		✓	1	7
CLINTON CRK → TIZA → CLINTON CRK		✓	2	0
REGIONAL		✓	1	5
TOTAL FLIGHT HOURS			5	2
TOTAL HOURS THIS CONTRACT TO DATE			40	2

PILOT'S SIG. [signature]

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MTCE. ENG.

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ENG. TTSOH

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78638

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DATE May 26/81 A/C C-GRZL

CHARTER ☐ CONTRACT Archer Cathro NON-REV. ☐

CUSTOMER Archer Cathro

ADDRESS P.O. Box 4127 Whitehorse Yukon.

P.O. # T.T.V PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.
Clinton Cr. - Tak - Clinton Cr.		✓	1	2
Clinton Cr. - Tizat - Clinton Cr.		✓	2	7
Regional		✓	1	9
TOTAL FLIGHT HOURS			5	9
TOTAL HOURS THIS CONTRACT TO DATE			46	2

A/F TTSOH

ENG. TTSOH

PILOT'S SIG. [signature]

CUSTOMER SIG. [signature]

MTCE. ENG.

N.W.T. ☐
YUKON ☑
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DATE May 27/81 A/C C-GPZL

CHARTER ☐ CONTRACT Archer Cathro NON-REV. ☐

CUSTOMER Archer Cathro

ADDRESS PO Box 4127 Whitehorse Yukon

P.O. # TTV PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.
Clinton Crk → TDC → Clinton Crk		✓	0	5
Clinton Crk → TIZA → Clinton Crk		✓	0	7
Clinton Crk → TJOP → Clinton Crk		✓	0	7
Regional		✓	1	6
TOTAL FLIGHT HOURS			3	5
TOTAL HOURS THIS CONTRACT TO DATE			40	5

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CUSTOMER SIG. ....

MTCE. ENG. ....

A/F TTSOH

ENG. TTSOH

FUEL USED

CACHE REMAINING

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DATE May 24 /81 A/C C-GRZL

CHARTER ☐ CONTRACT ARCHER CATHRO NON-REV. ☐

CUSTOMER ARCHER CATHRO

ADDRESS P.O. Box 4127 WHITEHORSE YUKON

P.O. # T.T.V PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.	
CLINTON → TOC		✓	0	7	
TIZA		✓	0	2	
CLINTON → TIZA		✓	0	4	
CASSIAR CRK		✓	0	2	REG.
TOC		✓	0	3	
REGIONAL		✓	1	3	REG.
TOC		✓	0	5	
TIZA		✓	0	5	
CASSIAR CRK		✓	0	2	REG.
TOTAL FLIGHT HOURS			3	9	
TOTAL HOURS THIS CONTRACT TO DATE			53	4	

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MTCE. ENG.

A/F TTSOH

ENG. TTSOH

FUEL USED

CACHE REMAINING

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Shirley Air

Shirley Air Services Ltd.
Hangar 6A, Municipal Airport
Edmonton, Alberta T5G 2Z3
Phone (403) 453 - 5121

78641

FLIGHT TICKET

DATE May 29/81 A/C C-GRZL

CHARTER ☐ CONTRACT Archer Cathro NON-REV. ☐

CUSTOMER Archer Cathro

ADDRESS PO Box 4127 Whitehorse Yukon

P.O. # TTV PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	CUST.	HRS.	MIN.
Clinton Crk → Toc → Clinton Crk		✓	0	6
Clinton Crk → Tiza → Clinton Crk		✓	1	0
Clinton Crk → Trap Regional - Clinton Crk		✓	0	5 REG.
Regional		✓	1	4 REG.
TOTAL FLIGHT HOURS			3	5
TOTAL HOURS THIS CONTRACT TO DATE			56	9

PILOT'S SIG. [signature]

CUSTOMER SIG. [signature]

MTCE. ENG.

A/F TTSOH

ENG. TTSOH

FUEL USED	CACHE REMAINING

N.W.T. ☐
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FLIGHT TICKET

DATE May 20/81 A/C C-GRZL

CHARTER ☐ CONTRACT ARCHER CATHRO NON-REV. ☐

CUSTOMER ARCHER CATHRO

ADDRESS PO Box 4127 WHITEHORSE YUKON

P.O. # TJV PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.
Clinton Crk → FOG → Clinton Crk		✓	0	7
Clinton Crk → TIZA → Clinton Crk		✓	1	4
TOTAL FLIGHT HOURS			2	1
TOTAL HOURS THIS CONTRACT TO DATE			59	0

PILOT'S SIG. [signature]

CUSTOMER SIG. [signature]

MTCE. ENG.

A/F TTSOH

ENG. TTSOH

FUEL USED

CACHE REMAINING

N.W.T. ☐
YUKON ☑
ALBERTA ☐
B.C. ☐
SASK. ☐
MAN. ☐
ONT. ☐
QUE. ☐
MARIT. ☐

SPECIAL REMARKS

CUSTOMER COPY

Shirley Air

Shirley Air Services Ltd.
Hangar 6A, Municipal Airport
Edmonton, Alberta T5G 2Z3
Phone (403) 453 - 5121

78645

FLIGHT TICKET

DATE May 21/81 A/C C-GPZA

CHARTER ☐ CONTRACT ARCHER CATHRO NON-REV. ☐

CUSTOMER ARCHER CATHRO

ADDRESS PO Box 4127 WHITEHORSE YUKON

P.O. # TTV PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.
CLINTON CRK → TOC → CLINTON CRK		✓	0	7
CLINTON CRK → TIZA → CLINTON CRK		✓	1	4
CLINTON CRK → TIZA REGIONAL → CLINTON CRK		✓	0	7
TOTAL FLIGHT HOURS			1	8
TOTAL HOURS THIS CONTRACT TO DATE			61	8

PILOT'S SIG. [signature]

CUSTOMER SIG. [signature]

MTCE. ENG.

A/F TTSOH

ENG. TTSOH

N.W.T. ☐
YUKON ☑
ALBERTA ☐
B.C. ☐
SASK. ☐
MAN. ☐
ONT. ☐
QUE. ☐
MARIT. ☐

SPECIAL REMARKS

FUEL USED

CACHE REMAINING

CUSTOMER COPY

Shirley Air

Shirley Air Services Ltd.
Hangar 6A, Municipal Airport
Edmonton, Alberta T5G 2Z3
Phone (403) 453 - 5121

78647

FLIGHT TICKET

DATE June 1 /81 A/C C-GRZL

CHARTER ☐ CONTRACT Archer Cathro NON-REV. ☐

CUSTOMER Archer Cathro

ADDRESS PO Box 4127 Whitehorse Yukon

P.O. # TTV PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	CUST.	HRS.	MIN.
Clinton Crk → TDC → Clinton Crk.		✓	1	4
Clinton Crk → TZA → Clinton Crk.		✓	1	4
TOTAL FLIGHT HOURS			2	8
TOTAL HOURS THIS CONTRACT TO DATE			64	6

PILOT'S SIG. [signature]

CUSTOMER SIG. [signature]

MTCE. ENG.

A/F TTSOH

ENG. TTSOH

FUEL USED

CACHE REMAINING

SPECIAL REMARKS

N.W.T. ☐
YUKON ☑
ALBERTA ☐
B.C. ☐
SASK. ☐
MAN. ☐
ONT. ☐
QUE. ☐
MARIT. ☐

CUSTOMER COPY

Shirley Air

Shirley Air Services Ltd.
Hangar 6A, Municipal Airport
Edmonton, Alberta T5G 2Z3
Phone (403) 453 - 5121

78649

FLIGHT TICKET

DATE June 2 /81 A/C C-GRZL

CHARTER ☐ CONTRACT Archer Cathro NON-REV. ☐

CUSTOMER Archer Cathro

ADDRESS PO Box 4127 Whitehorse Yukon

P.O. # TTV PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.
Clinton Cak → Toc → Clinton Cak		✓	1	2
Clinton Cak → TJA → Clinton Cak		✓	1	6
Regional		✓	0	3
Toc Regional		✓	0	4
TOTAL FLIGHT HOURS			2	5
TOTAL HOURS THIS CONTRACT TO DATE			64	1

PILOT'S SIG. [signature]

CUSTOMER SIG. [signature]

MTCE. ENG.

A/F TTSOH

ENG. TTSOH

N.W.T. ☐
YUKON ☑
ALBERTA ☐
B.C. ☐
SASK. ☐
MAN. ☐
ONT. ☐
QUE. ☐
MARIT. ☐

SPECIAL REMARKS

FUEL USED	CACHE REMAINING

CUSTOMER COPY

Shirley Air

Shirley Air Services Ltd.
Hangar 6A, Municipal Airport
Edmonton, Alberta T5G 2Z3
Phone (403) 453 - 5121

78926

FLIGHT TICKET

DATE June 3/81 A/C C-GRZJ

CHARTER ☐ CONTRACT Archer Cathro NON-REV. ☐

CUSTOMER Archer Cathro

ADDRESS PO Box 4127 White Horse Yukon

P.O. # TJV PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.
Clinton Cak → (Toc) → Clinton Cak		✓	1	7
Clinton Cak → Tiza → Clinton Cak		✓	0	9
Regional		✓	2	0
Clinton Cak → Toc → Dawson City → Dominion Mines → Toc	✓		1	9
Clinton Cak → Fifteen Mile Cak → Clinton Cak		✓	0	8
TOTAL FLIGHT HOURS			9	3
TOTAL HOURS THIS CONTRACT TO DATE			76	4

PILOT'S SIG. [signature]

CUSTOMER SIG. [signature]

MTCE. ENG.

A/F TTSOH

ENG. TTSOH

N.W.T.	☐
YUKON	☑
ALBERTA	☐
B.C.	☐
SASK.	☐
MAN.	☐
ONT.	☐
QUE.	☐
MARIT.	☐

SPECIAL REMARKS

Fuel from Dawson City 22.9 Gals @ 1.87/Gal

FUEL USED	CACHE REMAINING

CUSTOMER COPY

Shirley Air

Shirley Air Services Ltd.
Hangar 6A, Municipal Airport
Edmonton, Alberta T5G 2Z3
Phone (403) 453 - 5121

78928

FLIGHT TICKET

DATE June 4/81 A/C C-GRZL

CHARTER ☐ CONTRACT Archer Cathro NON-REV. ☐

CUSTOMER Archer Cathro

ADDRESS PO Box 4127 Whitehorse Yukon

P.O. # TJV PROJECT

FLIGHT/PASSENGER DETAILS	Fuel Supplied By S.A.	Fuel Supplied By CUST.	HRS.	MIN.
Clinton Crk → (Toc) → Clinton Crk		✓	0	5
Clinton Crk → TIZA → Clinton Crk		✓	0	8
TJOP Regional		✓	1	4
T.J.V.				
TOTAL FLIGHT HOURS			2	7
TOTAL HOURS THIS CONTRACT TO DATE			79	1

PILOT'S SIG. [signature]

CUSTOMER SIG. [signature]

MTCE. ENG. [signature]

A/F TTSOH

ENG. TTSOH

FUEL USED

CACHE REMAINING

N.W.T. ☐
YUKON ☑
ALBERTA ☐
B.C. ☐
SASK. ☐
MAN. ☐
ONT. ☐
QUE. ☐
MARIT. ☐

SPECIAL REMARKS

CUSTOMER COPY

DATE	DETAILS	CHARGES	CREDITS	BALANCE
	BALANCE FORWARD			
	Rental of 1 caterpillar model 225 Excavator as per Equipment Rental Agreement for the period from May 25 - 31, 1981. 57 Hrs @ $94.00/Hr.			5,358.00

pd June 23/81 #64✓

two percent may be charged on accounts over 30 days

S2STA

IN ACCOUNT WITH

PAYMENTS MADE AFTER DATE SHOWN SHALL APPEAR ON NEXT STATEMENT.

STATEMENT

LAST AMOUNT IN THIS COLUMN IS BALANCE OF YOUR ACCOUNT AT THE DATE SHOWN.

DRIVER'S TIME SHEET IBEX Const. LTD

DRIVER'S NAME	UNIT NO	DATE	REF NO
S. Grumpner		May 25/81	

	MILES	HOURS	FUEL
Walk Excavator into		6	
Toc property			
TOTALS			

J. Scott [signature] T.J.V.

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966 O

DRIVER'S TIME SHEET IBEX Const. LTD

DRIVER'S NAME	UNIT NO.	DATE	REF. NO.
S. Grumpner		May 26/81	

	MILES	HOURS	FUEL
Trenching (Toc)		9	
TOTALS			

J. Scott [signature] T.J.V.

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966 O

DRIVER'S TIME SHEET IBEX Const. LTD

DRIVER'S NAME	UNIT NO.	DATE	REF. NO.
S. Grumpner		May 27/81	

	MILES	HOURS	FUEL
Trenching / Toc		9	
TOTALS			

J. Scott [signature] T.J.V.

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966 O

DRIVER'S TIME SHEET IBEX Const. LTD

DRIVER'S NAME	UNIT NO.	DATE	REF. NO.
S. Grumpner		May 28/81	

	MILES	HOURS	FUEL
Trenching (Toc)		8½	
TOTALS			

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966

DRIVER'S TIME SHEET IBEX Const. LTD

DRIVER'S NAME	UNIT NO.	DATE	REF. NO.
S. Grumpner		May 29/81	

	MILES	HOURS	FUEL
Trenching (Toc)		9½	
TOTALS			

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966

DRIVER'S TIME SHEET IBEX Const. LTD

DRIVER'S NAME	UNIT NO.	DATE	REF. NO.
S. Grumpner		May 30/81	

	MILES	HOURS	FUEL
Trenching (Toc)		9	
TOTALS			

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966

DRIVER'S TIME SHEET IBEX Const. LTD

DRIVER'S NAME	UNIT NO	DATE	REF. NO
S. Grumpner		May 31/81	

	MILES	HOURS	FUEL
Trenching (Toc)		6	
TOTALS			

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966

DRIVER'S TIME SHEET IBEX Const. LTD

DRIVER'S NAME	UNIT NO.	DATE	REF. NO.
S. Grumpner		June 1/81	

	MILES	HOURS	FUEL
Trenching (Toc)		12	
TOTALS			

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966

DRIVER'S TIME SHEET IBEX Const. LTD

DRIVER'S NAME	UNIT NO.	DATE	REF. NO.
S. Grumpner		June 2/81	

	MILES	HOURS	FUEL
Trenching (Toc)		12	
TOTALS			

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966

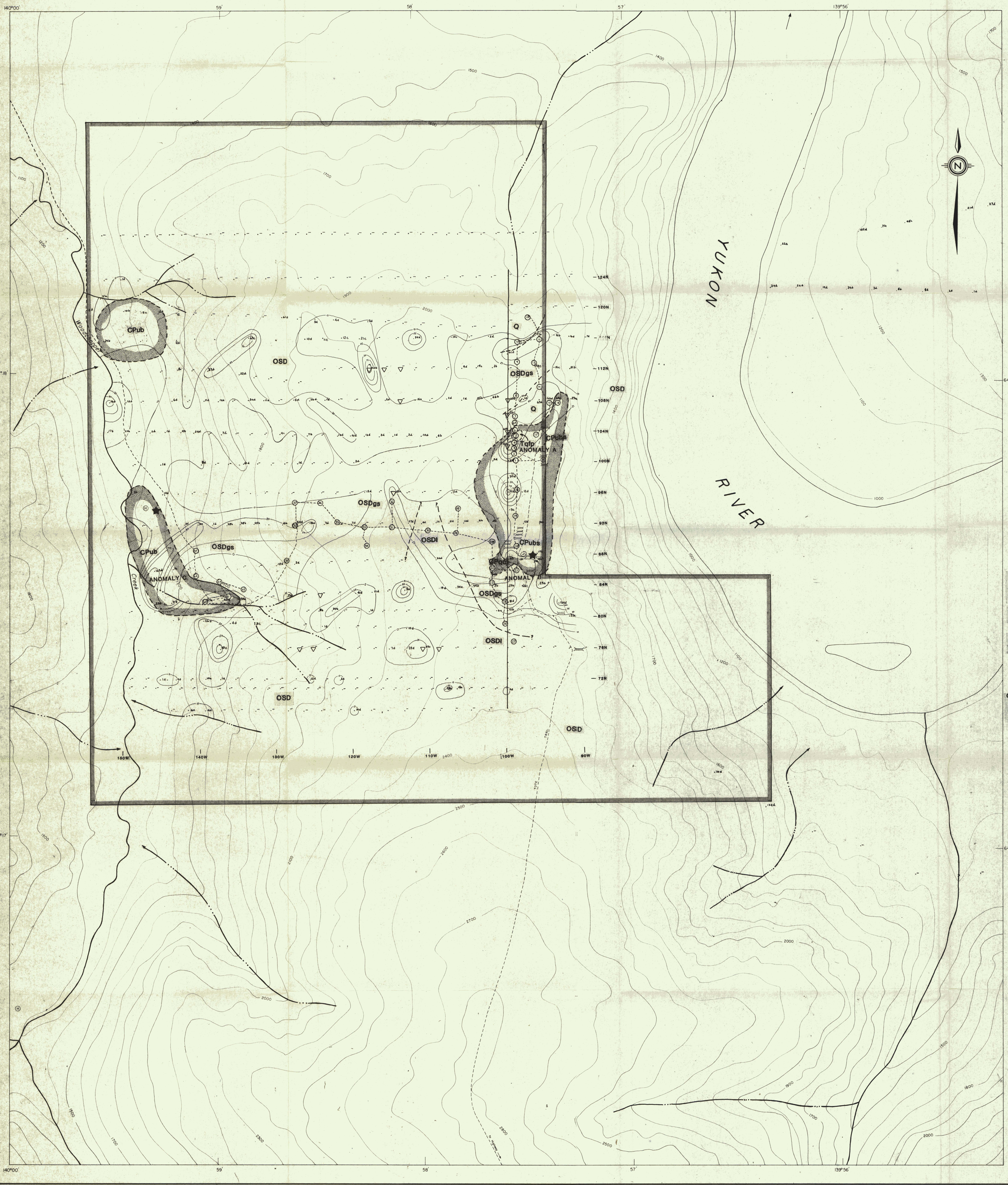
DRIVER'S TIME SHEET IBEX Const. LTD

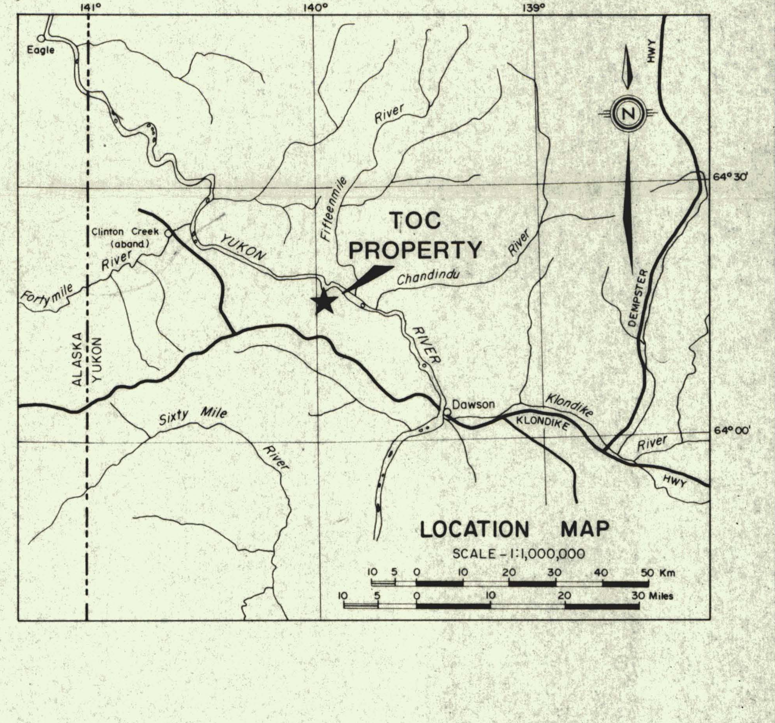
DRIVER'S NAME	UNIT NO	DATE	REF. NO
S. Grumpner		June 3/81	

	MILES	HOURS	FUEL
Trenching (Toc)		5	
TOTALS			

YUKON OFFICE SUPPLIES

MOORE SPEEDIPLY - 3 - MOORE CLEANPRINT PATENTED 1963-1966





LEGEND

QUATERNARY

Q	Unconsolidated alluvial deposits

TERTIARY

Tqfp	Quartz feldspar porphyry, aplite, granite, granodiorite and quartz monzonite

CARBONIFEROUS TO PERMIAN — **ANVIL ALLOCHTHON**

CPub	Dark green serpentite and quartz carbonate rocks
CPubs	Sheared and fish scale serpentinite
CPqcl	Quartz carbonate I

ORDOVICIAN TO DEVONIAN — **NASINA SUITE**

OSD	Undifferentiated grey quartz mica schist, graphite schist, chlorite schist, carbonaceous mudstone, phyllite, limy sandstone
OSDgs	Grey to black graphite schist
OSDl	Limestone, dolomite, marble

— — –	Geological contact defined, assumed
—25—	Point value isoline
—	Cut line
90N 100E	Grid coordinates
(21)	Excavator pit
	Trench
★	Chrysotile showing
- - - - -	Bulldozer trail
(H)	Helicopter pad
.30a	Soil sample location and point value
x59d	Silt sample location and point value
▽	Hand dug pit

NOTE: Chrysotile content of samples measured with Fine Particle Separator at GEOTOR SERVICES INCORPORATED, Kamloops, B.C.

Association of Professional Engineers of the Yukon Territory — R. J. CATHRO — GEOLOGICAL ENGINEER — Dec/81

Fig. 1

ARCHER, CATHRO & ASSOCIATES LTD.

GEOLOGY AND FIBRE DISPERSION SURVEY

TOC PROPERTY

TESLIN JOINT VENTURE

SCALE - 1:5000

0909558

To accompany report dated Dec./81