Open File 2006-5

Mineral Assessment of the Ddhaw Ghro Habitat Protection Area, Yukon

A. Fonseca

Open File 2006-5

Mineral Assessment of the Ddhaw Ghro Habitat Protection Area, Yukon

A. Fonseca

Published under the authority of the Minister of Energy, Mines and Resources, Government of Yukon

http://www.emr.gov.yk.ca

Printed in Whitehorse, Yukon, 2006.

This, and other Yukon Geological Survey publications, may be obtained from:

Geoscience and Information Sales
c/o Whitehorse Mining Recorder
102-300 Main Street
Box 2703 (K102)
Whitehorse, Yukon, Canada Y1A 2C6
phone (867) 667-5200, fax (867) 667-5150

Visit the Yukon Geological Survey web site at www.geology.gov.yk.ca

In referring to this publication, please use the following citation:
Fonseca, A., 2006. Mineral Assessment of the Ddhaw Ghro Habitat Protection Area, Yukon. Yukon Geological Survey, Open File 2006-5, 21 p. plus 1 map.

Preface

This report summarizes the results of geological field work and a detailed mineral assessment of the Ddhaw Ghro Habitat Protection Area. This assessment was done by the Mineral Resources Branch of the Department of Energy, Mines and Resources of Yukon Government in November, 2001.

The purpose of the mineral resource assessment was to provide the Department of Renewable Resources and the Special Management Area Steering Committee with information on the mineral potential of the area for use in the management planning process for the Habitat Protection Area. The Yukon Geological Survey is pleased to release the results of this mineral assessment in this report.
The information is being released as originally prepared and may not conform to current Yukon Geological Survey publication standards. Please note that this report does not include information from any studies that may have been carried out in the area since the mineral assessment was conducted.

Mineral Assessment
of
Ddhaw Ghro Habitat Protection Area
Special Management Area

Internal Report
Prepared by A. Fonseca
November, 2001

Introduction

Land status

A map notation designating McArthur Wildlife Preserve (#10-21) in what is now Ddhaw Ghro Habitat Protection Area Special Management Area (SMA) discouraged extensive exploration programs in the area since 1972. In 1974, the same area was proposed as an International Biological Program (IBP) site. The area was selected as a Special management area for the Selkirk and Na'Cho N'Y'Ak Dun First Nations **(Figure 1)** and given a Habitat Protection Area designation. Both Selkirk and Na'Cho N'Y'Ak Dun First Nation Final Agreements state that the objective of Ddhaw Ghro Habitat Protection Area is "to conserve and protect important fish and wildlife habitat for the benefit of all Yukon people". The Special Management Area became interim protected since 1997 for a period of three years. The area contained no active quartz or placer claims, or crown grants at the time of withdrawal. Land withdrawal was recently renewed through August 2005, or the completion of a management plan. The management plan may make recommendations regarding permanent land withdrawals.

The SMA is located in the south-central part of Yukon Plateau North Ecoregion, and near Yukon Plateau Central Ecoregion, both currently unrepresented by a YPAS Goal 1 protected area **(Figure 2)**.

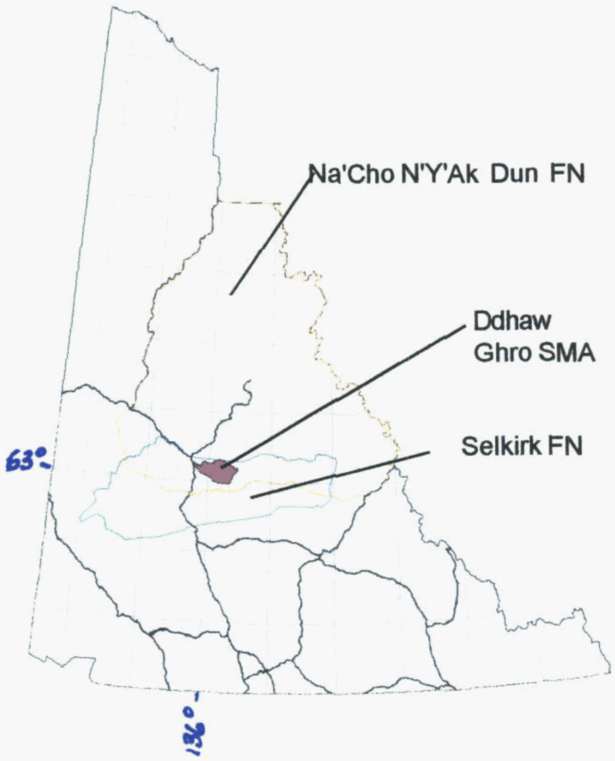

Figure 1. Map of Yukon showing traditional territories of Selkirk and Na'Cho N'Y'Ak Dun First Nations, Ddhaw Ghro SMA, and major roads.

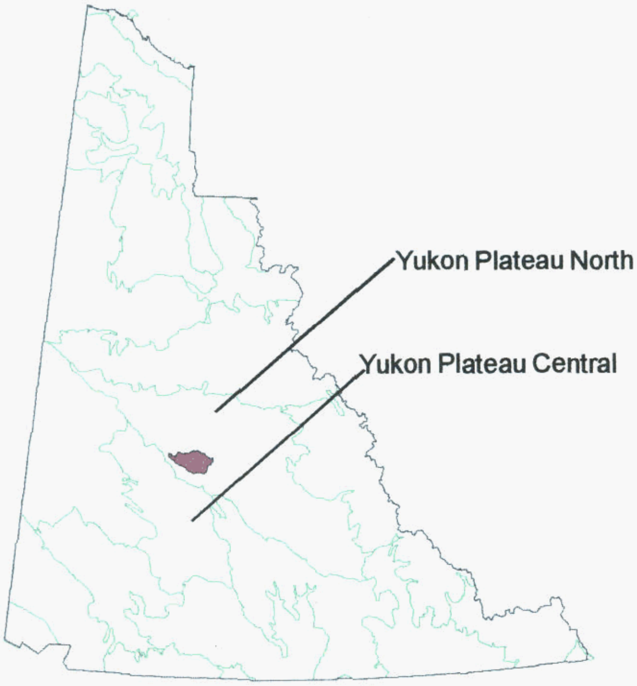

Figure 2. Map of Yukon Ecoregions showing Ddhaw Ghro SMA in south-central part of Yukon Plateau North Ecoregion.

Field work carried out by YTG

In the summer 2000, Anna Fonseca and Daniele Heon spent six days in the area between Grey Hunter Creek and Sideslip Creek, in the southeastern portion of Ddhaw Ghro SMA. Work included 1:20,000 scale mapping, prospecting, and collection of samples for geochemical analyses, fossil dating, and petrographic studies. All wildlife sightings were recorded on a 1:50,000 scale topographic map.

In August 2001, Anna Fonseca and Kel Sax spent 10 days mapping (1:50,000 scale) and sampling the area adjacent to the contacts of McArthur Batholith in map sheet 105M/3.

Location, access, and physiography

Ddhaw Ghro Habitat Protection Area Special Management Area consists of 1610 km^2 in central Yukon. The SMA occupies the southeastern portion of Mayo map sheet (105M), southwestern corner of McQuesten map sheet (115P), and northwestern corner of Glenlyon map sheet (105L). The northwestern corner of Dhaw Ghro SMA is a densely vegetated area adjacent to the Klondike Highway, and approximately 25 km south of Stewart Crossing.

Access is by helicopter from Mayo (approximately 75 km).

Ddhaw Ghro SMA roughly outlines the high ridges of McArthur Range, immediately northeast of Tintina Trench. Nogold Creek marks the northern boundary of the SMA.

Exploration history

Mineral exploration in the southeastern Mayo map sheet dates as far back as 1929, when Treadwell Yukon CL prospecting party claimed to discover the "Lost Wernecke Copper" (MINFILE # 105M 043) a large tonnage, low grade copper deposit in the McArthur Mountains. Treadwell Yukon did not stake the area, and copper showings were never found, despite regional exploration programs by Atlas EL in 1969 and United Keno Hill ML in 1970. In the early 1980s, Anaconda conducted a regional exploration project for copper targets, but staked no claims in the area that now consists the SMA.

Exploration by individuals and companies from the 1920s to the 1970s resulted in the identification of the following intrusive-related mineral occurrences: Sideslip (MINFILE # 105M 039, staked as early as 1950, but certainly in 1969 by Atlas EL); Great Horn (MINFILE # 105M 040, staked in 1971 by Great Horn Mg Syndicate Inc.); Ram (MINFILE # 105M 041, staked in 1966 by Kerr Addison ML); Hotspring (MINFILE # 105M 042, staked in 1966 by H. Mauthner); and Friesen (MINFILE # 105M 051, discovered in 1970 by United Keno Hill ML, and staked in 1972 by E. Woolven and E. Friesen, and again in 1974 by G. Van Bibber).

In 1992, Placer Dome conducted heavy mineral concentrate collection in the SMA area during a regional exploration program for Fort Knox type (intrusive-hosted) gold targets.

In 1996 and 1997, Viceroy Resources conducted a regional exploration program in the McArthur Wildlife Preserve. The company generated a significant target in the headwaters of Nogold Creek, near Sideslip mineral occurrence. Withdrawal of the SMA land from disposition late in the 1997 field season terminated Viceroy's exploration program.

Geology

Regional Setting

Most of Ddhaw Ghro SMA lies within Selwyn Basin. Roots (1996) mapped Mayo map sheet (105M) at 1:100,000 scale, and compiled the maps at 1:250,000 scale. Gordey and Makepeace (2000) produced a digital compilation of the geology of the Yukon, from which geology of Ddhaw Ghro SMA is shown in **Figure 3.**

Late Proterozoic through Siluro-Devonian easterly-derived sediments deposited in Selwyn Basin. In mid-Paleozoic time, Nogold basin opened along a NW-SE-trending axes, on the northern part of Ddhaw Ghro SMA, where Hyland Group sediments were reworked and re-deposited. In Devonian time, westerly- and northwesterly-derived Earn Group dark coloured turbidites deposited upon Selwyn Basin strata (Gordey, 1992). Mesozoic deformation produced NW-SE-trending, SE-plunging folds, and NE-verging thrusts in the southern part of Mayo map sheet (Roots, 1996). Intrusion of McArthur Batholith took place at 90-95 Ma (Roots, 1996). Magmatism post-dated the penetrative deformation, and produced wide contact metamorphic aureoles that overprinted penetrative fabrics. Starting in the Eocene, dextral movement along Tintina Fault juxtaposed basinal rocks of Ddhaw Ghro SMA (to the northeast) to Yukon-Tanana rocks of continental arc affinity.

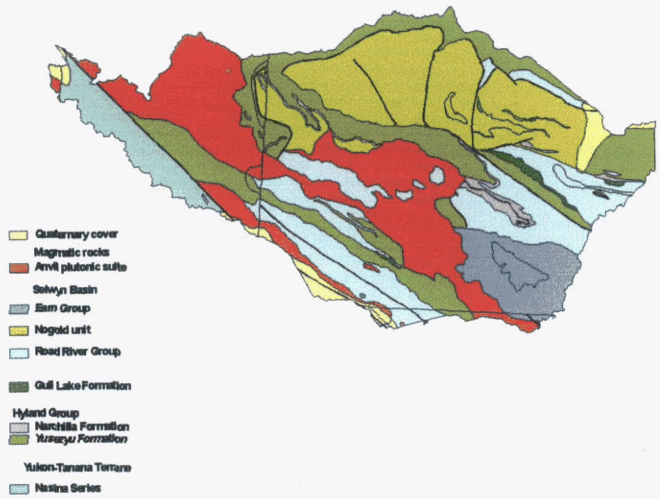

Figure 3. Simplified geology of Ddhaw Ghro SMA (from Gordey and Makepeace, 2000).

Geology Ddhaw Ghro SMA

Sedimentary rocks in the southeastern portion of the SMA were critical for the identification of structural and stratigraphic relationships, because the area exposes the transition from rocks that suffered intense metasomatism in the contact aureole of McArthur Batholith to their unaltered counterparts to the southwest. 1:50,000 scale geological compilation Ddhaw Ghro SMA (**Figure 4**) includes results of mapping during the 2000 and 2001 field seasons, and previous work compiled by Gordey and Makepeace (2000). Structures, alteration and mineralization in the northwestern part of the map are controlled by the intrusion of McArthur Batholith. Intensely jointed, muscovite-biotite-quartz-monzonite is ubiquitous, but biotite-quartz-monzonite and pegmatitic dikes are common. Mesocratic enclaves **(Plate 1)** are common, particularly along the margins of the batholith. McArthur Batholith contains large pendants reaching over 2 km diameter. Rocks forming northeastern-most pendant are resistant, rusty-weathering, pervasively hornfelsed quartz-arenite, siltstone, and shale.

Figure 5 shows the interpreted stratigraphic column for Ddhaw Ghro SMA.

Sedimentary rocks east of Grey Hunter Creek consist of a folded and thrust-imbricated sequence of Duo Lake Formation (dark grey to black chert, shale, and limestone, and minor tan-weathering, medium grey-brown subarkosic wacke) and Steel Formation (orange-weathering, bioturbated, wispy laminated calcareous shale) of Road River Group, and Portrait Lake Formation (blue-black weathering, dark grey to black arkosic wacke and shale) of Earn Group.

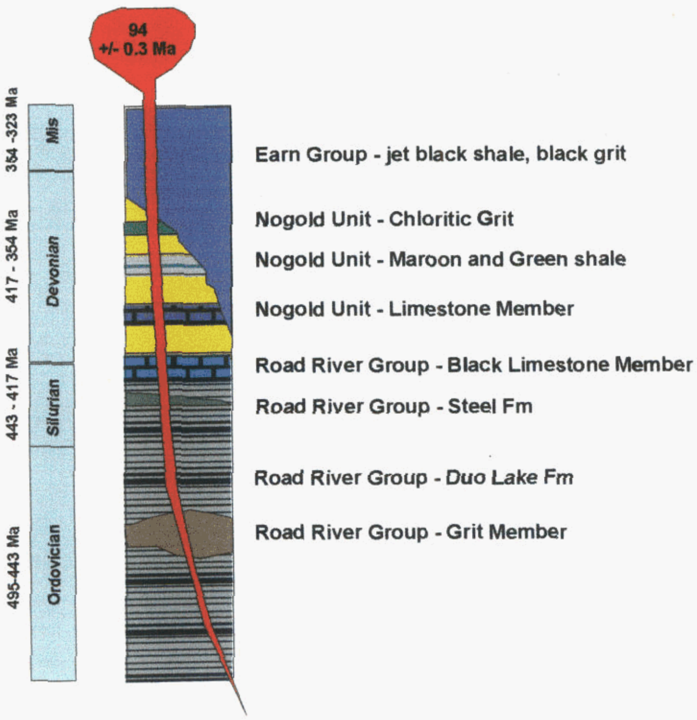

Figure 5. Stratigraphic column for Selwyn Basin rocks in Ddhaw Ghro SMA.

In the southeast part of the SMA, a conspicuous, fault-bounded, maroon-weathering, olive green shale **(Plate 2)** up to 12 m thick, and traced for a strike length of over 2 km within Duo Lake Formation rocks was previously interpreted as Narchilla Formation of Hyland Group. Although Hyland Group rocks may be present locally in the area as thin thrust sheets, these rocks are here interpreted as part of Roots' (1996) provisional Nogold unit. Light green weathering shales were also noted in the northwest part of the SMA.

A resistant, white-weathering black limestone **(Plate 3)** that hosts skarn mineralization in several locations was previously correlated with Rabbitkettle Formation (Roots, 1996). Mapping to the southwest shows that this unit is laterally continuous for several kilometres, hosts several skarn showings, and is stratigraphically underlain and overlain by dark grey to black chert and shale of Road River Group. Limestone concretions up to 10 cm wide are present locally along the upper contact of the black limestone **(Plate 4)**. The black limestone unit and the overlying black chert are interpreted as marking the contact between Road River Group (below) and Nogold unit (above).

Coarse- to fine-grained sedimentary rocks in the south-central and southwestern part of the SMA were mapped by Bostock (1957) as the "Grit Unit" and by Roots (1996) as Yusezyu Formation of Hyland Group. Although the rocks are visually similar to Yusezyu Formation (or Grit Unit), they are stratigraphically overlain, underlain, and interbedded with dark grey to black shale of Road River Group **(Plate 5)**, and are interpreted as recording coarse-grained (or shallow) sedimentation during Road River deposition.

Black grit and shale of Earn Group overlays Road River Group and Nogold unit unconformably. Nogold unit increases in thickness to the northwest, whereas Earn Group is thickest to the southeast.

Structural Geology

Within the contact metamorphic aureole of McArthur Batholith, primary textures are strongly to pervasively overprinted by biotite-hornfels alteration.

Two phases of deformation produced two penetrative foliations **(Plate 6)**, EW- (1st phase) and NW-trending (2nd phase) folds, boudinaged competent beds and veins, and NNE-directed thrusting. Cross-section ABCD **(Figure 6)** shows the interpreted structural style in the ridge northeast of Grey Hunter Creek. The contact between competent black limestone and incompetent dark grey shale of Duo Lake Formation is a plane of weakness along which thrust sheets appear to have nucleated during the second deformation event.

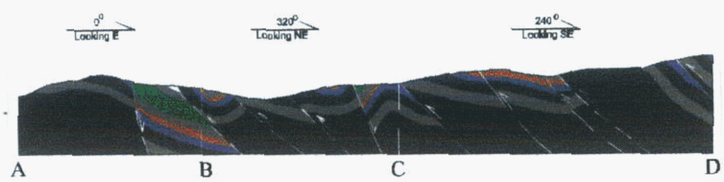

Figure 6. Cross-section showing folds and faults affecting Selwyn Basin strata in southeastern Ddhaw Ghro SMA. Refer ro Figure 4 for location of cross-section line.

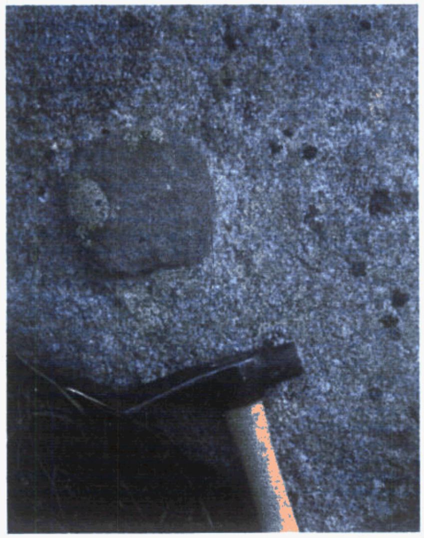

Plate I. Mesocratic, fine-grained enclaves along the margin of McArthur Batholith.

Plate 2. Light green shale interpreted as part of the provisional Nogold unit.

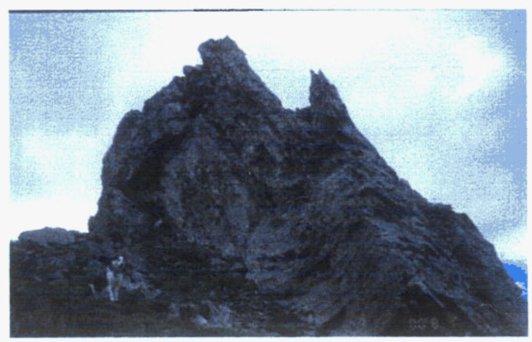

Plate 3. Resistant, white-weathering black limestone in Road River Group.

'late 4. Limestone concretions along the upper contact 'f the black limestone member of Road River Group.

Plate 5. Interbedded sandstone and dark grey to black shale of Road River Group.

Mineralization

Sideslip (MINFILE # 105M 039) is described as containing mineralized skarn and porphyry dike float. During the 2000 field season, no mineralization associated with the batholith was found in the Sideslip area. The slope SE of where Sideslip mineral occurrence is currently mapped, has skarn alteration **(Plate 7)** with up to 2% pyrrhotite, developed in black limestone interbedded with dark gray shale, in the footwall of an interpreted thrust. Two float samples collected in by YTG 2000 assayed 9589 ppb Au and 1895 ppb Au. Soil sampling programs by Viceroy Resources in 1996 and 1997 a NNE-trending geochemical anomaly over 1km long, approximately 2 km northeast of the YTG chip samples.

Great Horn (MINFILE # 105M 040) is described as skarn in limy Triassic rock near contact with a Cretaceous intrusion. No signs of mineralization were found where the occurrence is plotted, but garnet-skarn **(Plate 8)** and andalusite-bearing pegmatite veins with anomalous tantalum levels (27 ppm) **(Plate 9)** were located in black limestone on the steep north slopes of Black Ram Peak, where a dike swarm cross-cuts the Road River Group sequence of dark grey shales and black limestone.

Ram (MINFILE # 105M 041) is described as claims staked on a spurious geophysical anomaly, and limy rocks in contact with a Cretaceous intrusion. Soil samples collected by Kerr Addison yielded background levels. Mapping and chip sampling in 2001 identified a series of rusty-weathering outcrops of chert, shale and grit of Road River Group over airborne magnetic highs, but no signs of mineralization or calcareous rocks.

Hotspring (MINFILE # 105M 042) is described as minor silver-lead-zinc mineralization in veins cutting Triassic limy rocks near the contact of a Cretaceous intrusion. No geological investigation was carried out by YTG, because the mineral occurrence is in Selkirk First Nation Category A settlement land.

Friesen (MINFILE # 105M 051) is described as two skarns in limy Triassic rocks near a Cretaceous intrusion and molybdenite specks in dikes cross-cutting the intrusion. Mapping and sampling in 2001 located pyrite-pyrrhotite-skarn hosted in folded black limestone of Road River Group **(Plate 10)**.

Alteration and contact metamorphism

Contact metamorphism is the most ubiquitous alteration in the SMA, and its effects often extend beyond a kilometer of batholith contacts. Biotite, andalusite, and kyanite +/- staurolite are the most common contact metamorphic assemblage in siliciclastic rocks **(Plate 11)**, whereas garnet and andalusite are common minerals in the chilled margins of the batholith.

Quartz-Feldspar-muscovite-tourmaline pegmatitic veins and quartz-tourmaline veins cross-cut intrusive contacts. Bull quartz is common, and locally has crystalline quartz and rare malachite stains.

Geochemistry

Field work targeted to explain the significant anomalies in the regional geochemical survey (RGS). Not all geochemical targets were visited. A conspicuous tungsten anomaly in the south-central part of the SMA was not followed-up on, and remains unexplained.

Mineral Assessment

Regional context

In the regional mineral potential map of Selwyn Basin, the bulk of Ddhaw Ghro SMA is in a tract that ranks in the highest category of mineral potential **(Figure 7)**.

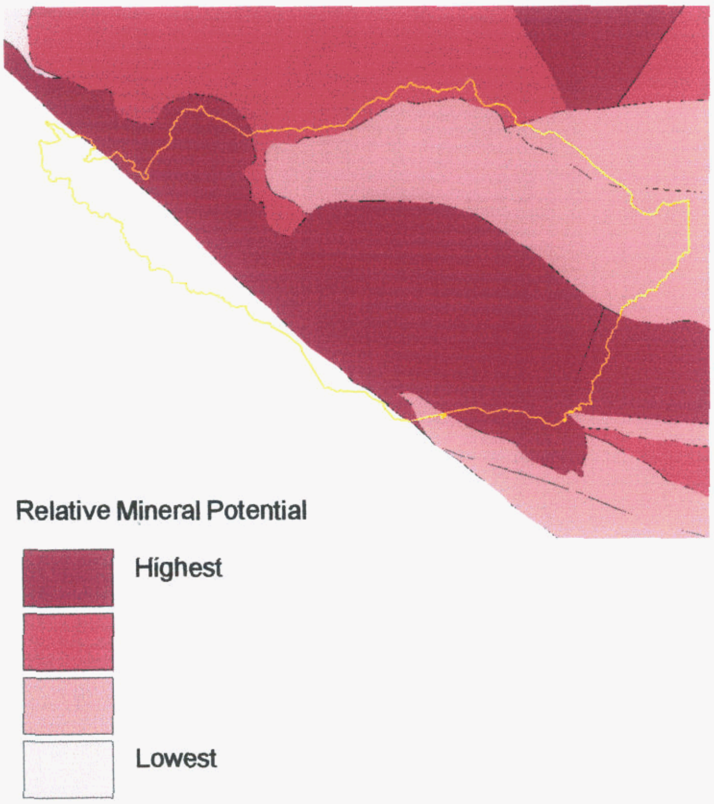

Figure 7. Regional mineral potential map of Selwyn Basin, showing the core of Ddhaw Ghro SMA in the highest mineral potential category.

Plate 6. Cross-cutting relationships between first and secod phase foliations are observed away from the contact metamorphic aureole.

Plate 7. Skarn bands in black limestone. Sideslip MINFILE occurrence (105M 039).

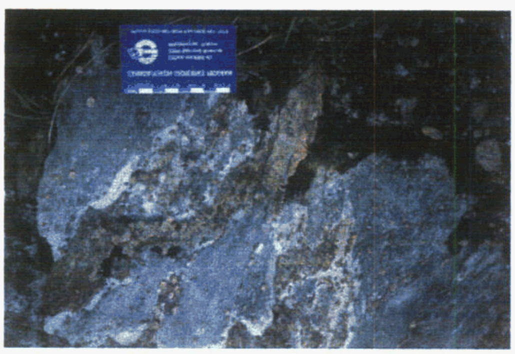

Plate 8. Garnet-skarn in black limestone. Great Horn MINFILE occurrence (105M 040).

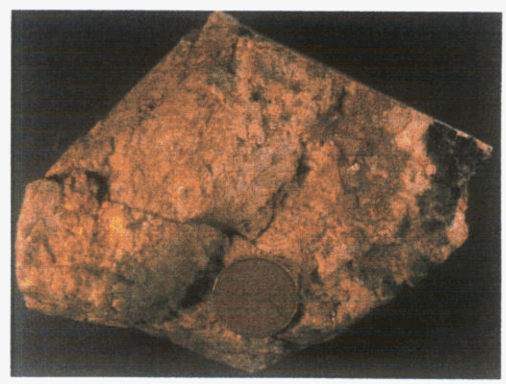

Plate 9. Pegmatite vein with anomalous tantalum levels (27 ppm).
Great Horn MINFILE occurrence (105M 040).

Plate 10. White skarn bed in folded black limestoneFriesen MINFILE occurrence (105M 051).

Plate 11. Kyanite laths in contact metamorphic aureole.

Detailed mineral potential map

A detailed mineral assessment of Ddhaw Ghro SMA took place in Whitehorse, on September 19th and 20th. **Figure 8** Shows the resulting mineral potential map of Ddhaw Ghro SMA.

Methodology

The study area was divided into sixteen tracts, each representing a package of rocks that is either fault-bounded, or constitutes a unique domain with respect to lithological, geochemical or geophysical characteristics. McArthur Batholith formed the largest tract.

Four panelists were chosen for their expertise in the geology and mineral deposit models pertinent to the Study Area: Carl Schulze (currently in the Nunavut Government), Gerry Carlson (Copper Ridge Exploration), Richard Hall (consultant), and Doug Brownlee (consultant). The assessment lasted two days. After examining and discussing all the geoscientific information available for each tract the panelists decided upon a list of deposit models pertinent to the tract, and filled in evaluation forms for likelihood of new discoveries of the median tonnage for each deposit type in the tract. The forms were utilized to maintain the focus on mineral deposit models and explorability of the tract, and reduce personal biases, not for statistical analyses. At the end of the second day, the panelists ranked the tracts relative to each other unanimously, from highest to lowest mineral potential.

Limitations

Mineral potential maps portray the best estimation at the time of the assessment. Since we are assessing a hidden resource, it is important to realize that the geological knowledge base is in a constant state of growth, and mineral deposits may one day be found in rocks that we once thought to have lower potential.

Results and conclusions

The final rank, from highest to lowest mineral potential is as follows: tract # 9 (highest), 3, 8, 15, 14, 13, 11, 12, 6, 5, 7, 10, 4, 2, 1 (lowest).

The mineral potential map displays the relative mineral potential within the SMA. The mineral potential of the highest-ranking tract is due to the presence of known showings and the results of mapping and sampling programs by Viceroy Resources and YTG. The most significant mineral deposit types applicable to Ddhaw Ghro SMA are intrusive-related mineralization such as Carlin-type, skarn, manto, etc. The northeastern and eastern parts of the SMA show the highest mineral potential, and if excluded from future land withdrawals as a single block, the area may attract the immediate attention of the exploration industry.

Recommendations and future work

In order to maintain the economic feasibility of the highest mineral potential tracts, it is recommended to exclude a 590 km^2 area from future mineral withdrawals **(Figure 9)**. This area is equivalent to approximately one third of the total SMA area, and its boundaries follow heights of land. This would preserve the most significant mineral potential for future economic development, with exception of tract #3, where potential for tungsten mineralization seems high, but is not fully characterized.

Three areas of research are recommended to better constrain the mineral deposit types applicable to Ddhaw Ghro SMA:

1) Field work to follow-up on an intense tungsten anomaly in the southeastern part of the SMA (tract # 3).
2) Microprobe analyses of contact metamorphic equilibrium assemblage to provide depth of emplacement of McArthur Batholith, from which potential to host significant tungsten deposits may be inferred.
3) Petrological mapping of the batholith, to define phases that have potential for hosting different deposit types.

Acknowledgements

Charlie Roots provided invaluable information and maps, was always ready to share his expertise and give excellent advice and new ideas on geology and field conditions of the Mayo map sheet. Rick Diment and Carl Schulze provided good accounts of the exploration history in southeastern Mayo area. Trans North provided safe transportation. Daniele Heon and Kel Sax assisted in the fieldwork phase. Shirley Abercrombie, Rod Hill, and Monique Shoniker performed the diplomatic and administrative services that allowed fieldwork to proceed. JoAnne VanRanden reviewed and edited this text.

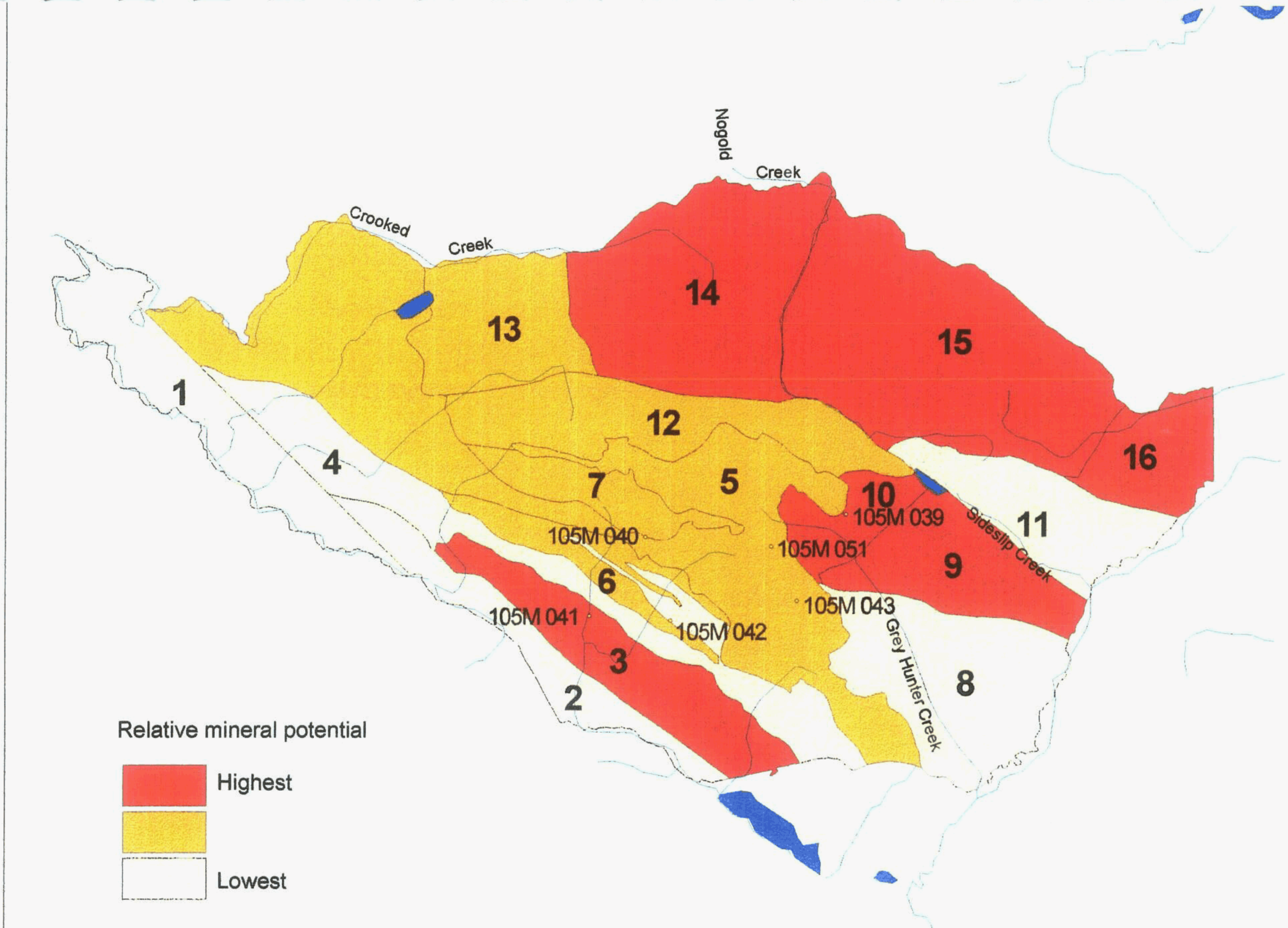

Figure 8. Mineral potential map of Ddhaw Ghro SMA.

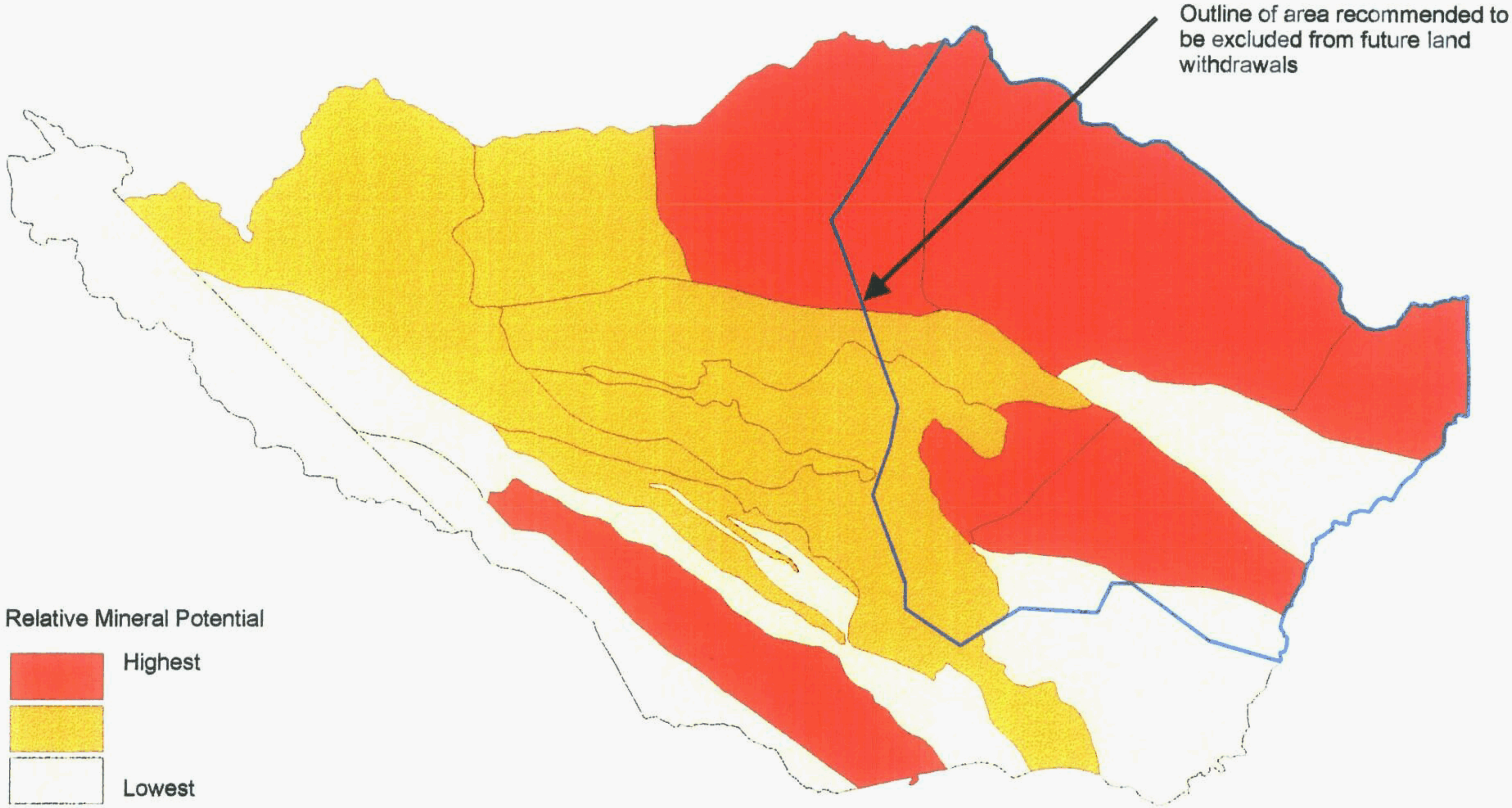

Figure 9. Mineral potential map of Ddhaw Ghro SME, showing the outline of a 590 km² area that was recommended to be excluded from future land withdrawals.

Appendices

Appendix I

Mineral deposit models applied to each tract

Tract 1
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Kuroko-type VMS
Tintina Gold Belt type
Sn-veins
Epithermal (High Sulfidation)
Sn-skarn
W-skarn
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Note: Very little geoscientific data is available for this tract, which is the only portion of Ddhaw Ghro SMA south of Tintina Trench. Initially, the experts were reluctant to estimate mineral potential at all. Evaluations of potential were based on geochemical data and rock types beyond (to the south) of this tract.

Tract 2
Au-quartz veins
Cu-Au-quartz veins
Polymetallic veins
Tintina Gold Belt type
Sn-veins
Epithermal (High Sulfidation)
W-Sn-stockwork

Tract 3
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Tintina Gold Belt type
Sn-veins
SEDEX
Sn-skarn
W-skarn
Stratiform barite
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Note: Intrusive rocks are sparse, but Bostock's map shows a long strip of granite (possibly extrapolated on the basis of small outcrops). Farther west a stock intrudes Earn Group shale and "Kalzas" crinoidal limestone. Also to the west, the Cave showing has 19% Zn in massive sulphide-barite lenses.

Tract 4
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Tintina Gold Belt type
Sn-veins
Sn-skarn
W-skarn
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Tract 5
Au-quartz veins
Cu-Au-quartz veins
Polymetallic veins
Tintina Gold Belt type
REE-stockwork
W-Sn-stockwork

Note: Heavy mineral concentrates collected by Placer Dome in 1992 yielded anomalous Au (20 to 80 ppb) and erratic W (18 to 91 ppm) along the eastern contact of McArthur Batholith.

Tracts 6 and 7
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Polymetallic mantos
Tintina Gold Belt type
Sn-veins
REE-skarn
Sn-skarn
W-skarn
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Note: tracts # 6 and # 7 were evaluated together.

Tract 8
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Polymetallic mantos
Tintina Gold Belt type
Sn-veins
SEDEX
Sn-skarn
W-skarn
Stratiform barite
W-Sn-stockwork
Cu-skarn

Pb-Zn-skarn

Note: The tract includes a strong, NW-trending and bifurcating magnetic high. There may be a Nick-type signature in the northern part of the tract. There may be a fault along Grey Hunter Creek, connected to the fault transecting Nogold Hills to the North (where a geochemical anomaly is prominent).

Tract 9
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Polymetallic mantos
Tintina Gold Belt type
Sn-veins
SEDEX
Sn-skarn
W-skarn
Stratiform barite
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Note: There may be volcanic rocks in the tract.

Tract 10
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Polymetallic mantos
Tintina Gold Belt type
Sn-veins
SEDEX
Sn-skarn
W-skarn
Stratiform barite
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Tract 11
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Polymetallic mantos
Tintina Gold Belt type
Sn-veins
SEDEX
Sn-skarn
W-skarn
Stratiform barite
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Tract 12
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Polymetallic mantos
Tintina Gold Belt type
Sn-veins
Sn-skarn
W-skarn
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Note: Heavy mineral concentrates collected by Placer Dome in 1992 are slightly elevated in Au (5 to 66 ppb), Bi, and As (9 to 86 ppm).

Tract 13
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Polymetallic mantos
Tintina Gold Belt type
Sn-veins
Sn-skarn
W-skarn
REE-skarn
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Tract 14
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins
Polymetallic mantos
Tintina Gold Belt type
Sn-veins
Sn-skarn
W-skarn
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Note: An inferred fault offsets an ENE-trending magnetic low feature.

Tracts 15 and 16 (joined)
Au-quartz veins
Au-skarn
Carlin
Cu-Au-quartz veins
Polymetallic veins

Polymetallic mantos
Tintina Gold Belt type
Sn-veins
Sn-skarn
W-skarn
Besshi-type VMS
W-Sn-stockwork
Cu-skarn
Pb-Zn-skarn

Note: Sn is elevated along an ENE-trending magnetic low feature trending off the intrusion.

Appendix II - Relative Rank

Tract	Rank
1	14
2	13
3	2
4	12
5	9
6	8
7	6
8	10
9	3
10	1
11	11
12	6
13	7
14	5
15	4
16	4

ACME ANALYTICAL LABORATORIES LTD. 852 E. HASTINGS ST. VANCOUVER BC V6A 1R6 PHONE(604)253-3158 FAX(604)253-1716
(ISO 9002 Accredited Co.)

GEOCHEMICAL ANALYSIS CERTIFICATE

Yukon Geology Program File # A004450

Economic Dev. (F-3), P.O., Whitehorse YT Y1A 2C6 Submitted by: Anna Fonseca

SAMPLE#	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppm	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Hg ppm	Sc ppm	Tl ppm	S %	Ga ppm	Au** ppb
AF-74B	1.8	325	506	628	2.5	35	61	1586	10.80	1	<1	<2	4	97	10.1	.6	68.7	80	1.83	.019	13	19	.64	20	.058	<1	1.03	.061	.08	1	<1	1.3	<1	4.06	6	16
AF-76A	1.0	135	19	28	.5	30	23	77	4.37	<1	1	<2	2	64	.4	<.5	.7	15	1.66	.018	4	14	.47	60	.045	<1	2.08	.062	.06	1	1	.6	<1	2.55	5	3
AF-83A	3.7	115	<2	28	.4	26	14	105	2.81	1	1	<2	7	286	<.2	3.1	9.9	48	4.29	.043	14	53	.61	143	.115	1	6.45	.610	.38	1	2	4.8	<1	1.05	14	3
AF-87A	24.2	79	2	37	.3	83	18	126	3.74	6	12	<2	4	125	<.2	1.4	1.1	309	2.12	.279	18	40	.83	150	.221	<1	2.74	.146	.58	4	1	4.4	<1	1.05	9	5
AF-88A	4.4	567	<2	52	.8	26	35	123	9.46	52	1	<2	8	143	.4	2.5	126.4	50	2.34	.041	13	69	1.20	30	.146	<1	4.65	.292	.82	6	1	7.3	3	5.58	13	200
Scull	21.0	204	1286	1070	2.5	57	15	911	4.73	62	7	<2	4	184	7.0	3.1	1.5	87	2.58	.290	8	31	.82	29	.004	5	.69	.030	.26	8	1	4.0	1	3.14	2	<2
AF-103A	5.1	106	6	13	.3	10	3	193	1.08	78	<1	<2	2	12	.3	1.7	15.5	4	.06	.025	5	22	.02	21	.001	2	.14	.007	.06	4	<1	.3	<1	.02	1	27
AF-106A	4.5	1444	13	54	.5	11	21	699	7.69	4	<1	<2	13	182	<.2	<.5	159.3	14	2.03	.042	28	40	.43	17	.052	<1	3.46	.109	.03	820	1	2.5	2	3.67	10	187
AF-111A	3.6	67	4	20	<.1	19	4	151	1.25	212	1	<2	11	15	.6	.6	.5	6	.14	.012	16	21	.17	61	.032	<1	1.04	.023	.26	16	<1	1.0	<1	.15	3	5
AF-119A	2.5	465	6	30	.5	13	8	671	4.99	21	1	<2	6	130	<.2	1.7	3.3	42	1.28	.035	18	32	.42	121	.087	2	2.39	.101	.23	36	1	3.9	1	.22	10	178
AF-120A	3.9	68	9	4	.8	7	<1	31	2.36	27442	1	10	9	5	<.2	223.9	9.7	5	.01	.006	19	18	.01	37	.003	<1	.22	.004	.14	3	<1	.8	<1	.23	<1	9589
AF-121A	7.1	709	4	25	.9	29	12	401	5.45	50	2	2	11	323	<.2	3.1	221.1	41	3.97	.188	18	45	.36	92	.080	4	5.17	.233	.15	25	2	3.5	1	1.76	15	1895
AF-123A	4.2	50	13	36	.2	17	5	519	3.18	484	1	<2	7	7	<.2	4.4	2.6	12	.03	.012	15	23	.04	41	.001	8	.44	.006	.13	2	<1	1.5	1	.02	1	63
AF-136A	13.6	91	23	28	1.0	10	<1	38	2.21	25	5	<2	13	62	.2	3.3	<.5	58	.13	.128	47	21	.37	476	.001	4	1.30	.011	.24	2	<1	2.6	<1	.05	4	5
AF-147A	2.5	50	7	52	.1	32	11	130	2.82	64	2	<2	15	20	.2	1.7	.7	23	.10	.027	29	25	.59	226	.026	2	1.31	.031	.49	1	<1	2.7	<1	.58	5	3
RE AF-147A	2.5	49	6	53	.1	31	11	124	2.82	62	1	<2	14	19	.2	1.6	<.5	22	.10	.027	28	25	.57	220	.024	3	1.27	.030	.47	1	<1	2.6	<1	.56	4	12
AF-150C	3.1	115	3	34	.3	22	15	446	2.79	4	1	<2	13	209	<.2	2.4	<.5	28	3.19	.041	39	35	.47	88	.127	2	5.05	.126	.11	4	1	3.4	<1	.66	13	<2
AF-151A	4.1	118	7	55	.3	21	12	267	2.89	8	2	<2	19	329	<.2	2.0	<.5	57	2.99	.040	52	54	.64	43	.179	<1	4.21	.144	.33	4	1	5.5	<1	.37	12	3
AF-152A	3.3	47	2	53	.3	22	13	126	2.02	2	1	<2	12	388	<.2	3.7	7.8	44	4.79	.039	34	45	.36	16	.172	4	5.47	.186	.09	4	1	4.0	<1	.54	15	10
AF-153A	1.1	26	2	<1	.4	6	4	184	.44	3	<1	<2	3	873	<.2	6.7	<.5	6	20.98	.038	11	6	.08	4	.033	6	.94	.087	.04	<1	<1	1.0	<1	.04	3	4
AF-154A	3.0	58	6	35	.3	17	9	377	1.95	1	2	<2	13	620	<.2	4.4	.6	26	6.81	.060	35	33	.32	70	.139	4	5.18	.402	.23	3	1	4.2	<1	.43	13	2
AF-155A	3.1	78	9	67	.3	23	11	227	4.34	3	3	<2	18	290	<.2	2.0	<.5	54	3.36	.058	40	62	.80	33	.191	3	5.43	.248	.29	1	1	10.3	1	.75	15	6
AF-158A	5.1	22	9	20	.2	3	<1	176	1.95	<1	1	<2	6	14	<.2	<.5	.5	69	.05	.006	22	74	.54	28	.022	<1	1.17	.030	.35	7	<1	5.9	<1	.33	6	7
AF-159A	3.3	18	6	14	.4	6	1	214	1.56	3	1	<2	5	434	<.2	2.3	<.5	34	7.78	.040	10	36	.27	18	.085	3	1.18	.058	.08	1	<1	3.7	<1	.10	5	7
AF-159B	4.0	7	41	12	.1	7	2	274	1.24	1	3	<2	11	22	<.2	<.5	<.5	2	.35	.051	16	20	.04	94	.001	<1	.45	.053	.21	8	<1	.8	<1	.53	1	7
AF-161A	.8	9	4	176	.4	10	5	539	2.02	4	<1	<2	3	363	.8	6.2	<.5	16	18.26	.019	7	18	2.03	66	.011	3	1.53	.008	.23	<1	1	3.7	<1	<.01	3	6
AF-161B	4.7	128	8	97	.9	48	7	76	2.81	7	5	<2	4	194	.9	3.6	<.5	80	5.05	.900	22	61	2.86	343	.003	<1	2.50	.012	.28	2	1	3.4	<1	.03	5	14
AF-162A	1.4	27	12	66	.5	7	13	905	4.18	40	1	<2	6	189	.3	2.9	<.5	80	5.26	.060	11	46	2.15	152	.001	<1	1.89	.006	.31	<1	<1	10.7	1	.51	5	11
AF-163A	6.5	40	34	470	.6	21	5	1165	2.10	16	1	<2	5	45	1.7	<.5	<.5	95	.99	.078	14	35	.48	173	.014	2	.97	.007	.21	9	<1	1.9	<1	.17	3	<2
AF-166A	1.9	71	15	58	.6	8	29	2044	4.65	6	<1	<2	<1	91	.2	5.4	1.1	9	16.78	.001	5	9	.07	9	.006	<1	.24	.004	.01	2	<1	4.8	<1	.48	2	13
AF-166B	2.5	4	9	81	.2	19	14	291	3.31	1	1	<2	15	59	.2	2.1	<.5	79	.93	.053	20	33	.97	275	.223	<1	2.79	.192	.70	3	1	10.1	1	<.01	9	3
AF-168B	2.0	3	7	11	.1	5	1	115	.46	4	<1	<2	15	10	<.2	<.5	<.5	9	.43	.154	10	26	.07	37	.041	1	.46	.079	.15	1	<1	1.3	<1	<.01	2	4
AF-CCR1	2.4	39	368	477	.7	10	13	1274	4.04	20	2	<2	8	45	3.4	.7	<.5	107	1.15	.091	22	20	1.55	504	.005	6	2.32	.053	.21	2	<1	11.0	<1	.27	8	7
AF-CCR2	10.0	117	22	211	.5	41	10	268	5.14	71	2	<2	9	17	1.0	1.6	<.5	59	.10	.010	32	21	.11	668	.002	3	.56	.044	.21	<1	<1	6.3	3	.23	3	14
STANDARD C3/AU-R	27.0	69	38	169	5.7	36	12	767	3.27	58	25	<2	21	28	24.9	17.6	23.8	80	.59	.093	18	176	.62	156	.086	19	1.87	.042	.17	15	2	4.3	1	.03	8	478
STANDARD G-2	1.5	3	3	46	<.1	7	4	509	1.95	17	2	<2	4	73	<.2	<.5	<.5	41	.63	.099	8	78	.59	225	.128	<1	.91	.077	.49	3	1	2.5	<1	<.01	5	-

GROUP 1DX - 0.50 GM SAMPLE LEACHED WITH 3 ML 2-2-2 HCL-HNO3-H2O AT 95 DEG. C FOR ONE HOUR, DILUTED TO 10 ML, ANALYSED BY OPTIMA ICP-ES.
UPPER LIMITS - AG, AU, HG, W = 100 PPM; MO, CO, CD, SB, BI, TH, U & B = 2,000 PPM; CU, PB, ZN, NI, MN, AS, V, LA, CR = 10,000 PPM.
ASSAY RECOMMENDED FOR ROCK AND CORE SAMPLES IF CU PB ZN AS > 1%, AG > 30 PPM & AU > 1000 PPB
- SAMPLE TYPE: ROCK R150 60C AU** GROUP 3B - 30.00 GM SAMPLE ANALYSIS BY FA/ICP.
Samples beginning 'RE' are Reruns and 'RRE' are Reject Reruns.

DATE RECEIVED: NOV 1 2000 DATE REPORT MAILED: Nov 15/00 SIGNED BY. C. L. D. TOYE, C.LEONG, J. WANG; CERTIFIED B.C. ASSAYERS

 Data / FA

ME YT LA OR .TI . NG V JV R6 PH 50 -3 AX 2 6

(ISO 9002 Accredited Co.)

GEOCHEMICAL ANALYSIS CERTIFICATE

Yukon Geology Program File # A102900 Page 1

Economic Dev. (F-3), P.O., Whitehorse YT Y1A 2C6 Submitted by: Anna Fonseca

SAMPLE#	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppm	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Tl ppm	Hg ppm	Au** ppb	Ta* ppm	W* ppm
AF 3	2	27	55	728	.6	19	11	1810	2.13	19	<8	<2	4	316	9.7	6	<3	12	8.09	.023	12	51	.45	39	<.01	3	.34	.03	.12	<2	<5	1	<2	.6	4
AF 4A	7	7	16	76	<.3	24	9	1869	2.53	41	<8	<2	3	24	.9	9	4	15	4.49	.026	10	78	.04	56	<.01	3	.38	.01	.25	3	<5	1	7	.5	7
AF 7	1	52	14	54	<.3	22	11	1420	3.87	6	<8	<2	7	369	.8	4	<3	23	20.81	.031	32	22	.77	35	<.01	<3	1.73	.01	.15	<2	<5	1	9	.7	7
AF 8	12	46	811	344	10.3	3	<1	175	2.34	929	<8	<2	15	40	9.3	<3	53	10	.10	.029	28	80	.04	58	<.01	<3	.55	.04	.33	2	<5	<1	7	1.7	25
AF 10	1	20	15	83	<.3	32	12	268	4.32	12	<8	<2	10	14	.2	<3	<3	19	.15	.054	50	45	1.38	151	.01	<3	2.55	.02	.25	<2	<5	1	<2	1.7	3
AF 11	3	3	27	50	<.3	4	5	524	1.99	2	<8	<2	15	11	<.2	<3	<3	13	.31	.069	32	59	.15	30	<.01	<3	.82	.02	.22	2	<5	1	<2	1.5	3
AF 12	3	6	22	281	<.3	8	3	357	1.50	<2	<8	<2	9	22	.5	<3	<3	22	.44	.039	19	108	.26	36	<.01	<3	.63	.03	.17	<2	<5	<1	3	.8	4
AF 14B	2	16	3	51	<.3	5	3	214	.81	<2	<8	<2	10	574	.6	<3	4	13	11.79	.051	25	51	.14	23	.08	3	1.73	.06	.09	3	<5	<1	<2	1.4	4
AF 15	2	100	7	61	<.3	16	10	317	3.24	<2	30	<2	11	191	.2	<3	<3	25	2.25	.219	35	88	.57	25	.10	<3	2.98	.26	.12	2	<5	1	<2	16.2	4
AF 15B	3	33	12	45	<.3	16	8	160	1.41	<2	<8	<2	10	536	<.2	<3	3	22	4.49	.059	30	46	.20	19	.16	<3	2.28	.12	.09	3	<5	<1	2	2.1	3
AF 15C	3	39	8	35	<.3	18	9	156	2.05	<2	<8	<2	8	426	<.2	<3	<3	31	2.70	.035	25	89	.21	22	.18	4	2.98	.17	.14	2	<5	<1	<2	1.7	6
AF 15D	1	36	3	22	<.3	16	9	173	1.77	<2	9	<2	5	857	<.2	<3	<3	27	8.86	.058	20	46	.10	11	.15	<3	2.84	.13	.06	<2	<5	<1	<2	1.5	5
AF 16	1	63	8	16	<.3	22	11	138	2.09	<2	<8	<2	15	243	<.2	<3	3	21	2.03	.037	41	72	.13	41	.16	3	2.57	.15	.07	3	<5	1	2	3.9	6
AF 16B	3	48	10	33	<.3	34	20	70	4.93	<2	<8	<2	6	1123	.2	<3	<3	29	3.84	.038	18	64	.21	11	.20	13	4.80	.52	.09	3	<5	1	4	3.6	5
AF 17D	1	40	5	76	<.3	14	6	193	3.35	8	<8	<2	17	20	.2	<3	<3	10	.10	.032	41	44	.95	111	.02	<3	1.75	.02	.24	2	<5	1	4	1.9	3
RE AF 17D	1	42	7	80	<.3	15	7	202	3.52	10	<8	<2	17	21	.3	<3	<3	10	.10	.032	43	47	1.01	118	.02	<3	1.86	.02	.25	2	<5	2	<2	2.0	4
AF 24	2	<1	3	3	<.3	12	2	713	2.44	<2	<8	<2	<2	372	.2	<3	<3	<1	13.41	.015	3	40	3.89	17	<.01	<3	.59	.02	.01	<2	<5	1	2	.1	2
AF 26B	2	40	22	47	<.3	49	45	65	3.29	9	<8	<2	13	298	.2	<3	<3	32	2.31	.086	9	56	.57	87	.19	<3	2.96	.35	.25	3	<5	1	4	3.4	4
AF 27B	2	18	15	116	<.3	55	19	264	5.50	67	<8	<2	18	10	<.2	<3	<3	69	.18	.060	62	94	1.18	384	.27	<3	3.20	.04	1.97	3	<5	1	<2	2.1	8
AF 27C	3	18	<3	12	<.3	8	2	263	.78	5	8	<2	<2	15	<.2	<3	<3	7	2.58	.008	1	115	.02	9	.01	<3	.12	<.01	.03	4	<5	<1	<2	<.1	7
AF 28A	1	7	14	47	<.3	19	8	1562	3.58	7	<8	<2	2	567	.3	<3	<3	6	14.57	.049	9	23	.57	87	.01	<3	.58	.01	.13	<2	<5	1	<2	1.5	6
AF 28B	3	907	<3	16	.7	9	1	54	.60	4	<8	<2	<2	5	<.2	<3	<3	5	.10	.006	<1	114	.01	18	<.01	<3	.05	<.01	.02	3	<5	<1	6	.1	6
AF 29A	3	56	<3	65	<.3	47	18	364	4.31	2	<8	<2	9	38	.2	<3	<3	59	.53	.028	24	89	1.07	647	.28	<3	2.79	.09	1.57	3	<5	1	6	1.6	6
AF 30A	<1	11	3	25	<.3	8	5	787	.90	2	<8	<2	9	346	.3	<3	<3	11	13.26	.030	13	53	.13	77	.03	<3	.71	.04	.12	<2	<5	<1	3	.8	4
AF 32A	3	84	11	44	.3	27	12	437	2.65	<2	<8	<2	8	105	.3	<3	<3	29	1.44	.041	10	88	.42	224	.06	<3	2.48	.12	.31	3	<5	<1	<2	.8	3
AF 33A	3	52	9	29	.3	12	4	321	2.63	<2	<8	<2	3	56	<.2	<3	<3	11	.79	.033	4	113	.58	140	.04	<3	2.01	.18	.45	3	<5	<1	3	.2	4
AF 38B	8	44	4	120	<.3	56	14	83	2.17	4	<8	<2	7	7	1.5	<3	<3	118	.04	.024	19	105	.59	157	.07	3	1.81	.03	.47	5	<5	1	3	1.5	5
AF 38C	9	65	5	132	<.3	66	17	143	2.85	5	<8	<2	8	6	.5	<3	<3	132	.04	.030	23	135	.75	243	.10	4	2.39	.03	.65	3	<5	<1	8	1.6	6
AF 39A	7	77	9	53	.6	11	4	216	2.37	2	<8	<2	7	97	.8	<3	<3	27	.72	.110	11	68	.48	127	.12	<3	1.11	.03	.20	2	<5	1	6	1.1	5
AF 40B	7	12	<3	43	<.3	11	2	136	2.58	3	<8	<2	10	9	<.2	<3	<3	67	.03	.043	29	55	.67	530	.10	3	1.54	.02	.64	3	<5	<1	3	1.1	14
AF 41A	10	8	5	28	<.3	6	<1	71	1.90	13	<8	<2	4	23	<.2	3	<3	51	.01	.057	8	112	.22	319	.01	<3	.40	.03	.11	2	<5	1	16	.6	11
AF 41B	4	123	13	52	1.2	23	<1	238	5.62	9	<8	<2	3	64	.9	7	<3	49	.16	.066	7	98	.33	452	.05	5	1.00	.02	.10	2	<5	<1	18	.3	5
AF 42A	2	73	7	17	.3	9	3	2285	4.25	10	<8	<2	<2	552	.4	<3	<3	<1	19.15	.041	8	9	3.87	51	.03	33	.25	.01	.10	5	<5	2	5	.2	6
AF 42B	3	53	<3	45	<.3	29	14	98	3.28	90	<8	<2	9	134	<.2	<3	4	63	2.03	.078	25	88	.78	198	.21	5	3.35	.15	.73	3	<5	<1	26	4.8	6
STANDARD C3/AU-R/SO-16	27	65	35	165	5.9	39	13	809	3.33	55	23	3	21	28	23.2	14	24	84	.56	.096	18	178	.63	156	.09	17	1.85	.04	.17	23	<5	2	481	1.8	23
STANDARD G-2	3	3	3	43	<.3	9	4	548	1.98	<2	<8	<2	4	69	<.2	<3	<3	40	.64	.099	8	81	.62	231	.13	3	.91	.07	.51	3	<5	1	-	-	-

GROUP 1D - 0.50 GM SAMPLE LEACHED WITH 3 ML 2-2-2 HCL-HNO3-H2O AT 95 DEG. C FOR ONE HOUR, DILUTED TO 10 ML, ANALYSED BY ICP-ES.
UPPER LIMITS - AG, AU, HG, W = 100 PPM; MO, CO, CD, SB, BI, TH, U & B = 2,000 PPM; CU, PB, ZN, NI, MN, AS, V, LA, CR = 10,000 PPM.
AU** GROUP 3B - 30.00 GM SAMPLE ANALYSIS BY FA/ICP. TA* & W* GROUP 4B - REE - LiBO2 FUSION, ICP/MS FINISHED.
ASSAY RECOMMENDED FOR ROCK AND CORE SAMPLES IF CU PB ZN AS > 1%, AG > 30 PPM & AU > 1000 PPB
- SAMPLE TYPE: ROCK R150 Samples beginning 'RE' are Reruns and 'RRE' are Reject Reruns.

DATE RECEIVED: AUG 27 2001 DATE REPORT MAILED: Sept 8/01 SIGNED BY......... D. TOYE, C.LEONG, J. WANG; CERTIFIED B.C. ASSAYERS

Data ✓ FA ____

SAMPLE#	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppm	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Tl ppm	Hg ppm	Au** ppb	Ta* ppm	W* ppm
AF 42C	3	39	16	77	.3	56	27	124	4.94	55	<8	<2	4	45	<.2	3	<3	55	1.44	.156	13	79	.87	120	.15	6	2.80	.17	1.06	2	<5	1	84	4.7	4
AF 42F	2	40	10	8	.3	37	25	180	2.10	42	8	<2	7	311	<.2	<3	<3	41	7.11	.066	14	42	.68	103	.15	3	2.27	.07	.51	<2	<5	<1	32	4.1	4
AF 42H	1	9	11	6	<.3	1	2	1359	.97	14	<8	<2	<2	505	.2	5	<3	1	31.41	.012	6	4	.13	30	<.01	<3	.09	<.01	.01	<2	<5	<1	3	.2	1
AF 42I	4	97	21	12	.5	34	20	139	2.32	24	<8	<2	6	126	<.2	<3	<3	24	1.81	.070	13	65	.47	76	.11	6	1.31	.06	.29	2	<5	1	9	1.7	4
AF 42J	2	38	4	24	<.3	31	19	293	3.80	2	<8	<2	4	160	.3	<3	<3	66	3.69	.016	12	99	1.69	328	.17	<3	6.24	.26	1.46	2	<5	1	6	1.5	2
AF 42K	5	206	8	7	.4	14	20	105	3.42	145	<8	<2	6	208	<.2	<3	<3	22	1.50	.161	20	46	.59	48	.17	8	1.04	<.01	.08	<2	<5	1	3	2.9	3
AF 42M	2	81	11	30	.4	41	26	75	3.17	1239	<8	<2	11	44	<.2	<3	<3	46	.56	.080	27	69	.81	92	.16	4	1.39	.07	.82	3	<5	<1	102	3.3	5
AF 42N	1	1	10	9	.3	1	1	676	.32	7	10	<2	2	330	.5	<3	<3	3	26.58	.024	7	17	<.01	3	.01	61	.23	.01	.01	<2	<5	<1	<2	.2	2
AF 43A	2	61	21	108	<.3	29	16	1262	6.68	38	<8	<2	10	29	<.2	15	3	31	.08	.051	27	78	.94	110	.05	<3	2.63	.01	.43	3	<5	<1	<2	1.7	7
AF 43B	3	99	14	54	<.3	23	5	372	4.86	174	<8	<2	14	32	<.2	40	3	27	.08	.062	47	44	.56	244	.07	6	2.10	.03	.85	<2	<5	<1	8	1.7	5
AF 43C	3	63	16	161	<.3	82	23	994	9.08	4	<8	<2	9	8	<.2	3	<3	56	.06	.057	19	69	1.86	222	.13	<3	4.01	.01	1.02	3	<5	1	<2	1.7	2
AF 43D	3	21	16	24	<.3	10	5	335	1.62	64	<8	<2	11	14	<.2	<3	<3	17	.18	.045	23	56	.31	48	.01	3	.88	.05	.09	<2	<5	<1	2	.7	2
AF 43E	2	149	7	22	<.3	8	5	3666	2.40	8	<8	<2	15	258	<.2	<3	16	8	10.01	.033	22	45	.46	31	.07	3	3.10	.26	.03	2	<5	1	63	.6	2
AF 43F	3	188	13	45	<.3	13	12	1253	3.08	6	<8	<2	9	114	<.2	<3	8	20	1.70	.047	15	67	.75	48	.03	3	2.71	.12	.07	12	<5	1	46	.6	15
AF 43G	1	47	5	133	<.3	58	32	1035	5.70	<2	<8	<2	10	21	<.2	4	3	50	.12	.045	26	71	1.27	253	.15	<3	3.48	.06	1.18	2	<5	1	4	1.4	2
AF 43H	3	55	12	106	<.3	49	21	959	5.78	24	<8	<2	11	53	<.2	5	<3	58	.64	.034	15	91	1.26	283	.17	<3	3.75	.14	1.48	<2	<5	1	4	1.7	2
AF 43I	4	120	20	161	<.3	88	93	7903	15.91	<2	<8	<2	9	22	<.2	34	<3	36	.05	.028	23	52	.05	147	<.01	3	1.14	.01	.18	3	14	1	2	.9	15
AF 44A	4	157	18	150	<.3	84	48	1061	5.35	9375	<8	<2	10	97	.6	81	<3	33	.83	.084	17	64	.88	96	.02	4	2.55	.14	.29	81	<5	<1	39	.7	109
AF 45A	3	71	6	28	<.3	12	3	605	3.03	18	<8	<2	8	49	.2	<3	<3	22	.42	.025	8	105	.36	50	.04	<3	1.64	.07	.07	2	<5	1	2	.5	3
RE AF 45A	3	73	11	27	<.3	12	3	623	3.12	16	<8	<2	8	51	<.2	<3	3	23	.44	.026	9	105	.37	51	.04	<3	1.71	.08	.07	<2	<5	1	7	.4	3
AF 46A	3	81	11	94	<.3	39	24	524	5.42	16	<8	<2	10	39	<.2	<3	<3	44	.13	.043	23	80	1.07	310	.13	<3	3.33	.07	1.32	3	<5	<1	2	1.3	2
AF 46B	4	65	10	134	.3	66	43	344	6.32	8	<8	<2	13	29	.2	<3	<3	44	.14	.073	28	61	1.06	180	.12	<3	3.22	.04	1.10	2	<5	1	2	1.7	2
AF 48A	5	96	78	85	<.3	42	23	722	3.95	7	<8	<2	7	12	<.2	9	3	30	.02	.028	14	74	.06	88	<.01	<3	.64	.01	.18	3	<5	1	2	.9	10
AF 50A	1	14	11	93	<.3	54	22	853	4.32	2	<8	<2	17	12	<.2	<3	4	18	.07	.032	65	35	.57	218	.02	<3	1.82	.01	.36	<2	<5	2	<2	1.4	3
AF 50B	5	63	15	54	<.3	30	13	457	2.63	17	<8	<2	11	354	.3	<3	5	49	7.46	.070	18	42	.69	381	.03	<3	2.43	.12	.37	20	<5	1	16	1.0	26
AF 50C	2	20	12	54	<.3	4	<1	135	3.06	2	<8	<2	16	24	<.2	5	<3	11	.10	.066	50	22	.41	155	<.01	<3	1.00	.05	.19	<2	<5	1	2	1.1	2
AF 51A	3	22	14	104	<.3	33	16	1020	4.56	9	<8	<2	9	25	<.2	<3	4	45	.18	.050	30	81	1.15	194	.12	<3	2.73	.05	.89	3	<5	1	<2	1.2	2
AF 51B	6	30	10	68	.3	12	3	295	4.16	24	<8	<2	16	28	<.2	4	<3	16	.10	.080	28	64	1.25	119	<.01	<3	2.03	.03	.16	2	<5	2	3	1.2	3
AF 52A	5	639	21	56	.7	29	19	845	5.09	122	<8	<2	9	448	.2	<3	4	39	6.65	.056	13	65	.95	173	.05	<3	3.76	.17	.28	<2	<5	1	10	.7	3
AF 53A	3	899	22	60	.9	32	39	937	9.92	42	8	3	8	117	<.2	<3	37	30	1.65	.035	9	75	1.94	71	.08	<3	3.46	.10	.44	38	<5	<1	871	.7	59
AF 54A	3	25	24	97	<.3	19	5	192	3.71	12	<8	<2	15	90	<.2	<3	<3	23	.36	.033	40	53	1.00	199	<.01	<3	2.52	.09	.19	2	<5	1	13	1.8	3
AF 54B	3	49	14	94	<.3	25	6	563	4.57	4	<8	<2	12	119	<.2	<3	<3	38	.68	.053	22	95	1.50	378	.11	<3	3.31	.14	.91	3	<5	<1	2	1.0	3
AF 55A	4	42	11	67	.4	17	7	115	3.77	12	<8	<2	16	39	<.2	5	<3	14	.06	.026	46	93	.54	136	.01	<3	1.39	.01	.25	<2	<5	2	7	1.2	4
AF 55B	7	38	13	43	<.3	34	10	347	1.71	9	<8	<2	9	316	.5	<3	<3	27	3.36	.021	15	41	.31	163	.03	3	2.16	.14	.21	2	<5	<1	2	.7	2
AF 56A	6	3	16	4	<.3	2	3	36	2.17	21272	<8	<2	<2	18	<.2	16	3	4	.10	.001	1	76	.01	11	<.01	<3	.16	<.01	.05	2	<5	1	7	.1	3
STANDARD C3/AU-R/SO-16	28	65	38	167	6.2	39	12	799	3.33	53	20	3	21	28	23.9	16	25	85	.56	.096	19	177	.64	155	.09	19	1.84	.04	.18	19	<5	2	498	1.9	24
STANDARD G-2	2	3	8	41	<.3	8	4	533	1.89	<2	<8	<2	4	69	<.2	<3	<3	41	.67	.098	7	81	.61	228	.13	3	.86	.07	.51	2	<5	1	-	-	-

Sample type: ROCK R150. Samples beginning 'RE' are Reruns and 'RRE' are Reject Reruns.

 Data ___ FA ___

SAMPLE#	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppm	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm
AF 57A	2	6	14	8	<.3	7	1	127	.42	26	<8	<2	8	6	<.2	<3	<3	5
AF 58A	7	35	14	37	.8	16	7	108	1.82	49	<8	<2	17	23	2.4	<3	<3	11
AF 59A	5	38	6	104	<.3	28	10	219	2.63	4	<8	<2	9	136	.7	<3	<3	45
AF 60A	2	49	3	21	<.3	27	5	74	1.56	11	<8	<2	5	107	<.2	<3	3	34
AF 60B	1	37	10	44	.4	41	9	57	1.77	2	<8	<2	7	101	.8	<3	<3	16
AF 61A	8	46	6	12	<.3	46	8	71	.59	68	8	<2	6	412	.2	<3	<3	9
AF 61B	5	84	7	25	.3	47	7	44	1.25	11	<8	<2	7	380	<.2	<3	<3	10
AF 61D	1	15	3	17	.3	14	4	225	.50	887	<8	<2	4	229	<.2	<3	<3	1
AF 65A	2	30	6	24	.3	34	9	81	2.46	<2	<8	<2	8	124	.2	<3	<3	41
AF 69A	1	5	101	7	<.3	5	7	2826	.73	12	10	<2	6	671	<.2	<3	<3	1
RE AF 69A	2	5	96	7	<.3	5	7	2747	.70	11	8	<2	6	652	<.2	<3	<3	2
STANDARD C3/AU-R/SO-16	26	67	34	165	5.9	37	11	781	3.40	56	21	3	19	29	23.5	16	22	82
STANDARD G-2	2	2	3	43	<.3	9	3	539	2.03	<2	<8	<2	5	70	<.2	<3	<3	41

SAMPLE#	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Tl ppm	Hg ppm	Au** ppb	Ta* ppm	W* ppm
AF 57A	.05	.014	3	100	.02	23	<.01	6	.37	.04	.17	2	<5	<1	<2	11.3	5
AF 58A	.01	.023	32	36	.46	327	.04	3	1.11	.02	.64	<2	<5	<1	<2	1.5	4
AF 59A	2.16	.086	14	83	.87	292	.08	4	2.97	.15	.63	3	<5	<1	<2	.9	5
AF 60A	1.44	.018	10	87	.58	78	.11	3	2.63	.30	.35	<2	<5	<1	3	.7	4
AF 60B	1.57	.025	11	62	.42	52	.13	<3	2.78	.39	.21	2	<5	<1	<2	.7	3
AF 61A	3.32	.046	9	16	.62	116	.07	5	3.64	.20	.06	<2	<5	<1	3	.7	2
AF 61B	3.18	.044	9	21	.40	203	.11	3	4.45	.33	.08	<2	<5	<1	3	1.0	3
AF 61D	4.80	.043	5	17	1.38	62	.04	4	1.89	.07	.03	<2	<5	1	<2	.5	1
AF 65A	2.46	.030	12	69	1.30	119	.16	<3	4.34	.51	.77	<2	<5	<1	<2	1.1	3
AF 69A	14.80	.031	5	40	.06	33	<.01	<3	.22	.01	.07	<2	<5	<1	<2	.6	2
RE AF 69A	14.38	.030	5	35	.05	31	<.01	<3	.20	.01	.07	46	<5	<1	<2	.5	2
STANDARD C3/AU-R/SO-16	.58	.088	19	170	.62	149	.10	17	1.87	.04	.16	20	<5	1	473	1.8	23
STANDARD G-2	.64	.093	7	77	.62	225	.15	4	.92	.07	.47	2	<5	<1	-	-	-

Sample type: ROCK R150. Samples beginning 'RE' are Reruns and 'RRE' are Reject Reruns.

Data ___ FA ___

[redacted]

GEOCHEMICAL ANALYSIS CERTIFICATE

Yukon Geology Program File # A102953 Page 1

Economic Dev. (F-3), P.O., Whitehorse YT Y1A 2C6 Submitted by: Anna Fonseca

SAMPLE#	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Ni ppm	Co ppm	Mn ppm	Fe %	As ppm	U ppm	Au ppm	Th ppm	Sr ppm	Cd ppm	Sb ppm	Bi ppm	V ppm	Ca %	P %	La ppm	Cr ppm	Mg %	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Tl ppm	Hg ppm	Au** ppb	Ta* ppm	W* ppm
AF-47A	1	53	18	61	<.3	25	6	681	2.90	11	<8	<2	9	288	.3	<3	<3	35	3.26	.029	17	74	.85	388	.11	3	4.23	.25	.82	10	<5	<1	2	1.1	21
AF-62A	2	33	11	32	<.3	26	5	139	1.64	6	9	<2	6	86	<.2	<3	<3	38	2.05	.025	8	76	1.50	100	.15	5	3.46	.33	.80	2	<5	<1	2	.8	2
AF-62B	4	26	3	10	.3	40	8	35	1.29	<2	<8	<2	6	70	.2	<3	<3	9	1.51	.039	9	29	.20	97	.11	<3	2.29	.31	.07	3	<5	<1	5	.8	4
AF-63A	<1	51	3	23	<.3	26	7	143	1.00	49	<8	<2	4	145	<.2	<3	<3	8	2.19	.028	9	23	.51	95	.07	<3	1.55	.11	.08	3	<5	<1	2	.7	2
AF-63B	3	67	11	16	.4	24	7	177	1.44	20	<8	<2	11	50	<.2	3	<3	59	.44	.017	18	86	1.17	83	.07	<3	1.41	.09	.74	2	<5	<1	5	1.5	4
AF-63C	5	927	<3	15	2.3	26	7	107	6.57	5	<8	<2	<2	10	<.2	<3	<3	5	.65	.086	6	33	.32	8	.01	<3	.52	.01	.01	3	<5	<1	2	.2	3
AF-63D	2	49	7	35	.3	23	6	128	2.15	7	<8	<2	5	185	.2	<3	<3	56	1.30	.021	13	89	.83	258	.13	<3	2.76	.30	.57	3	<5	<1	7	.8	4
AF-64A	12	35	6	18	.3	24	6	162	1.68	2	<8	<2	7	89	<.2	<3	<3	36	1.32	.166	13	60	.36	103	.07	<3	1.41	.02	.22	2	<5	<1	14	.7	4
AF-64B	8	71	<3	12	.9	24	5	115	2.82	4	<8	<2	3	50	<.2	<3	<3	19	1.37	.200	8	74	.16	19	.03	4	1.21	.05	.02	15	<5	<1	8	.4	19
AF-64C	80	119	4	116	<.3	113	13	137	2.58	<2	31	<2	5	78	<.2	<3	<3	432	.84	.026	10	130	.93	136	.18	6	2.15	.33	.64	5	<5	<1	<2	.6	4
AF-71A	1	49	<3	52	.4	21	2	584	1.37	4	<8	<2	3	380	.2	<3	<3	38	9.41	.094	8	22	3.43	290	.04	10	1.04	.01	.47	106	<5	<1	<2	.3	184
AF-71B	17	275	22	163	.6	26	8	111	1.57	3	13	<2	10	20	3.6	<3	3	301	.31	.187	17	121	1.69	427	.07	3	1.93	.04	1.12	5	<5	<1	3	1.0	5
AF-76A	2	8	38	5	<.3	5	<1	48	.46	2	<8	<2	8	9	<.2	<3	<3	4	.05	.011	6	72	.02	21	<.01	<3	.30	.06	.18	2	<5	<1	11	27.0	6
AF-76B	2	6	40	4	<.3	2	<1	26	.45	<2	<8	<2	9	9	<.2	<3	<3	3	.01	.010	7	61	.01	35	<.01	<3	.29	.06	.17	2	<5	<1	7	27.1	5
AF-76D	2	7	6	10	<.3	6	<1	257	.57	2	<8	<2	14	2	<.2	<3	<3	3	.02	.003	6	82	.02	9	<.01	<3	.29	.05	.15	3	<5	<1	3	1.3	3
AF-77A	1	5	<3	32	<.3	6	3	1847	.51	5	<8	<2	3	458	1.8	<3	<3	4	15.18	.052	9	34	.18	109	.03	44	1.12	.02	.03	4	<5	<1	<2	.5	6
AF-77B	1	4	<3	9	<.3	2	1	1266	.28	2	13	<2	<2	415	1.4	<3	<3	2	18.19	.005	1	50	<.01	29	<.01	14	.09	<.01	.01	<2	<5	1	<2	<.1	4
AF-79A	9	44	11	52	.4	7	3	267	3.37	102	<8	<2	13	16	<.2	<3	<3	44	.16	.026	32	44	.66	210	.02	<3	1.17	.03	.30	2	<5	<1	2	1.6	9
RE AF-79A	10	44	14	55	.4	7	3	272	3.46	106	<8	<2	13	16	<.2	<3	<3	45	.13	.027	32	44	.68	214	.02	5	1.20	.03	.31	2	<5	<1	<2	1.8	10
AF-80A	1	68	19	55	.3	20	5	877	3.53	8	<8	<2	4	241	<.2	<3	<3	55	1.46	.021	17	64	1.00	99	.13	<3	2.90	.08	.68	3	<5	<1	8	.8	3
AF-81A	3	14	25	17	<.3	4	1	69	.48	2	<8	<2	9	6	<.2	<3	28	6	.04	.004	4	72	.03	24	<.01	3	.27	.04	.11	2	<5	<1	88	2.9	4
AF-81B	1	49	95	88	.5	30	21	811	3.39	373	<8	<2	10	11	.2	<3	3	48	.02	.027	33	64	.83	403	.07	3	2.25	.03	.69	3	<5	<1	<2	2.4	3
AF-81C	3	6	30	5	<.3	2	<1	59	.50	7	<8	<2	4	3	<.2	<3	<3	3	.01	.004	5	66	.03	13	<.01	<3	.30	.03	.18	<2	<5	<1	3	5.2	13
STOP 7	5	264	6	62	<.3	17	28	699	9.41	175	<8	<2	<2	3	<.2	<3	16	85	.09	.024	2	96	1.22	22	.01	<3	2.47	.02	.08	4	<5	<1	7	<.1	9
STOP 13	14	90	<3	23	<.3	20	11	1206	5.66	181	<8	<2	2	42	<.2	3	<3	40	1.08	.141	7	46	1.04	69	<.01	4	1.28	.01	.29	<2	<5	<1	60	.9	4
STOP 15	1	19	4	74	<.3	46	28	636	5.03	3	<8	<2	10	20	<.2	<3	<3	58	.32	.029	38	71	2.34	50	.05	<3	2.57	.04	.14	3	<5	<1	3	1.1	2
STOP 16	1	18	25	21	<.3	2	1	111	1.34	5	21	<2	32	10	.2	<3	<3	3	.19	.030	18	39	.04	32	<.01	<3	.28	.05	.17	4	<5	1	3	3.8	3
STOP 17	1	115	43	208	2.3	202	52	211	8.31	<2	<8	<2	3	114	2.0	<3	<3	31	3.99	.217	5	62	.38	5	.37	5	4.82	.27	.03	<2	<5	<1	3	3.7	5
STOP 18	2	306	11	114	<.3	112	20	598	8.56	<2	<8	<2	4	52	.4	3	<3	173	1.45	.302	20	400	2.03	227	.36	<3	4.50	.17	2.68	4	<5	<1	8	3.7	2
01-KS-100	2	92	<3	75	<.3	66	20	245	3.07	<2	<8	<2	6	53	<.2	<3	<3	18	.89	.023	6	96	.58	100	.07	<3	2.19	.09	.39	17	<5	<1	6	.5	26
01-KS-101	2	9	13	85	<.3	2	<1	190	.77	<2	14	<2	38	14	<.2	<3	<3	<1	.21	.001	18	33	.25	84	<.01	<3	1.58	.02	.34	8	<5	<1	2	11.9	19
01-KS-102	1	2	<3	3	<.3	6	<1	1445	4.46	2	8	<2	5	197	.3	<3	<3	<1	16.49	.014	8	5	7.63	44	<.01	<3	.28	.01	.10	<2	<5	1	<2	.4	2
01-KS-103	2	112	5	107	<.3	49	26	230	5.06	5	<8	<2	8	7	<.2	<3	<3	82	.08	.009	32	101	.91	169	.34	<3	2.96	.04	1.41	4	<5	<1	5	1.8	5
01-KS-104	4	45	4	107	<.3	41	11	111	2.51	5	<8	<2	7	9	.5	<3	<3	61	.12	.032	21	98	.68	285	.09	3	2.06	.04	.51	4	<5	<1	2	1.5	4
STANDARD C3/AU-R/SO-16	26	67	34	165	6.1	37	11	782	3.39	56	25	3	19	29	23.5	16	23	82	.57	.087	19	170	.62	150	.10	17	1.87	.04	.16	20	<5	1	486	1.9	24
STANDARD G-2	1	2	<3	43	<.3	8	4	545	2.04	<2	<8	<2	4	72	<.2	<3	<3	42	.66	.094	7	79	.62	225	.15	<3	.93	.07	.46	3	<5	<1	-	-	-

GROUP 1D - 0.50 GM SAMPLE LEACHED WITH 3 ML 2-2-2 HCL-HNO3-H2O AT 95 DEG. C FOR ONE HOUR, DILUTED TO 10 ML, ANALYSED BY ICP-ES.
UPPER LIMITS - AG, AU, HG, W = 100 PPM; MO, CO, CD, SB, BI, TH, U & B = 2,000 PPM; CU, PB, ZN, NI, MN, AS, V, LA, CR = 10,000 PPM.
AU** GROUP 3B - 30.00 GM SAMPLE ANALYSIS BY FA/ICP. TA* & W* - GROUP 4B - REE - LiBO2 FUSION, ICP/MS FINISHED.
ASSAY RECOMMENDED FOR ROCK AND CORE SAMPLES IF CU PB ZN AS > 1%, AG > 30 PPM & AU > 1000 PPB
- SAMPLE TYPE: ROCK R150 60C <u>Samples beginning 'RE' are Reruns and 'RRE' are Reject Reruns.</u>

DATE RECEIVED: AUG 30 2001 **DATE REPORT MAILED:** Sep/14/2001 **SIGNED BY** ......D. TOYE, C.LEONG, J. WANG; CERTIFIED B.C. ASSAYERS

 Data ✓ FA ____

Appendix IV
Station Location Map

Ddhaw Ghro SMA
Tract Map
Location Map
Ddhaw Ghro Habitat Protection Area - SMA
Interim withdrawal in effect through 2005
or completion of a management plan
Yukon MINFILE
QUATERNARY
Unconsolidated alluvium, colluvium, and glacial deposits
INTRUSIVE ROCKS
CRETACEOUS
South Lansing Suite (94.5 +/- 0.5 Ma)
Medium-grained, biotite +/- hornblende +/- K-feldspar granodiorite to quartz-monzonite. Local country rock xenoliths varying in size from few centimetres to hundreds of metres in diameter. Pegmatitic to aplitic dykes and veins.
LAYERED ROCKS
SELWYN BASIN
DEVONIAN TO EARLY MISSISSIPPIAN
Earn Group
Dark grey to jet black shale, black grit
MID-PALEOZOIC
Nogold Unit
Medium- to coarse-grained quartz-arenite to feldspathic-wacke with abundant dark grey shale interbeds (resembles Yusezyu Fm. of Hyland Group)
Maroon, green, and greenish grey shale; minor siltstone and sandstone (resembles Narchilla Fm. of Hyland Group)
White-weathering, white, coarsely crystaline limestone
Green, chloritic grit
ORDOVICIAN AND SILURIAN
Road River Group
White-weathering, black limestone. Forms resistant outcrops. Local limestone concretions on upper contact
Steele Formation
Orange-weathering, medium- to light-grey, non-calcareous to calcareous, bioturbated shale
Duo Lake Formation
Dark grey shale and siltstone; dark grey to black chert; brown- to rusty-weathering medium- to coarse-grained sandstone and wacke with abundant dark grey shale interbeds (resembles Yusezyu Fm. of Hyland Group)
Duo Lake Formation - Grit Member
Siltstone, fine-to coarse-grained sandstone, shale (resembles Yusezyu Fm. of Hyland Group)
Hornfelsed Duo Lake Fm rocks
YUKON-TANANA TERRANE
DEVONO-MISSISSIPPIAN
Nasina Assemblage
graphitic quartzite and muscovite quartz-rich schist, with interspersed marble and probable correlative successions; eclogite occurrences
Tintina Fault
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
105M 039 SIDE SLIP
GREAT HORN
FRIESEN
105M 043 LOST WERNECKE COPPER
105M 041 RAM
105M 042 HOTSPRING
5 0 5 10 15 20 25 Km
Scale 1:100,000
Figure 4