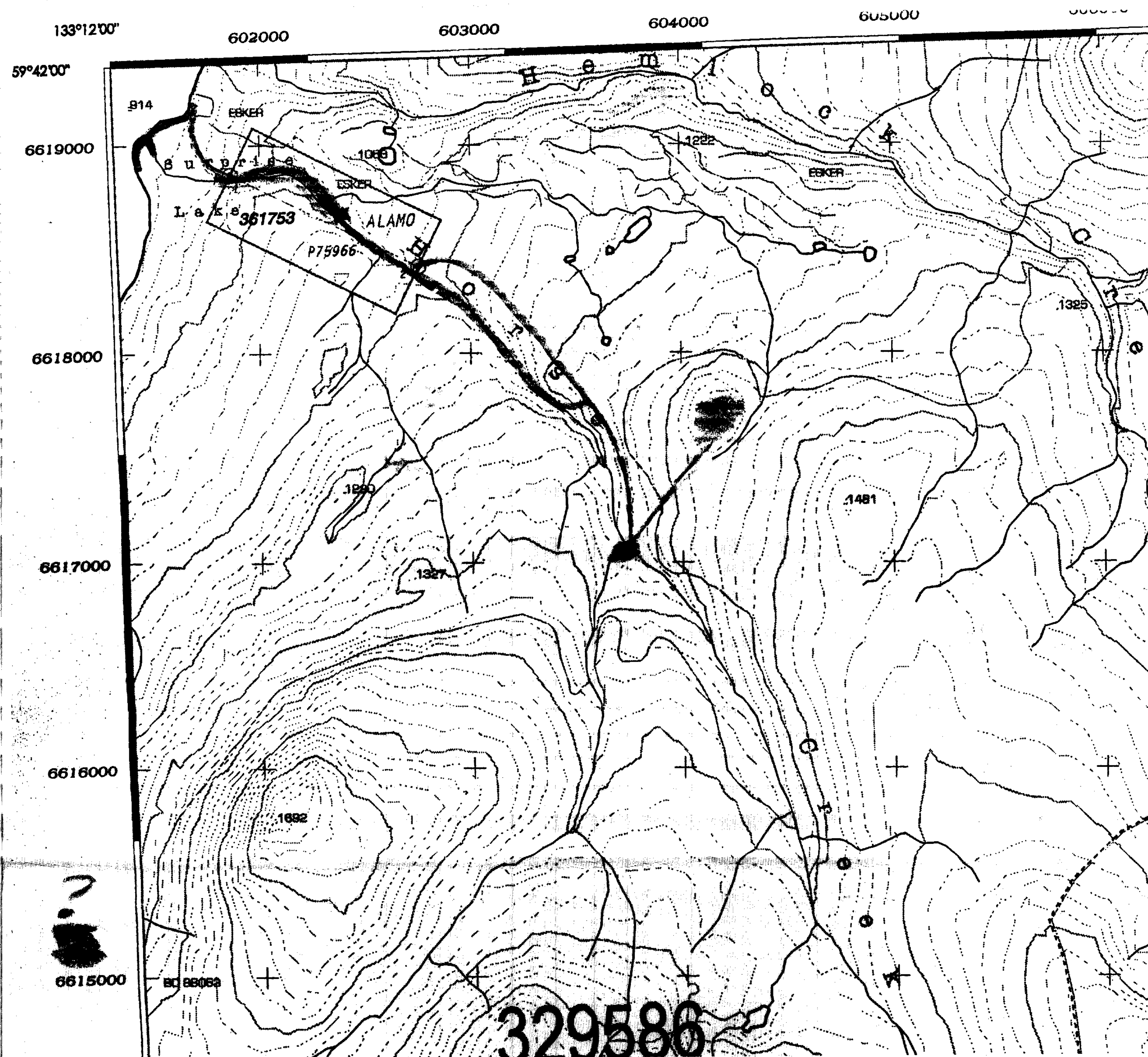
BRITISH COLUMBIA

PROSPECTORS ASSISTANCE PROGRAM

MINISTRY OF ENERGY AND MINES

GEOLOGICAL SURVEY BRANCH

PROGRAM YEAR:	2001/2002
REPORT #:	PAP 01-33
NAME:	J. PETER ROSS



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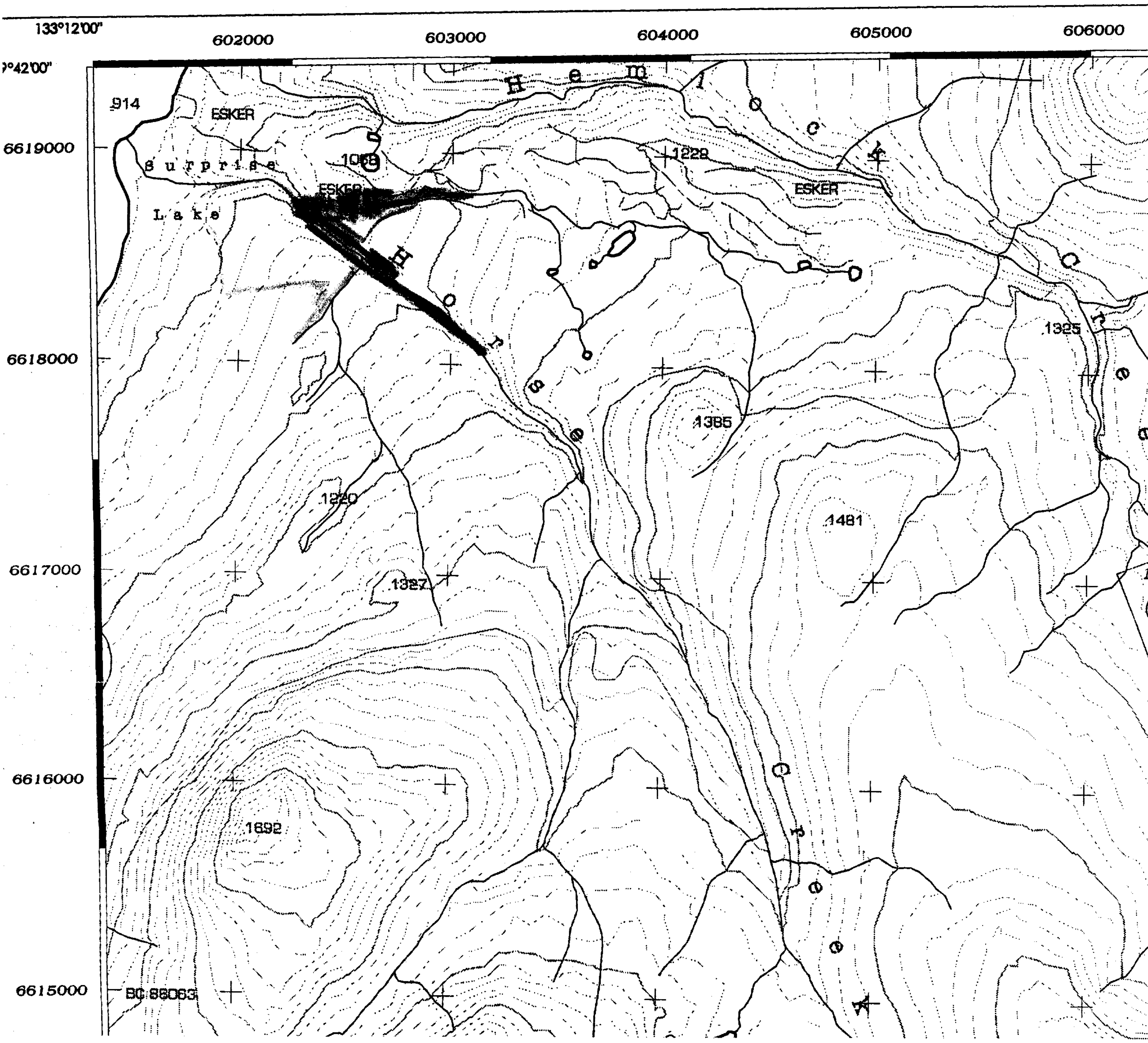

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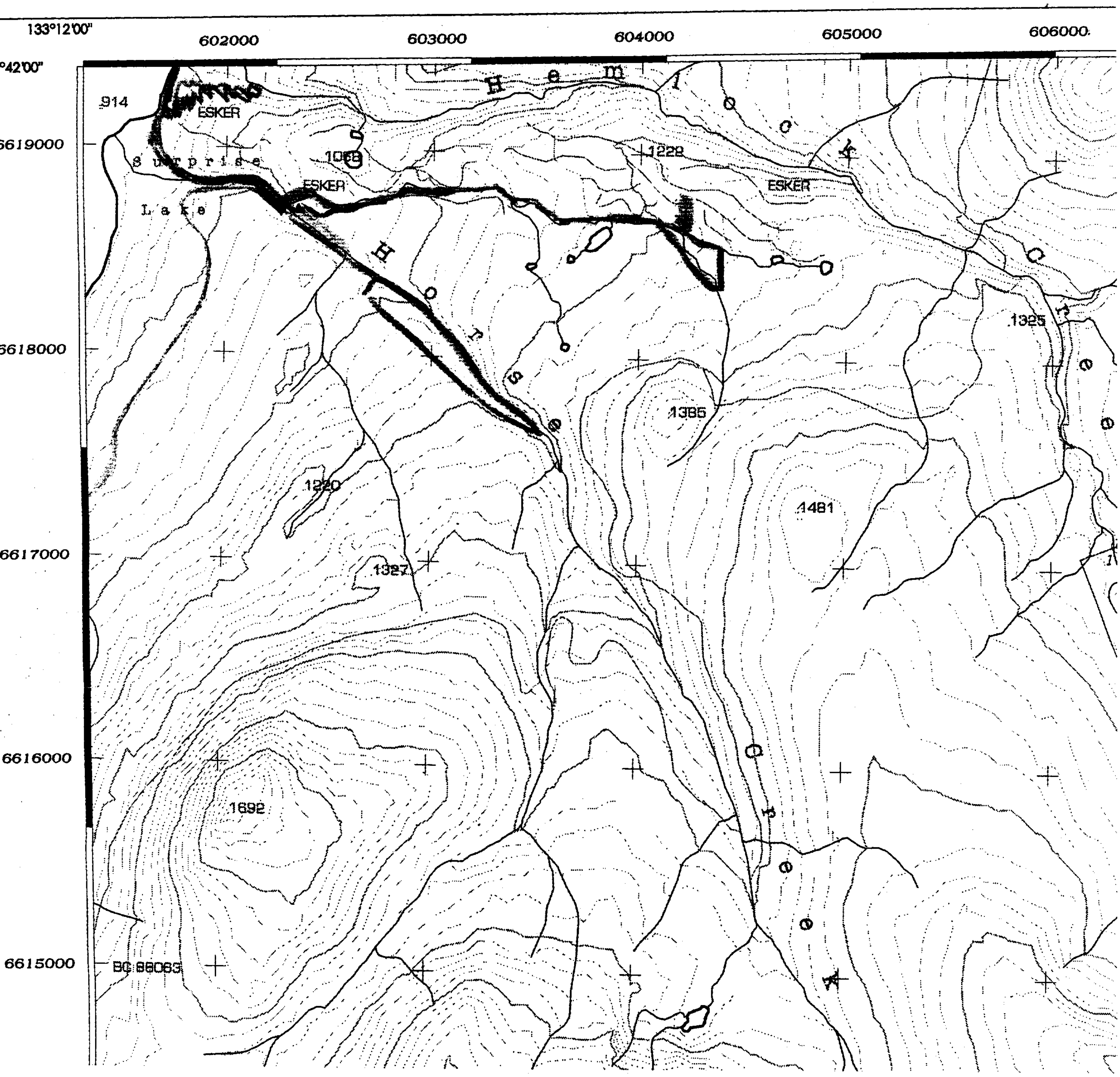

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1 Aug 2001

2 Aug 2001

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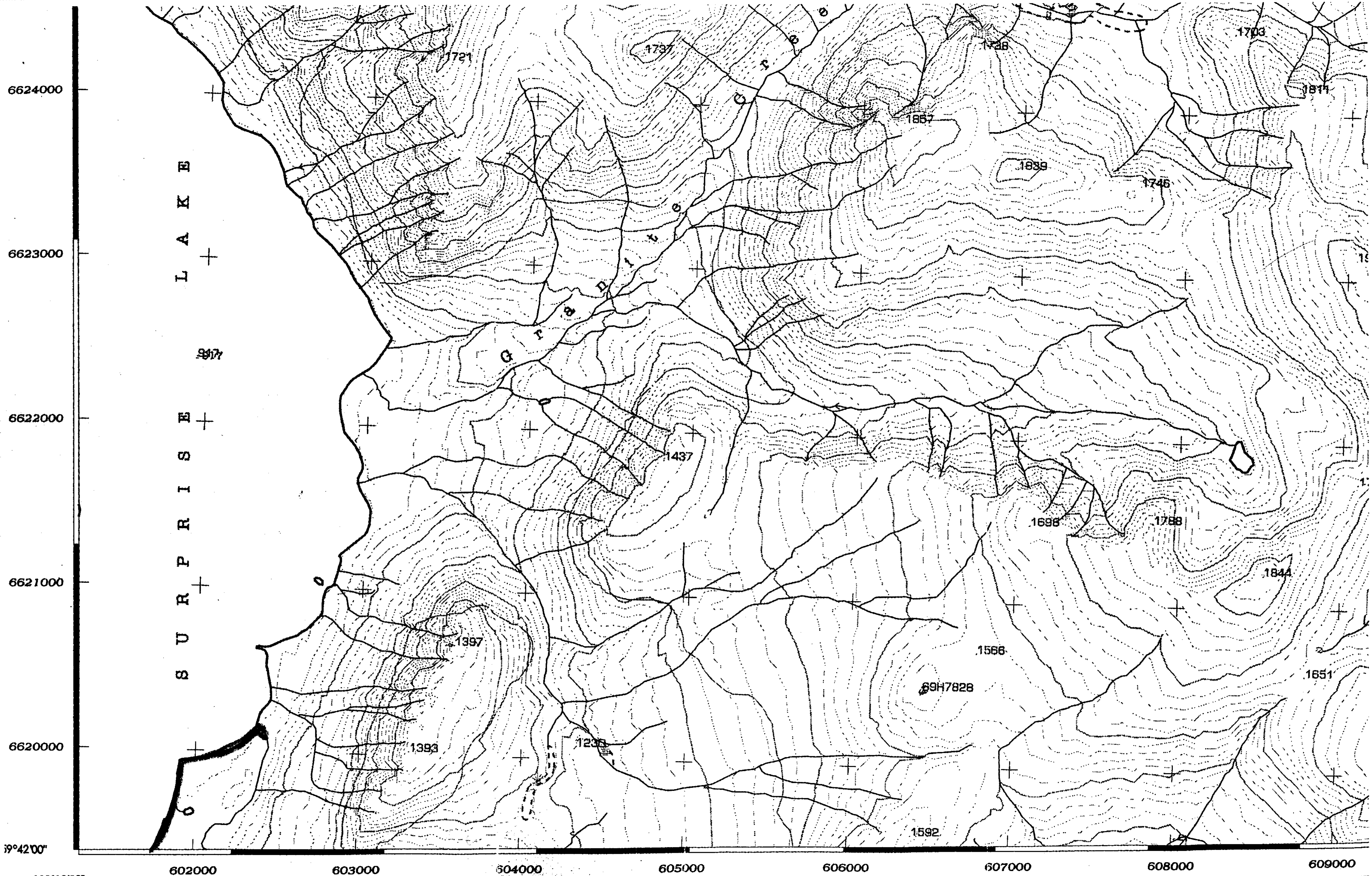

SURPRISE LAKE
Granite Creek
6624000
6623000
6622000
6621000
6620000
59°42'00"
133°12'00"
602000
603000
604000
605000
606000
607000
608000
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1721
1737
1738
1703
1811
1857
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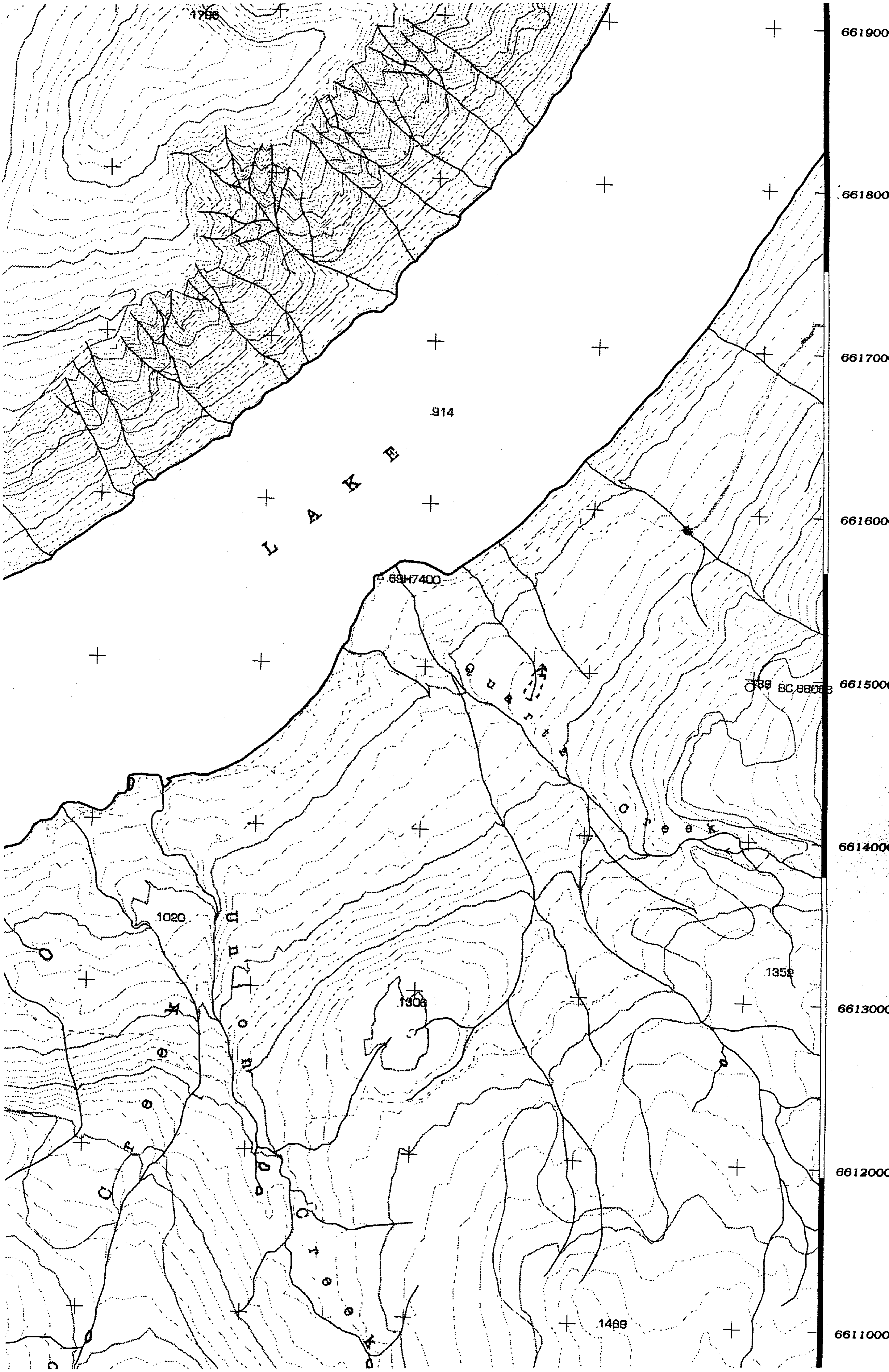
917
1437
1698
1788
1844
1397
1566
69H7828
1651
1393
1230
1592



1796
LAKE
914
69H7400
Quartz Creek
Union Creek
Creek
Creek
1020
1306
1352
1469
189
BC 86063
6619000
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6617000
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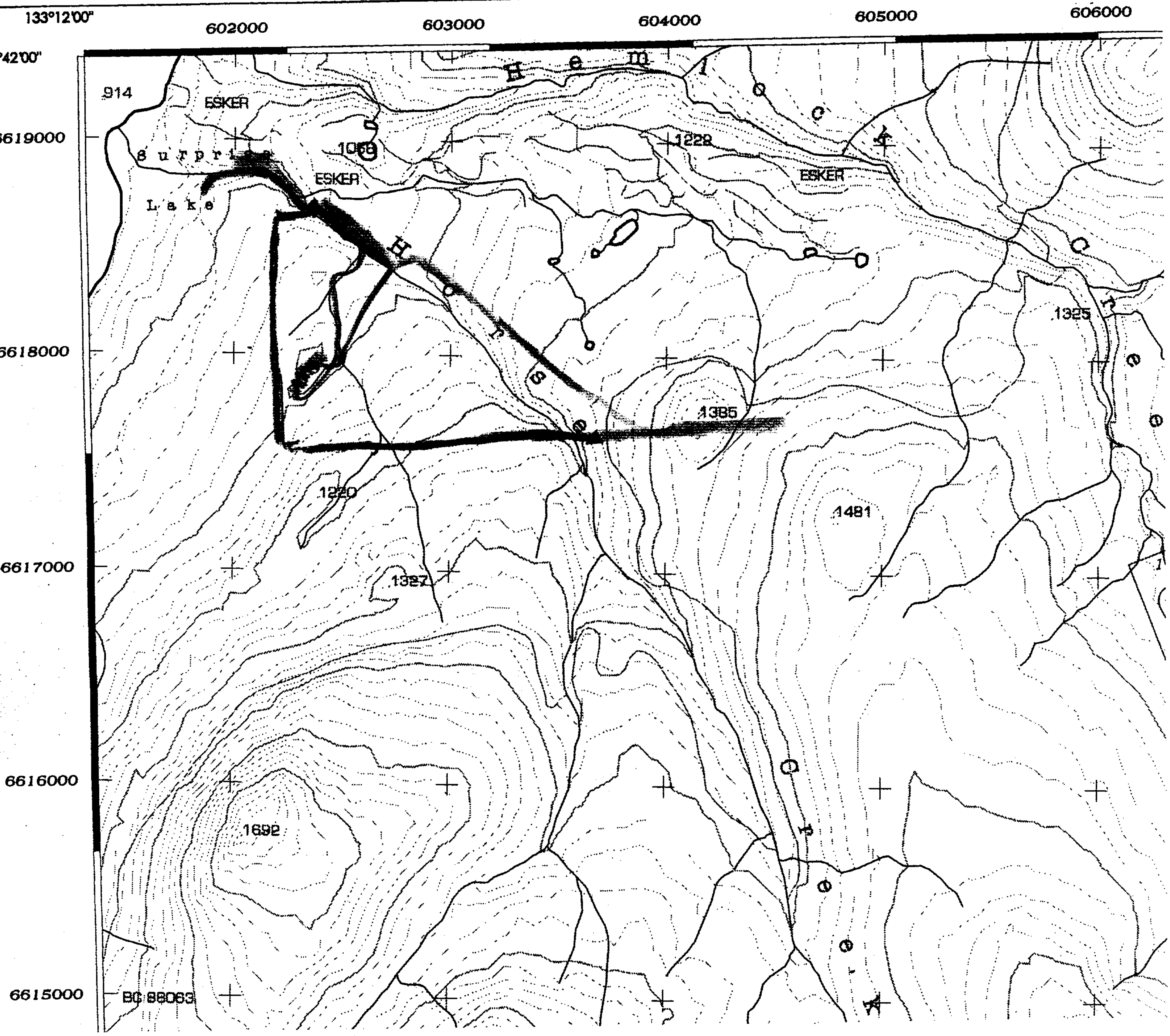

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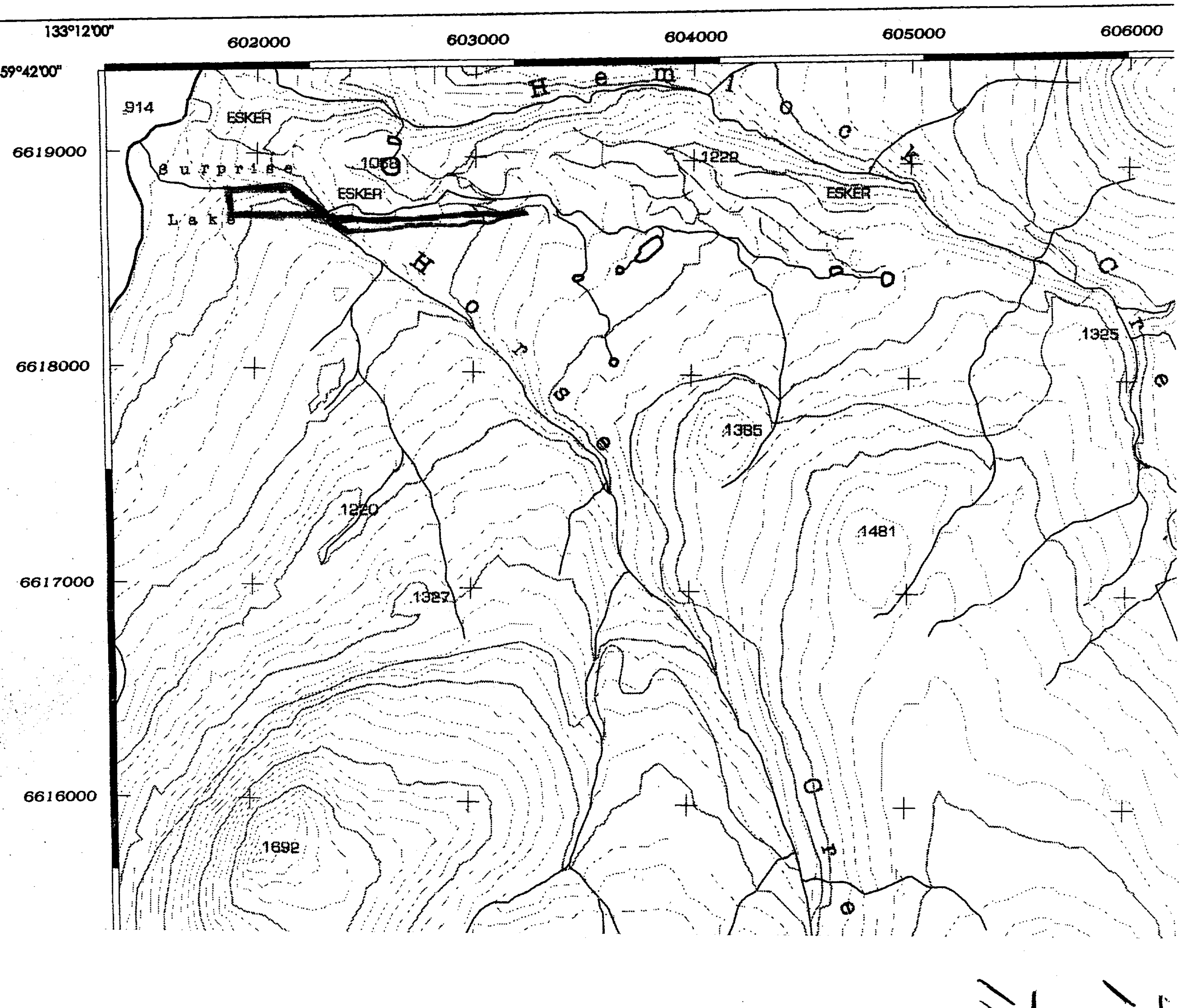

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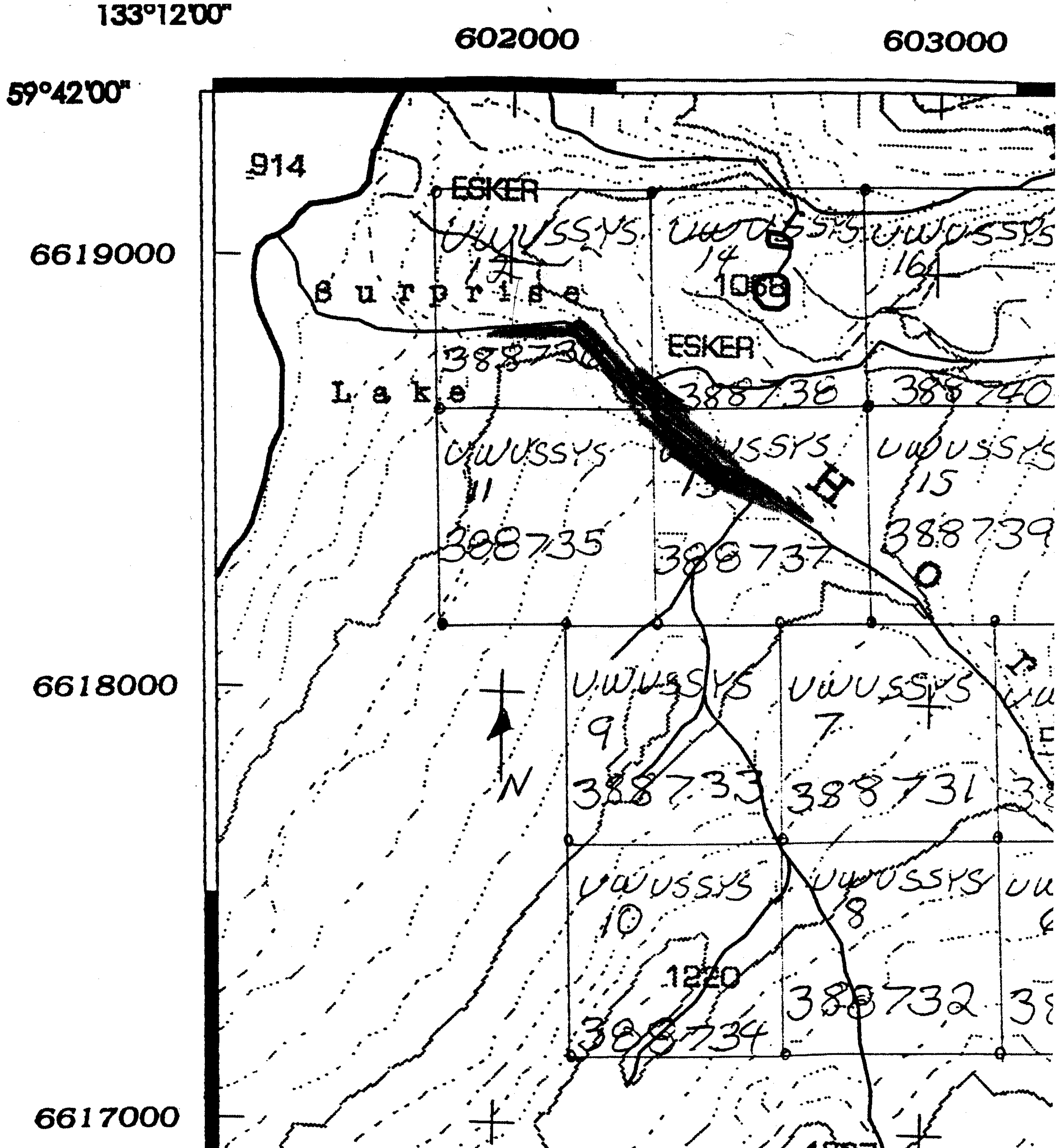
11 Aug 2001



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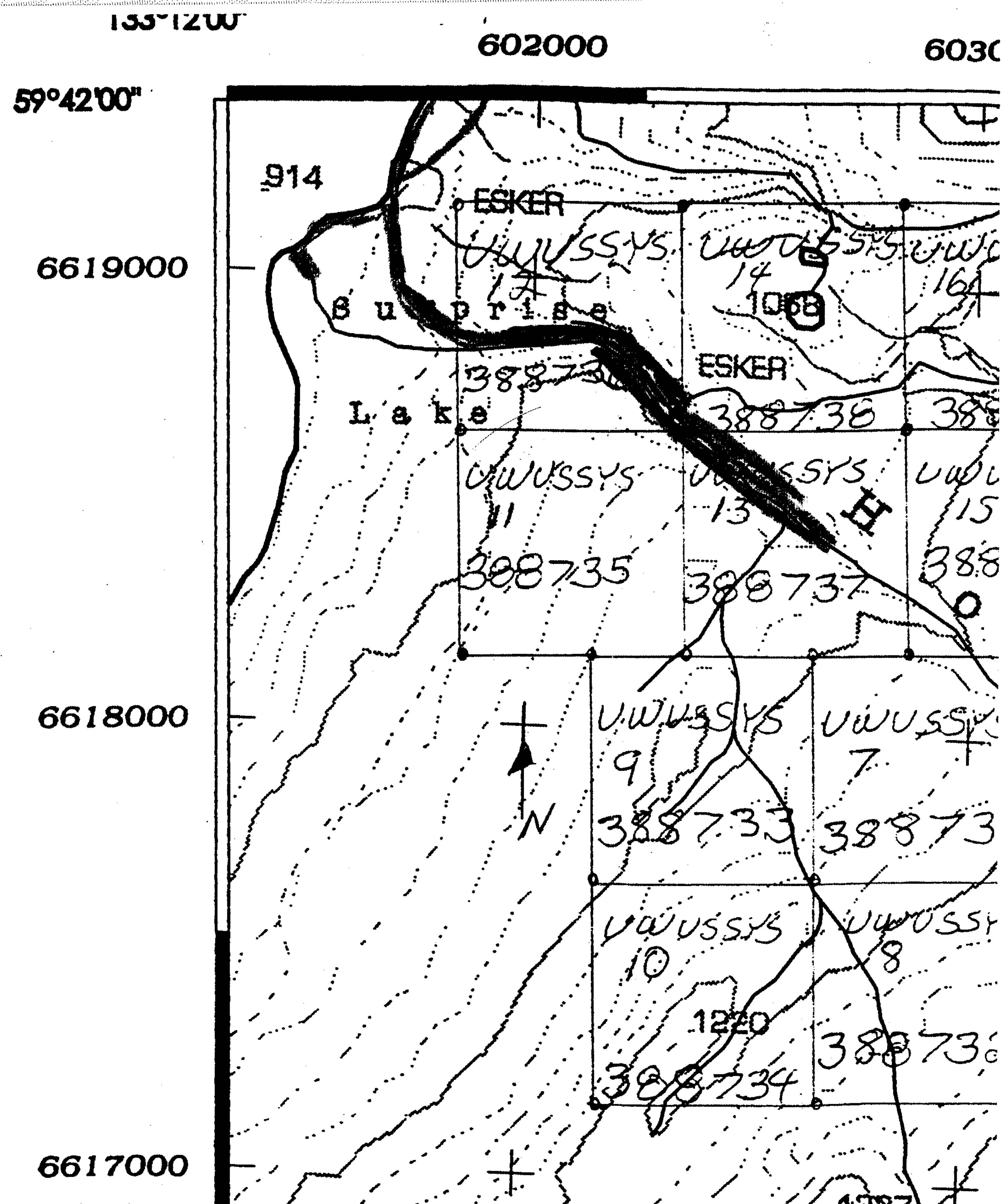

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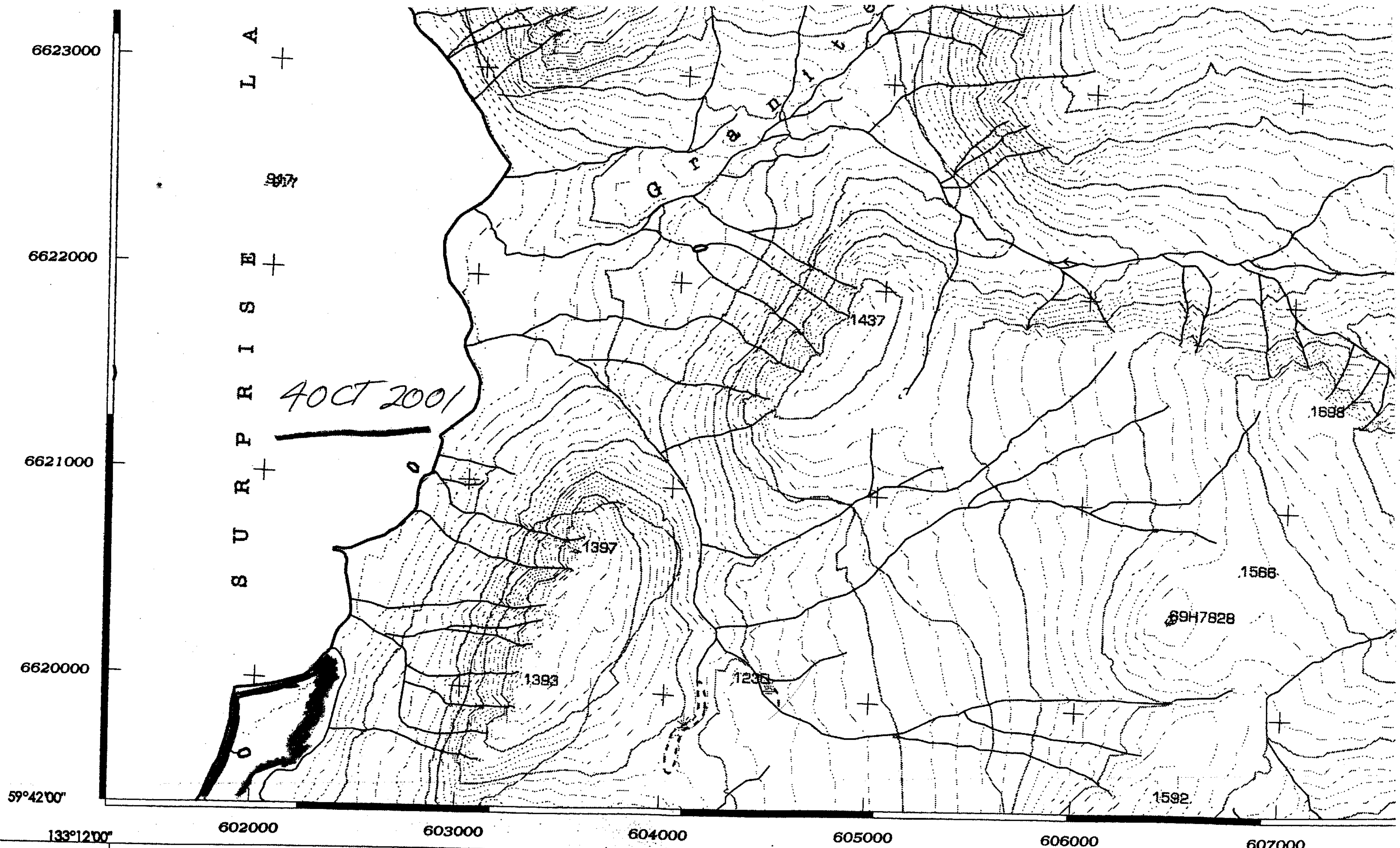
3 OCT 2001

4 OCT 2001

5 OCT 2001

6 OCT 2001

7 OCT 2001



NOTES FROM MINERAL LEGEND

GOLD COMMISSIONER OFFICES

Summary of Work
Horse Creek Area
British Columbia, N.T.S. 104 N/11 E

for

B.C. Prospectors Assistance Program
5-1810 Blanshard Street, Victoria B.C.

File Number BC #56

John Peter Ross, Prospector
January 2002

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LIST OF FIGURES

APPENDICES

Chapter One: INTRODUCTION

1.1 Introductory Statement

The Horse Creek area map sheet 104 N/11 E was chosen because;

1. I wanted to diversify my Yukon claim groups (mostly gold).

2. British Columbia is becoming more open to mineral exploration.

3. Tantalum in the period 2000 to 2001 showed a price increase from \$40 - \$50 US / lb. up to \$448 US / lb. However at present in January 2002 it is now \$40 US / lb. Long term contracts are \$120 - \$140 ?

4. Tantalum has a lot of uses and demand is growing. Production and use of tantalum in my opinion should rise faster than inflation for the next 10 years.

5. The Surprise Lake batholith is a volatile-rich or specialty granite. Associated mineralization generally consists of one or more of the Mo, W, Sn, F, Vr, Th, Nb, Ta, Yt or rare earth elements in vein, greissen, skarn, porphyry or pegmatite deposits.

6. The Surprise Lake batholith has anomalous silts for these elements (Mo, Nb were not done). BC RGS NTS 104N - Atlin.

7. Interest is high in tantalum now, but less than PGE's. Tantalum production in 2000 was about 5.5 million lbs.

8. Numerous Ta silt anomalies are present on the Atlin 104 N map sheet.

9. At the mouth of Horse Creek is silt sample #9152. Ta - 75.0 ppm (highest value), W - 520 ppm (highest value), Sn - 507 ppm (highest value), Th - 189 ppm (highest value), V - 142 ppm (very high). Upstream of #9152 are 9153, 9154 with lower values.

10. Tantalum is not a very mobile element in stream sediments.

11. Curious elevated ridges or knobs were present on topographic maps. These could be pegmatites which are sulphide poor and resist weathering. Pegmatites occur in groups.

12. My target was deposits of Ta $\pm$ Nb $\pm$ Sn $\pm$ W $\pm$ Au veins, greissens, porphyry and pegmatites.

1.2 Location and Access

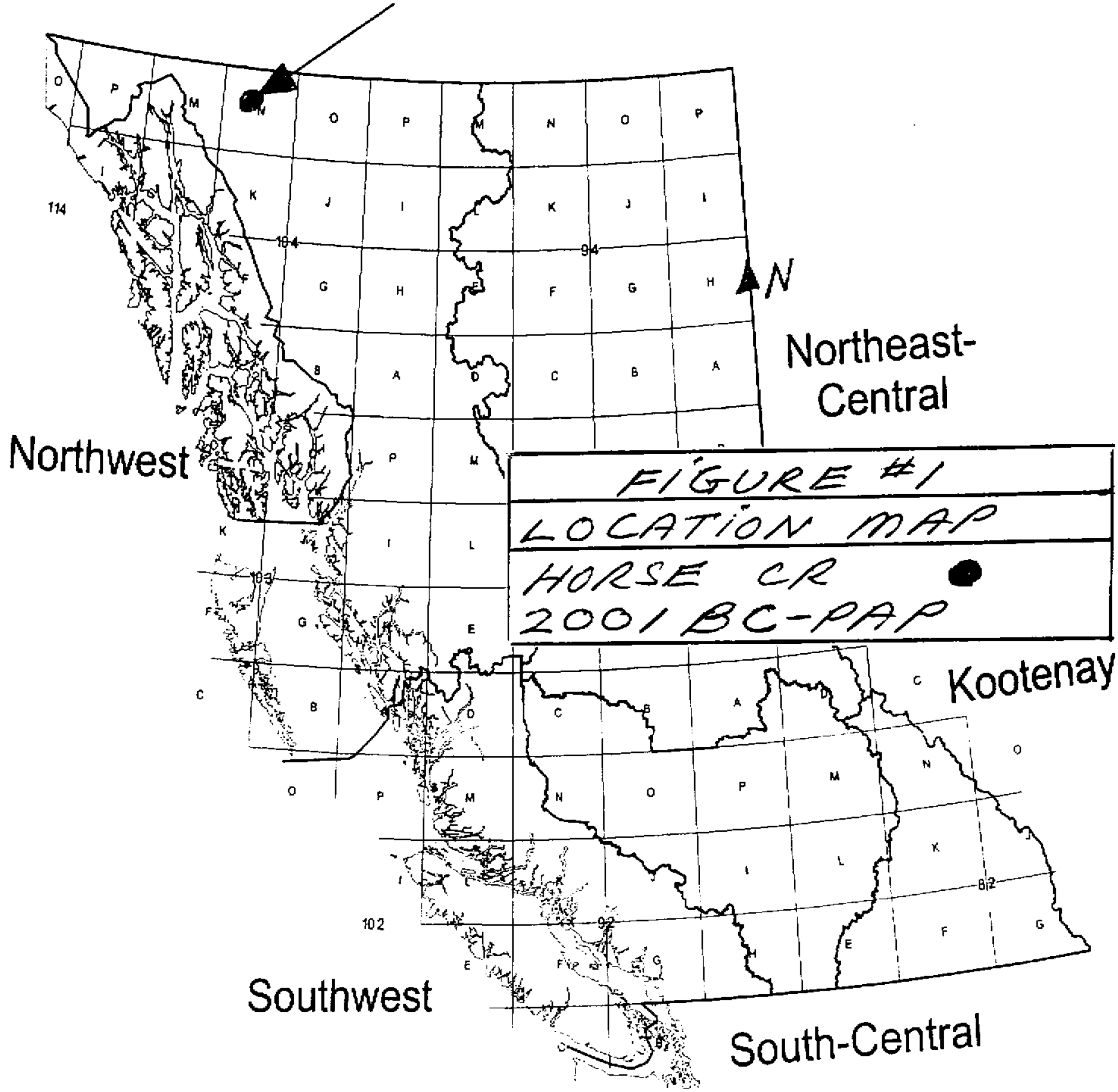
One can drive on an all season road to Atlin B.C. Then access is by helicopter from Atlin 34 km. (21 miles) to a clear spot on Horse Creek. Other ways of access are by boat to the mouth of the creek or by rough, swampy (impassable by vehicle) cat trails (winter access).

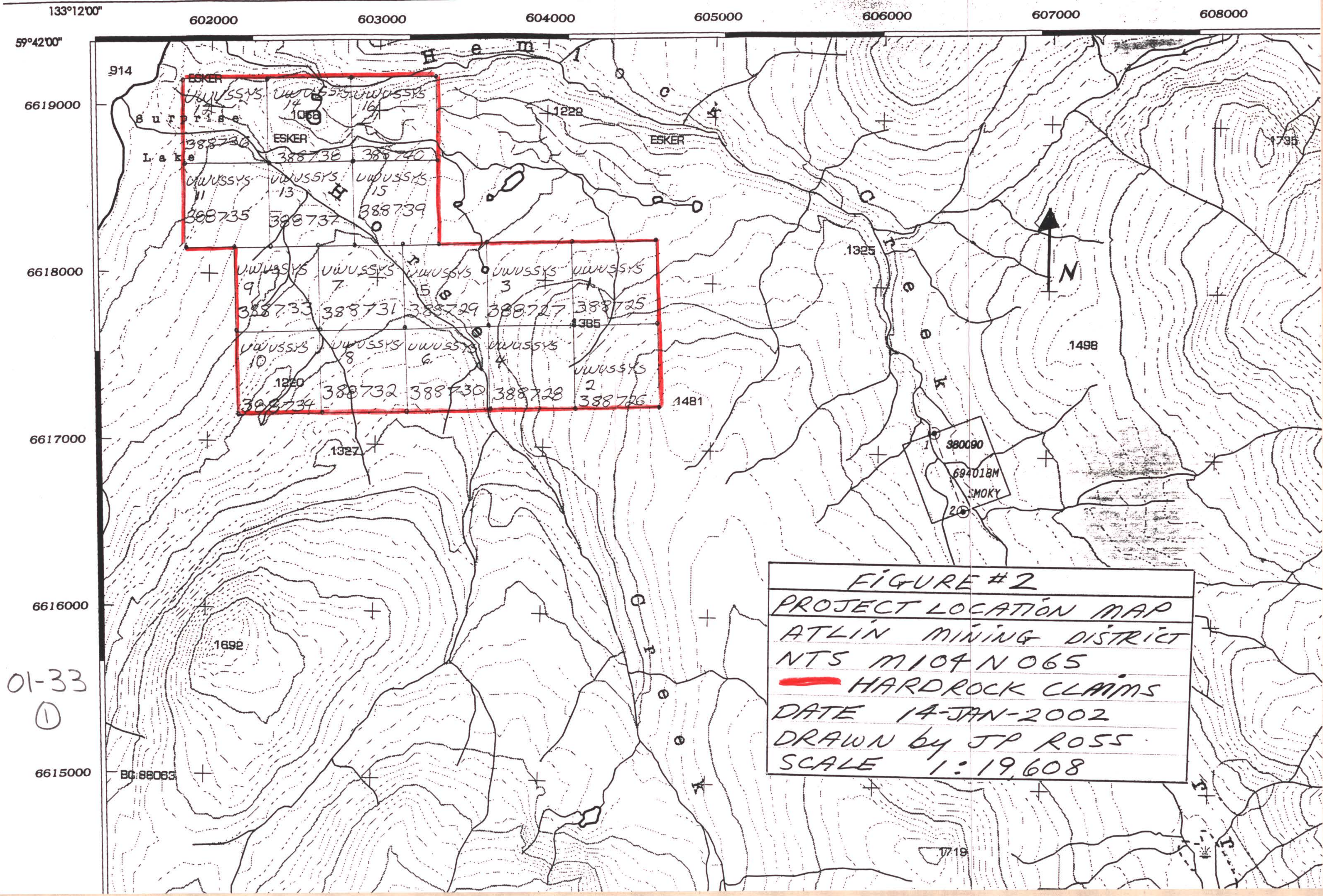
The project is on map sheet 104 N/11 E. The Atlin Mining District has designated the area M 104 N 065 for claim data.

Horse Creek enters Surprise Lake from the east side.

PROGRAM PROPOSAL - PART B
Location of Proposed Project(s)

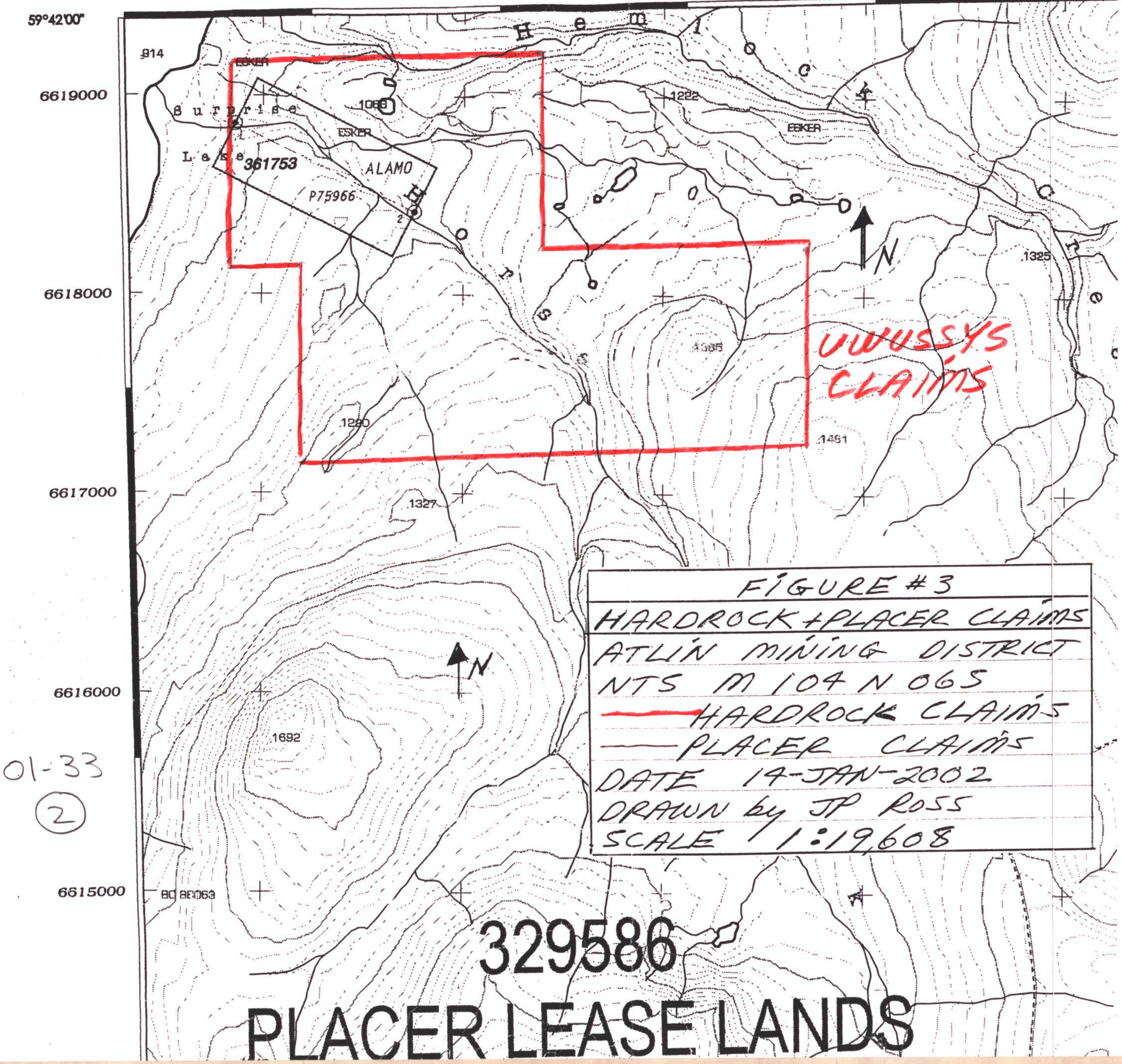
Indicate on this map (using an "X") the general location of each of the projects covered by this proposal.





133°12'00"
602000
603000
604000
605000
606000
607000
608000
59°42'00"
6619000
6618000
6617000
6616000
6615000
914
ESKER
Surprise Lake
Hemlock Creek
Horse Creek
1068
1228
1325
1365
1220
1327
1481
1498
1735
1692
1719
BC 88063
UWUSSYS 12 388736
UWUSSYS 14 388738
UWUSSYS 16 388740
UWUSSYS 11 388735
UWUSSYS 13 388737
UWUSSYS 15 388739
UWUSSYS 9 388733
UWUSSYS 7 388731
UWUSSYS 5 388729
UWUSSYS 3 388727
UWUSSYS 1 388725
UWUSSYS 10 388734
UWUSSYS 8 388732
UWUSSYS 6 388730
UWUSSYS 4 388728
UWUSSYS 2 388726
380090
694018M
SMOKY
N
FIGURE #2
PROJECT LOCATION MAP
ATLIN MINING DISTRICT
NTS M104 N 065
HARDROCK CLAIMS
DATE 14-JAN-2002
DRAWN by JP ROSS
SCALE 1:19,608

01-33
①


59°42'00"
6619000
6618000
6617000
6616000
6615000
914
ESKER
Surprise Lake
361753
ALAMO
P75966
1068
ESKER
1222
ESKER
Hemlock Creek
Horse
1325
1385
1290
1461
1327
1692
BC 86063
N
UWUSSYS CLAIMS
FIGURE #3
HARDROCK + PLACER CLAIMS
ATLIN MINING DISTRICT
NTS M 104 N 065
HARDROCK CLAIMS
PLACER CLAIMS
DATE 14-JAN-2002
DRAWN by JP ROSS
SCALE 1:19,608
329586
PLACER LEASE LANDS

01-33
(2)


FIGURE #4
PROJECT GEOLOGY
ATLIN MINING DISTRICT
NTS M104 N 06 S
DATE 14-JAN-2002
DRAWN by JP ROSS
SCALE 1:253,440
134°00′
30′
15′
60°00′
45′
30′
Alaska Highway
27 Miles
YUKON T
BRITISH
N
UWUSSYS
CLAIMS
BLACK MOUNTAIN
MOUNT CARTER
MT McINTOSH
Jones L.
Shaker Lake
Logger Bay
Telegraph Bay
Deep Bay
Eight Mile
Safety Cove
Lower McDonald Lake
McDonald Lake
ATLIN-RUFFNER
MT VAUGHAN
TABLE MTN.
TAGISH LAKE
Taku
Scotia Bay
Atlin
Pine
Discovery
SURPRISE LAKE
Five Mile Pt.

01-33
(3)

01-33
(4)

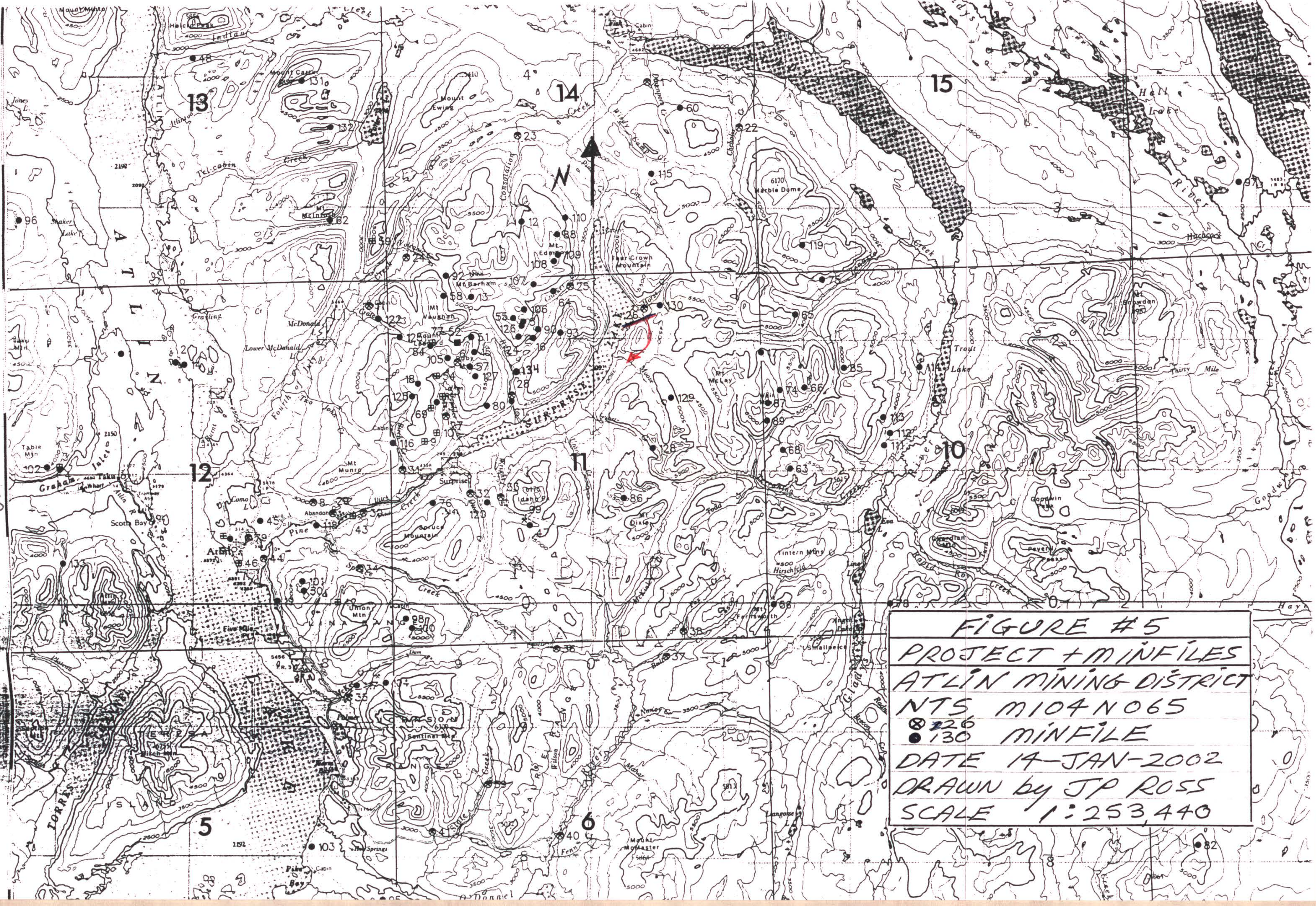


FIGURE #5
PROJECT + MINFILES
ATLIN MINING DISTRICT
NTS M104N065
⊗ 26
● 130 MINFILE
DATE 14-JAN-2002
DRAWN by JP ROSS
SCALE 1:253,440
N

Geology

13a	CRETACEOUS, ALASKITE • Map 1082 A, Geology Atlin, to accompany GSC Memoir 307 by J.D. Aitken
	LATE CRETACEOUS, LKqS - Surprise Lake Batholith, epizonal plutonic suite, alaskite, hornblende - granite, quartz monzonite • BC RGS 51 - NTS 104 N Atlin

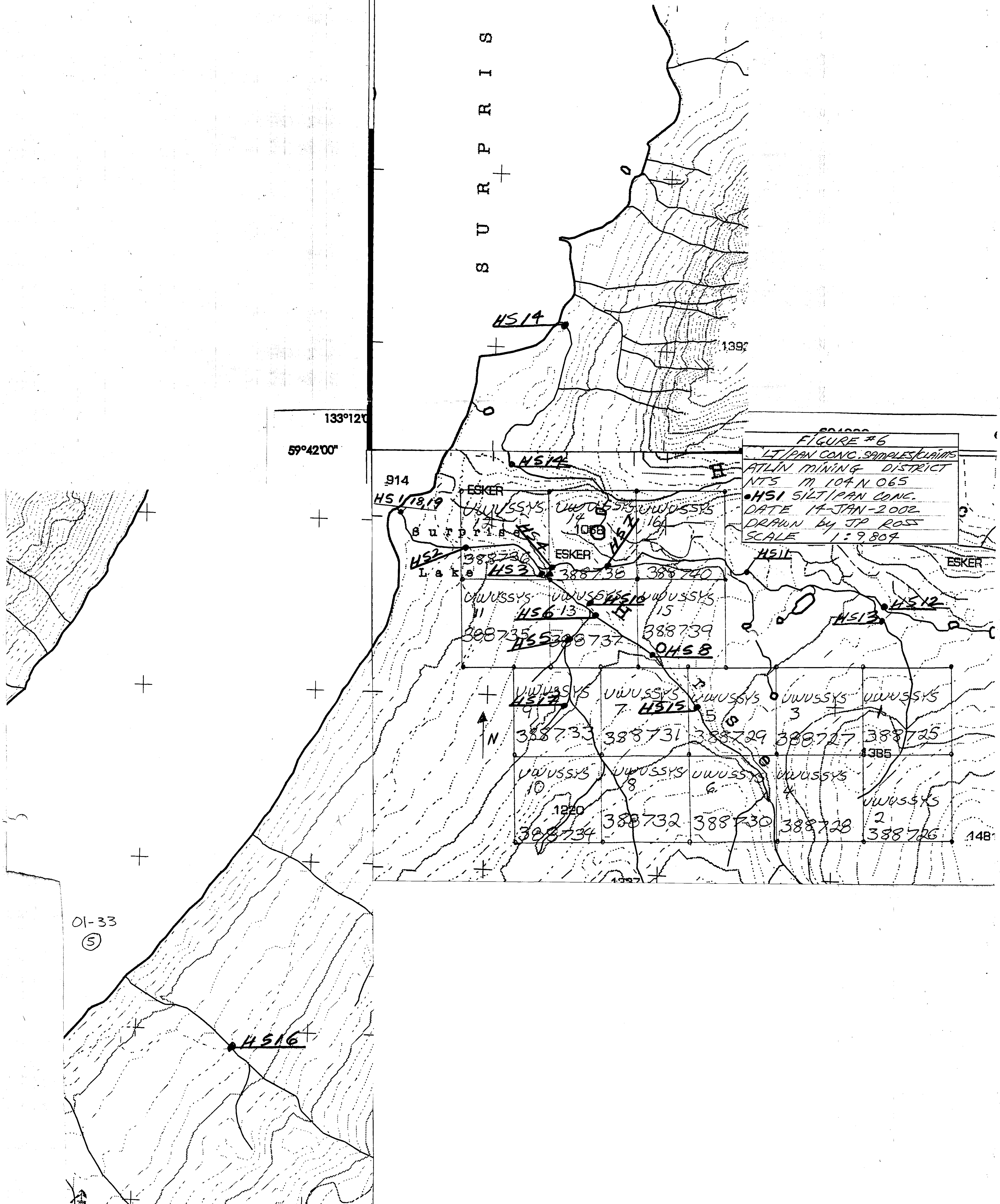


FIGURE #6
LT/PAN CONC. SAMPLES/CLAIMS
ATLIN MINING DISTRICT
NTS M 104N 065
•HS1 SILT/PAN CONC.
DATE 14-JAN-2002
DRAWN by JP ROSS
SCALE 1:9,804
SURPRISE
Surprise Lake
133°12'0
59°42'00"
914
1068
1220
1385
ESKER
ESKER
ESKER
HS1 18,19
HS2
HS3
HS4
HS5
HS6
HS7
HS8
HS10
HS11
HS12
HS13
HS14
HS14
HS15
HS16
HS17
UWUSSYS 12 388736
UWUSSYS 14 388738
UWUSSYS 16 388740
UWUSSYS 11 388735
UWUSSYS 13 388737
UWUSSYS 15 388739
UWUSSYS 9 388733
UWUSSYS 7 388731
UWUSSYS 5 388729
UWUSSYS 3 388727
UWUSSYS 1 388725
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UWUSSYS 2 388726
N
01-33
5

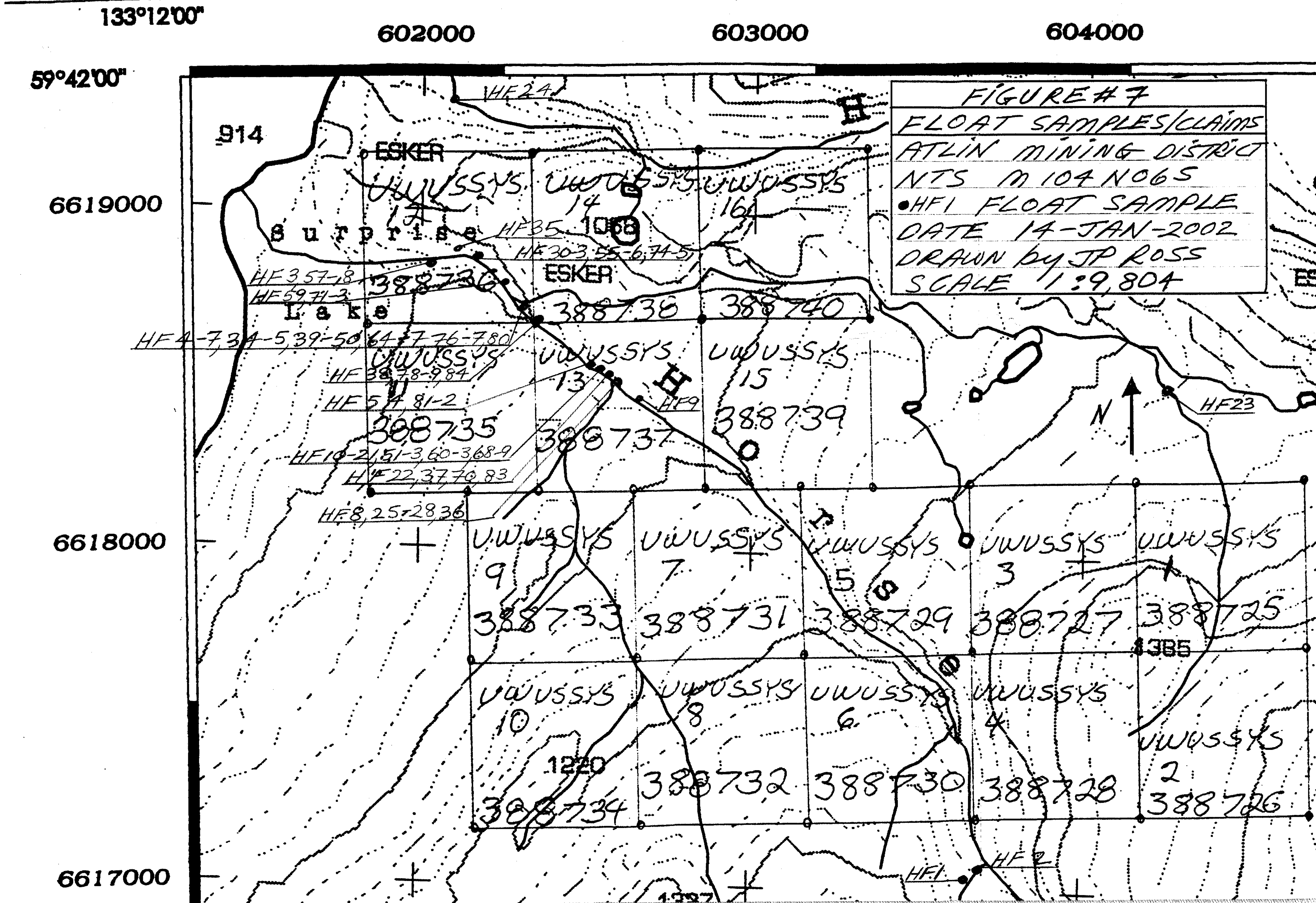
FIGURE #7
FLOAT SAMPLES/CLAIMS
ATLIN MINING DISTRICT
NTS M 104N06S
•HF1 FLOAT SAMPLE
DATE 14-JAN-2002
DRAWN by JP ROSS
SCALE 1:9,804
133°12'00"
59°42'00"
602000
603000
604000
6619000
6618000
6617000
914
1068
1220
1385
ESKER
Surprise Lake
Horse
N
UWUSSYS 12
UWUSSYS 14
UWUSSYS 16
UWUSSYS 11
UWUSSYS 13
UWUSSYS 15
UWUSSYS 9
UWUSSYS 7
UWUSSYS 5
UWUSSYS 3
UWUSSYS 1
UWUSSYS 10
UWUSSYS 8
UWUSSYS 6
UWUSSYS 4
UWUSSYS 2
388736
388738
388740
388735
388737
388739
388733
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388734
388732
388730
388728
388726
HF24
HF35
HF30-3,55-6,74-5
HF3,57-8
HF59,71-3
HF4-7,34-5,39-50,64-7,76-80
HF38,78-9,84
HF5,4,81-2
HF10-21,51-3,60-3,68-9
HF22,37,70,83
HF8,25-28,36
HF9
HF23
HF1
HF2

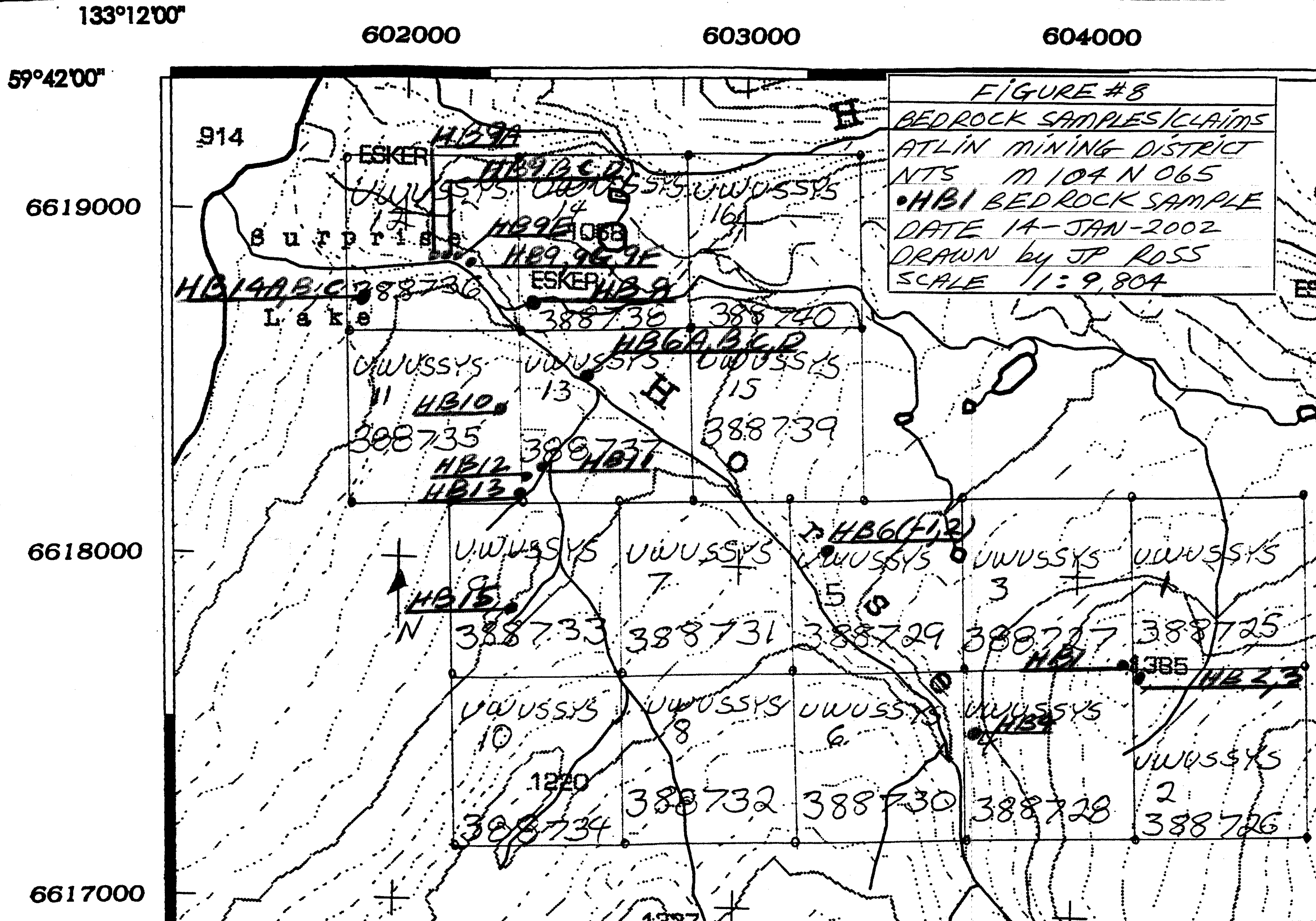
FIGURE #8
BEDROCK SAMPLES/CLAIMS
ATLIN MINING DISTRICT
NTS M 104 N 065
•HB1 BEDROCK SAMPLE
DATE 14-JAN-2002
DRAWN by JP ROSS
SCALE 1:9,804
133°12'00"
59°42'00"
602000
603000
604000
6619000
6618000
6617000
914
ESKER
Surprise
Lake
1220
N
HB9A
HB9B,C,D
HB9E
HB9,9E,9F
HB14A,B,C
HB8
HB6A,B,C,D
HB10
HB12
HB13
HB11
HB15
HB6(F,I,2)
HB1
HB2,3
HB4
UWUSSYS 12
UWUSSYS 14
UWUSSYS 16
UWUSSYS 11
UWUSSYS 13
UWUSSYS 15
UWUSSYS 9
UWUSSYS 7
UWUSSYS 5
UWUSSYS 3
UWUSSYS 1
UWUSSYS 10
UWUSSYS 8
UWUSSYS 6
UWUSSYS 4
UWUSSYS 2
388736
388738
388740
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388739
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388731
388729
388727
388725
388734
388732
388730
388728
388726
385

Chapter Two: SUMMARY

First Trip

J. Peter Ross staked and recorded the UWUSSYS 1-16 hard rock claims (388725 - 388740). The claims are 2 post claims.

No soil samples were taken.

Eighteen (18) silt samples were taken at 17 sites. Moss mats or active stream sediments were passed through a -20 mesh screen, placed in a soil bag and later screened to -80 mesh. The -80 mesh was sent to Actlabs in Ancaster Ontario. A 30g sample was encapsulated, irradiated and tested by INAA. Au +34 ID enhanced - Au, W, Sn, Ta rare earths etc.

Eleven (11) pan concentrate samples were taken at 11 of the 17 silt sample sites. A gold pan was filled with -8 mesh silt from active stream sediment. The sample was panned down to about 1 lb., pulverized and a 30 gram sample was sent to Actlabs. Samples were tested by INAA Au +34 ID enhanced.

Forty-three (43) float samples were taken, then crushed and pulverized. Thirty gram samples were sent to Actlabs and tested by INAA, Au +34 - ID enhanced.

Twenty-seven (27) bedrock samples were taken, then crushed and pulverized. Thirty gram samples were sent to Actlabs and tested by INAA, Au +34 - ID enhanced.

Second Trip

Two (2) silt samples were taken at HS1 and sent to Actlabs and tested by INAA, Au +34 - ID enhanced. They were also tested separately for Mb (niobium) and Sn (tin).

Forty-one (41) float samples were taken, crushed, pulverized and sent to Actlabs and tested by INAA, Au +34 - ID enhanced.

The results were generally disappointing. In silts the highest values were 361 ppb Au, 36.1 ppm Ta, 130 ppm W.

In pan concentrates the highest values were 23,800 ppb Au, 37.4 ppm Ta, 100 ppm W.

In float the highest values were 7 ppm Au, 24.7 ppm Ta and 5 ppm W (rest = 0).

In bedrock the highest values were 8 ppb Au, 3.2 ppm Ta and 27 ppm W.

No tin was detected except in the second trip; special test for tin.

Dates worked: J. Peter Ross - July 19-31, August 1-14, September 26-30, October 1-8, 2001. One day of sample preparation; August 16.

Paul Wodjack BC geologist from Smithers visited the site on July 20.

Chapter Three: GEOCHEMICAL SURVEY

3.1 Soil Sample Geochemistry

No soil samples were taken.

3.2 Silt Sample Geochemistry

Sample sites were marked by blue and yellow flagging tape. At HS3, a second sample HS3-sand was taken to compare a rocky area to a sandy area.

3.3 Pan Concentrate Sample Geochemistry

Only 11 of 17 silt sample locations were adequate for good pan concentrates.

3.4 Float Sample Geochemistry

Sample areas were marked with red flagging tape. Some were cut by diamond saw for study. A representative piece was kept of each sample.

3.5 Bedrock Sample Geochemistry

Sample areas were marked with red flagging tape or red spray paint. Representative pieces were kept of each sample.

3.6 Interpretation

I chose this area because of silt sample #9152. Sample HSl was taken at this site?!

	Sample 9152	HS1	HS18	HS19
Ta	76.0 ppm	13.4	20.1	36.1
W	520 ppm	55 ppm	67 ppm	130 ppm
Sn	507 ppm	-	76 ppm	95 ppm
Th	189 ppm	72.6 ppm	74.8 ppm	12.1 ppm
U	142 ppm	44.6 ppm	43.6 ppm	65.4 ppm

On the second trip I re-sampled HS1 and went to sample the lower end of the gravel bars; samples HS18 and HS19.

Since 200 ppm Ta is considered to be an economical grade; 76 ppm was a good lead. I hoped to get higher Ta values as I approached a Ta system. However Ta values were erratic.

By panning I could not concentrate Sn or W; they are probably in very fine pieces and far from the source. Gold however was concentrated in 4 areas, 2 spectacularly so.

On my first trip I concentrated on pegmatites and greissens with albite silicification. I sampled a lot of bedrock areas. I tried to get a sample of each type of rock and also tested rocks I thought were strange or altered. One rock float HF43 ran 24.7 ppm Ta. Fine grained blue grey dyke (black specs) is a pegmatite.

On my second trip I concentrated on float/bedrock with veins, dykes or stringers. I spent my time mostly in the creek bottom, trails and cracked open a lot of rocks.

At one location I took 2 silts. HS3 was in a rocky area. HS3-sand was in a sandy area. There was no noticeable difference in the results.

I used my tungsten lamp for the first 5-6 silt/pan concentrate samples. No scheelite was seen. If tungsten is present it probably is wolframite, a black non-fluorescent mineral.

At HS2, where a trail crosses the stream I took a pan sample in an area of fast water (the pan to the side was from calmer water). I found 3 coarse pieces of gold on top of the screen (+8 mesh), one piece had quartz attached to it. The 3 pieces of gold did not go into the sample. About ± 30 colours were seen. No scheelite was noticed. Strange brown/black crystals were seen.

I came back the next day and took 6 pans, put the concentrate into a vial and sent to my friend Bob Stirling who used a gold spiral to separate about 0.1 grams of gold. No scheelite was seen. I have the vial for further study. The gold is coarse, small and some crystal structure; also some quartz attached!

Bedrock was never seen on the creek bottom. Many outcrops were seen as walls of the creek and on ridges. Boulders were common, up to 10 feet across. Glacial till is everywhere. There is very little fine silt in the creek! It took a lot of work to enough -20 mesh material for a silt sample.

Placer production is noted as 373 grams from 1916 to 1918. However I saw 2 old cabins (1930's ?), 6x6 boulders that had been dug out, under and around, 5 wing dams, a few flumes, lot of ditches, (one elevated 20 feet in elevation, numerous piles of cut logs, rows of clean boulder piles, hillsides are full of old stumps. And an old "whipsaw" lumber set-up on a hillside. There is also a trail from the lake (camps; tent frames?), a tote trail (full of water and swampy in many places). A cat has pushed a trail almost up to the cabin (just below HS6). The uppermost wing dam was at HS56. There is no evidence of placer work above it.

I am not a placer miner. I gave my data and ideas to Bob Stirling in return for a 5% royalty in case he decides to stake and test it and develop it into a placer mine.

3.7 Conclusion

I did not find any rocks that had Sn or W mineralization, except for 3 rocks that had low Ta - 24.7, 11.7, 17 ppm. The rest of the samples were lower than 10 ppm.

Sn, W, and Ta are fine grained i.e.) I could not concentrate this in a pan. I can then say probably there is a Ta, Sn, W system in the Surprise Lake area. It is probably not on my UWUSSYS claims.

The gold source may be on my UWUSSYS claim group. The gold is coarse, some has quartz attached, crystal structure, and is not flattened by glacial activity.

Chapter Four: PROSPECTING

As Ta values are erratic throughout the Surprise Lake Batholith; the price of Ta is low now; prospecting for Ta now is a very low priority. Perhaps a Ta system is present up glacial till movement from my claim group.

The gold potential for hard rock Au deposits is high in my opinion, but the source may be off my claim group.

Appendix 1

References

High Tech Metals in B.C. Information Circular 1990-19.

Vein Type Tungsten Deposits of China and Adjoining Regions. Ore Geology Rev. 8(1993) p. 233-246.

Columbium (Nb) and Tantalum Memorandum Series #135 (1957).

Numerous Articles, Brochures on Tantalum and Niobium.

GSC Rock Kit (Uganda Ta placer sample) Ta and Nb samples.

BC RGS 51, 104 N Atlin Geochemical Survey.

BC Minfiles. 026 - Horse Creek, 18 - Quartz creek, 129 - B+B, 130 - Granite Creek, 134 - Daybreak.

Memoir GSC #307. J.D. Aitken Map Atlin 1959.

Personal Communication

W.D. Sinclair, GSC Ottawa, Ontario
Ray Lett, Geological Survey, B.C.
John Kowalchuk, Rock Resources, Vancouver B.C.
George Simandl, Geological Survey, B.C.
Tom Gledhill, Geologist, Toronto, Ontario. Part owner OKA Nb mine, P.Q.

BC
Ministry of Energy, Mines and
Petroleum Resources
Mineral Resources Division
Geological Survey Branch
Hon. Jack Davis, Minister

HIGH-TECH METALS IN BRITISH COLUMBIA

BY JENNIFER PELL AND Z.D. HORA

INFORMATION CIRCULAR 1990-19

BRITISH COLUMBIA GEOLOGICAL SURVEY

FOREWORD

Recent technological breakthroughs in the fields of ceramics, medicine, aerospace engineering and electronics, in particular the areas of computers and superconductors, are creating new uses for a variety of rare and minor metals. These include zirconium (Zr), hafnium (Hf), yttrium (Y), rare-earth or lanthanide elements (REE), germanium (Ge), gallium (Ga), niobium (Nb), tantalum (Ta) and beryllium (Be). As a result, there is now considerable interest in economic deposits of these metals, however, most geologists and prospectors are unfamiliar with these commodities and the geological environments in which they occur.

With the exception of a minor amount of byproduct recovery of gallium and germanium from Cominco's Trail smelter, none of these metals is currently produced in British Columbia. The purpose of this Information Circular is to increase awareness of these commodities and to provide the background information which will hopefully lead to new discoveries of these resources.

For additional information, phone or write:

British Columbia Geological Survey Branch
Industrial Minerals Unit
Ministry of Energy, Mines and Petroleum Resources
Parliament Buildings
Victoria, British Columbia
V8V 1X4

Tel: (604) 356-2846
Fax: (604) 356-8153

NIOBIUM AND TANTALUM

USES

Niobium, which is also referred to as columbium, is a metal used as an alloying element in the production of high-temperature specialty steels (high-strength, low-alloy, or HSLA steels) and superalloys used in heavy equipment, ships, structural steels and in nuclear, aerospace and pipeline applications. The addition of a small amount of niobium to steel helps control the grain size and thereby improves mechanical properties and strength-to-weight ratios. It also improves the heat resistance of steel which allows its use in gas and steam turbine engines, aircraft and aerospace power systems and heat shields on rocket nozzles. Niobium also has important potential as a superconductor of electricity at cryogenic temperatures (Griffith, 1970).

Tantalum is a relatively rare, heavy, inert metal that is used in electronics, chemical processing equipment, metal-cutting tools and high-temperature steel alloys. Tantalum capacitors are used in solid-state circuitry for computer and communications equipment used in space, defense and industrial fields. It is also used in electronic tubes, battery chargers, transistors and voltage-surge arresters. Because of its resistance to corrosion and good thermal conductivity it is used extensively in chemical and metallurgical processing equipment and laboratory ware. Tantalum is completely inert to human body fluids and can therefore be used in numerous medical applications such as screws to hold bones together, surgical staples to close wounds, replacement joints and bone parts (Griffith and Sheridan, 1970).

OCCURRENCE-GEOLOGICAL SETTING

Niobium is the 33rd most abundant element in the earth's crust, which contains 24 ppm on average. The principal niobium-bearing mineral is pyrochlore, a niobium-titanium-calcium oxide, although other niobium-bearing species, such as columbite and fersmite, are also known. It is principally concentrated in carbonatites and related alkaline rocks; the Aley prospect in northern British Columbia is a good example of this type of deposit. To a lesser extent, niobium is also found in alkaline granite-syenite complexes, such as Thor Lake, N.W.T., associated with other 'high-tech' elements, or in pegmatites and tin deposits associated with volatile-enriched granite systems.

Tantalum is a relatively rare element, the 54th most abundant in the earths crust, where it has an average abundance of 2.1 ppm. It is generally associated with tin in skarns, greissens and pegmatites related to volatile-enriched granite systems. Tantalum is mined from the Tanco pegmatite, near Winnipeg, Manitoba. It also occurs in alkaline granite-syenite systems, as at Thor Lake, N.W.T. and Strange Lake, Labrador, and may also be present in carbonatites, generally in the mineral pyrochlore. In carbonatites and alkaline rocks the niobium/tantalum ratios commonly exceed 100, whereas in granitic rocks they average 4.8 (Currie, 1976). The exception are carbonatites in Blue River area, B.C. where niobium/tantalum ratio is 4.

Niobium occurs in all carbonatite complexes in B.C.; however, in most it is present in subeconomic concentrations, generally less than 0.3 per cent Nb_2O_5. The Aley carbonatite complex appears to have the greatest potential of any carbonatites so far discovered in this province. Work by Cominco Ltd. since 1982 has defined extensive zones containing between 0.66 and 0.75 per cent Nb_2O_5, and localized areas containing in excess of 2 per cent Nb_2O_5 (K. Pride, personal communication 1988), grades that easily rival the Niobec deposit at St. Honoré, Quebec. In light of the current soft niobium market, this deposit is not currently being developed.

Tin-bearing mineralization is associated with specialty granites in northern British Columbia in the Cassiar district and in some areas in the south of the province, but little information is available on the tantalum potential of these rocks. No tantalum pegmatites are known in British Columbia.

ECONOMICS

The majority of the world's niobium is produced from carbonatites and residual weathered zones overlying carbonatite complexes. Approximately 85 per cent of total world production comes from Brazil, where pyrochlore has been concentrated by residual weathering to grades in the order of 3 per cent Nb_2O_5. In Canada, niobium is being mined by Niobec Inc. at St. Honoré, near Chicoutimi, Quebec, where grades are 0.5 to 0.67 per cent Nb_2O_5. Minor amounts are recovered as byproducts from placer tin placer mining in Nigeria. In 1988 and 1989 niobium concentrate (containing approximately 60 per cent Nb_2O_5 in pyrochlore or columbite) sold for $2.25 to 2.65US per pound, which was considerably down from the mid-1980s price of around $4.00US per pound.

Tantalum is principally recovered as a coproduct of mining, tin lodes, tin placers and beryllium-tin-niobium pegmatites (Griffith and Sheridan, 1970). The principal tantalum-producing countries are Zaire, Nigeria, Brazil, French Guiana, Mozambique, Thailand, Australia, Malaysia, South Africa and Canada. In 1989 tantalite sold for about $39US per pound of contained tantalium pentoxide.

Pyrochlore crystals from the Blue River carbonatite, British Columbia.

POTENTIAL TARGETS IN BRITISH COLUMBIA

"High-tech" elements are commonly hosted by, or associated with the rock types identical in the accompanying table. In British Columbia, a number of carbonatite-syenite complexes and volatile-rich or "specialty" granites have been discovered and others may be recognized in the future. These rocks are good exploration targets for a number of the "high-tech" elements and will be described in more detail in the following sections. Carbonate-hosted lead-zinc and volcanogenic massive sulphide deposits are present in British Columbia; some are known to have anomalous concentrations of gallium and germanium and therefore should always be analyzed for those two elements.

Peralkaline granite-syenite complexes are important in that they may host significant quantities of a number of "high-tech" metals. Copper-rich breccia pipes are important potential gallium and germanium hosts. Neither of these environments have been recognized in British Columbia; however, brief descriptions are included in this report as no *a priori* reason exists for their absence. Bauxite deposits do not occur in British Columbia; the conditions for their formation (deep tropical weathering) never existed in this part of the world. Other deposit types mentioned are less important and, while they should not be overlooked by the prospector or geologist, will not be dealt with in any detail here.

CARBONATITE - SYENITE SYSTEMS

Carbonatite/syenite complexes are mined for lanthanides, yttrium and niobium. They may also contain significant concentrations of zirconium and can be anomalous in tantalum. In Africa, Brazil and the U.S.S.R. they are also mined for associated copper, phosphate (apatite), iron and vermiculite. Nepheline syenite is quarried in Ontario for use in the glass industry (Currie, 1976). In the Jordan River area of British Columbia, northwest of Revelstoke, molybdenum associated with a nepheline syenite gneiss complex was extensively explored in the late 1960s (Fyles, 1970).

DESCRIPTION

Carbonatites are igneous rocks composed of more than 50 per cent primary carbonate minerals, predominantly calcite or dolomite. Common accessory minerals include olivine, pyroxene (often sodic), amphibole (also, often sodic), phlogopite, apatite, magnetite, ilmenite, zircon columbite and pyrochlore. Other minerals such as feldspars, fluorite and rare-earth carbonates may also be present. Carbonatites occur most commonly as intrusive bodies; they may form as dikes, sills, plugs, veins or segregations in other alkaline rocks. Less common are extrusive carbonatite flows, tuffs or agglomerates. Metasomatic rocks (fenites), which are generally enriched in sodium and ferric iron and depleted in silica, are often developed marginal to intrusive carbonatites or carbonatite complexes.

Carbonatites can be associated with nephelinite or nephelinite/nepheline syenite complexes (*e.g.* the Ice River complex near Field, B.C.; Currie; 1975, 1976), with nepheline or sodalite syenites only (*e.g.* Paradise Lake carbonatite, near Blue River, B.C.; Pell, 1987), or with weakly alkaline syenites (*e.g.* Lonnie complex, near Man-

ROCK TYPE/DEPOSIT TYPE	ASSOCIATED ELEMENTS
Carbonatite-syenite complexes	Nb, Y, REE, Zr, (Ta)
Volatile-rich granite systems	Be, Ta, Y, Ree, Nb
*Peralkaline granite-syenite systems	Be, Nb, Ta, Y, Ree, Zr, Ga
Carbonate-hosted lead-zinc deposits	Ga, Ge
Zinc-rich volcanogenic massive sulphide deposits	Ga
*Sediment-hosted, copper-rich breccia pipes and oxidized equivalents	Ga, Ge
*Bauxite deposits	Ga
Coals	Ge
Iron oxide deposits	Ge
Sedimentary phosphorites	Y

* *Not known to occur in British Columbia*

son Creek, B.C.; Currie, 1976; Pell, 1987). The nephelinites associated with carbonatite complexes contain varying amounts of pyroxene (generally sodic or titanium-bearing) and nepheline. Nepheline and sodalite syenites generally contain potassium feldspar, nepheline and plagioclase feldspar with or without sodalite, with biotite or pyroxene as the common mafic phase. Weakly alkaline syenites do not contain feldspathoids. In all cases, the associated rocks are devoid of quartz as with the carbonatites.

In the field, carbonatites resemble marbles or other carbonate rocks, but in British Columbia most can be recognized by their unique orangish brown to dark reddish brown weathering colour, unusual mineral assemblage (apatite, olivine, pyroxene, magnetite, zircon, *etc.*) and anomalous radioactivity (the scintillometer is a useful prospecting tool). Other distinctive minerals such as purple fluorite may also be associated with carbonatite complexes. The most common associated igneous rock types are quartz-free syenites and nepheline or sodalite syenites which are usually white to greyish weathering. When present, nepheline can be identified in hand specimen by its slightly greyish colour and greasy lustre, while sodalite can be easily recognized by its distinctive ultramarine blue colour.

The fenites, or metasomatic alteration zones associated with intrusive carbonatite complexes, vary from being almost non-existent to forming halos extending several hundreds of metres into the hostrocks. Their nature is also highly variable, dependant on the original lithology and the composition of the fluids associated with the alkaline rocks. In general, calcsilicate and biotite-rich hostrocks are altered to sodic pyroxene and amphibole-rich rocks; quartzo-feldspathic protoliths (granites or quartz and feldspar-rich sedimentary rocks) are altered to rocks of syenitic or monzonitic composition; and carbonate hostrocks are altered to iron and magnesium-rich carbonates that may contain fluorite and rare-earth minerals.

Geochemically, carbonatites and related alkaline rocks are undersaturated with respect to silica and may contain high concentrations of elements such as strontium (generally 1000 ppm), barium, niobium and rare earths. Mineralization generally occurs in primary magmatic deposits; commonly, rare metal enriched phases, crystallized directly from the melt, occur as accessory or, less commonly, rock forming minerals.

DISTRIBUTION

In British Columbia, carbonatites, syenite gneisses and related alkaline rocks are present in a broad zone which follows the Rocky Mountain Trench. They occur in three discrete areas (Figure 2): along the western edge of the Foreland Belt, east of the Rocky Mountain Trench and immediately east of the Trench in the Cassiar Mountains (northeastern Omineca Belt); along the eastern edge of the Omineca Belt; and within the Omineca Belt in the vicinity of the Frenchman Cap dome, a core gneiss complex.

Carbonatites and related rocks in the Foreland and northeastern Omineca belts are generally present in large, multiphase intrusive and extrusive complexes with extensive metasomatic or contact metamorphic alteration halos overprinting Middle Cambrian to Middle Devonian miogeoclinal hostrocks. Carbonatites along the eastern margin of the Omineca Belt are found westward from the Rocky Mountain Trench for 50 kilometres or more. All the intrusions within this belt are hosted by late Precambrian (Upper Proterozoic) to early Cambrian metasedimentary rocks. They form foliated sill-like bodies and are associated with only minor amounts of fenitization. Along the margins of the Frenchman Cap gneiss dome, intrusive and extrusive carbonatites and syenite gneiss bodies are conformable in a mixed paragneiss succession of probable late Proterozoic to Eocambrian age (Pell and Höy, 1989; Pell, in preparation).

Alkaline igneous rocks intruding Paleozoic strata in the Foreland and northeastern Omineca belts are of Devono-Mississippian and possibly Silurian ages. Carbonatites and syenites hosted by Precambrian rocks in the eastern Omineca Belt are predominantly Devono-Mississippian. All have been deformed and metamorphosed to some degree; those in the Foreland and northeastern Omineca belts were subjected to sub-greenschist to greenschist facies metamorphism, while those elsewhere in the Omineca belt attained upper amphibolite facies (Pell and Höy, 1989; Pell, 1987, and in preparation).

Carbonatites with the best economic potential for "high-tech" elements appear to be those of mid-Paleozoic age hosted by Paleozoic sediments that are found in the Rocky Mountains and eastern Cassiar Mountains, however, carbonatites found elsewhere should not be overlooked.

VOLATILE-RICH GRANITES

In many parts of the world, "specialty" or volatile-enriched granitoids of 'topaz rhyolite' affinity are metallogenically linked to deposits of a variety of high-tech metallic and non-metallic minerals such as beryllium, yttrium, rare-earths, niobium and to deposits of tin, tungsten, molybdenum and possibly gold. Important deposit types include: Climax-type molybdenum-tungsten porphyries; silver-lead-zinc manto deposits, such as Santa Eulalia, Mexico and Midway, British Columbia; tin skarn deposits; replacement fluorite deposits, for example Las Cuevas, Mexico or beryllium deposits such as Spor Mountain, Utah.

Description

Volatile-enriched or "specialty" granites may be of two types. The first are generally not true granites, in the strictest petrographic sense, but are commonly alaskites (alkali feldspar granites). They have a low colour index and contain few mafic minerals; biotite is the most common and alkaline clinopyroxene (aegirine) or alkaline amphibole (riebekite or arfvedsonite) may also be present. Accessory minerals may include titanite (sphene), magnetite, apatite, zircon, allanite, fluorite, melanite garnet and monazite. Miarolitic cavities lined with quartz, feldspar, biotite, fluorite and alkaline amphiboles are commonly developed. Quartz syenites are also often present in zoned intrusions with the alaskites. Associated mineralization generally consists of one or more of molybdenum, tungsten, tin, fluorine, uranium, thorium, niobium, tantalum, yttrium or rare-earth elements in vein, greissen, skarn, porphyry or pegmatitic deposits (Anderson, 1988).

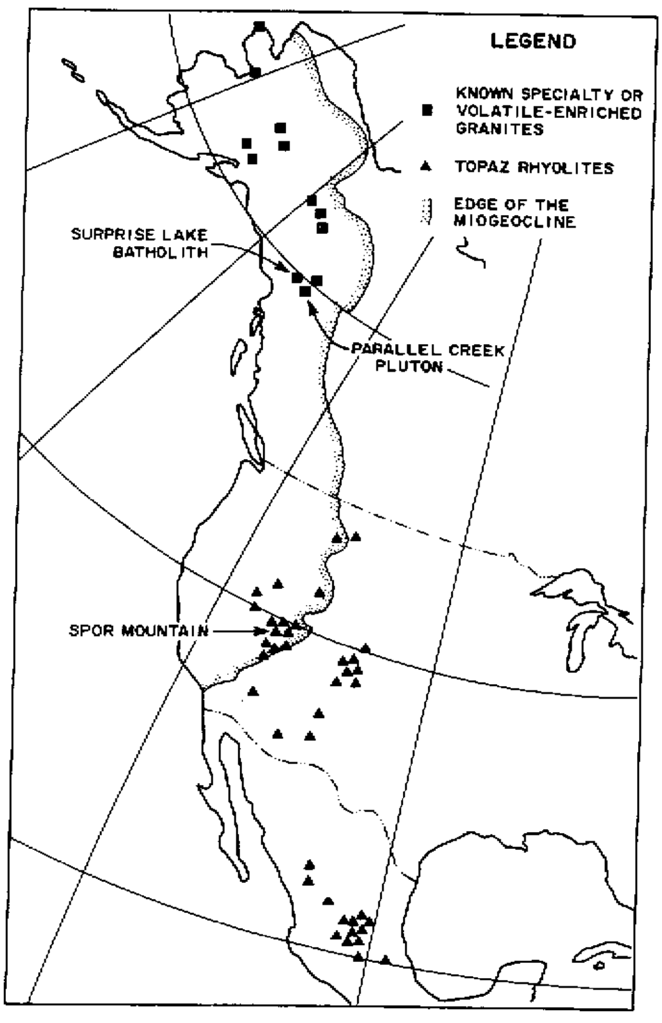

Figure 3. Distribution of specialty granites in western North America.

Two-mica granites, or more accurately, quartz monzonites may also be enriched in volatile elements. These rocks commonly have low colour indexes and contain plagioclase, potassic feldspar, quartz, muscovite, biotite and accessory tourmaline, fluorite, ilmenite, monazite and topaz. Miarolitic cavities containing quartz, feldspar and tourmaline are commonly developed. As is the case with the previous example, quartz syenites are common plutonic associates. Mineralization related to these granitic rocks may consist of tin, tungsten, copper, beryllium, zinc and, to a lesser extent, molybdenum in skarn, greissen or vein deposits (Anderson, 1988; Swanson *et al.*, 1988).

In both cases, the granitic rocks are characterized by high silica contents (SiO_2 >70 wt%), K_2O > Na_2O, relatively low TiO_2 and high concentrations of associated volatile-enriched elements such as fluorine. In general, they are peraluminous to peralkaline in composition. As well, $^{87}Sr/^{86}Sr$ isotopic ratios are commonly greater than 0.708, although the alaskites may have strontium ratios as low as 0.703. In western North America, most volatile-enriched granitoids are late Cretaceous to early Tertiary in age (Anderson, 1988; Barton, 1987).

The volatile-enriched granite environment can be most easily recognized by its geochemical signature or by the recognition of petrologic features such as miaroli cavities or accessory minerals such as fluorite. Regional geochemical surveys are a good prospecting tool; granitic bodies with associated fluorine, tin, tungsten, uranium and molybdenum anomalies are potential hosts for deposits of "high-tech" metals, particularly rare earths, yttrium, beryllium, niobium and tantalum. As previously mentioned, the deposits can occur in many forms, such as skarns, greissens, veins and pegmatites. In many cases, the mineralization is not obvious; some tin-fluorite skarns known as wrigglites (Kwak, 1987) look more like banded metasediments than conventional skarns. In exploring for these deposits any slightly unusual or altered rock should be carefully examined and, if in doubt, analyzed.

Distribution

A well-defined belt of topaz rhyolites and specialty granites exists north and south of British Columbia within the Cordillera (Figure 3), with numerous examples in the western United States and Mexico (Barton, 1987; Burt *et al.*, 1981, 1982; Christiansen *et al.*, 1986; Ruiz *et al.*, 1985) and in Alaska and the Yukon (Anderson, 1986; Ballantyne *et al.*, 1978, 1982, 1983; Mitchell and Garson, 1981; Sinclair, 1986; Taylor, 1979). With the exception of the Surprise Lake batholith near Atlin, and the Parallel Creek batholith between Cassiar and Teslin Lake (Ballantyne and Ellwood, 1984), no examples have been documented in British Columbia. However, there are a number of indirect indicators - namely fluorine and uranium anomalies in stream waters and silts, in some

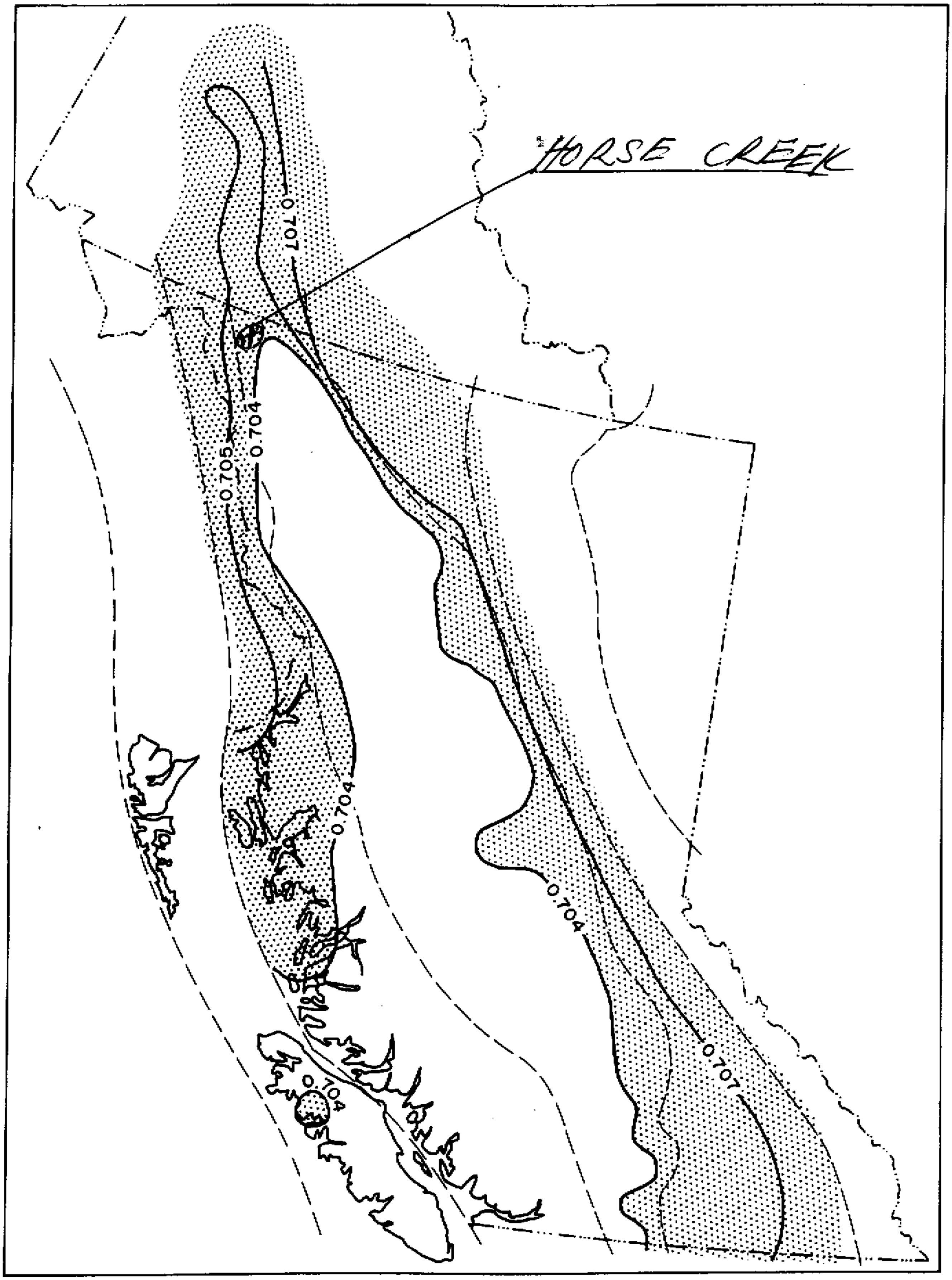

Figure 4. Map of the Canadian Cordillera showing Mesozoic $^{87}Sr/^{86}Sr$ initial ratios.

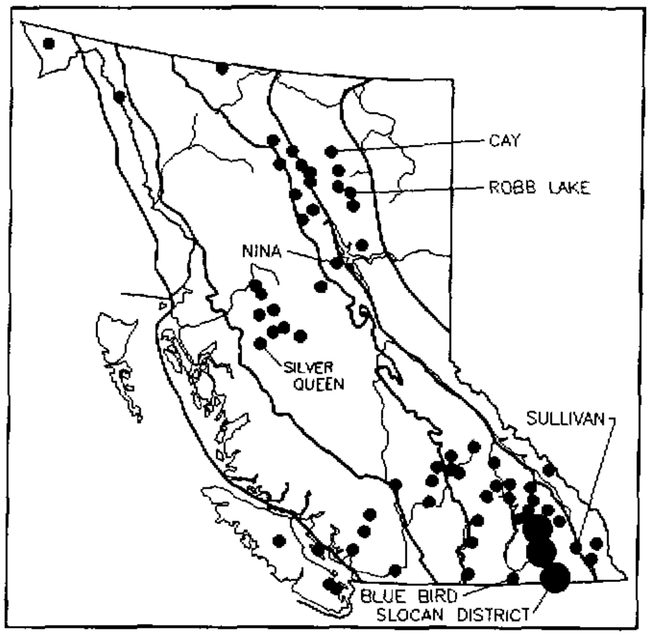

Figure 5. Location of lead-zinc deposits in B.C.

cases with coincident tin, tungsten and molybdenum anomalies, that point to the possible presence of these metallogenically important rocks in British Columbia. Isotopic evidence (Armstrong, 1985) indicates that volatile-enriched granites could possibly exist anywhere in the Cordillera where initial $^{87}Sr/^{86}Sr$ are greater than 0.704, that is areas underlain by Precambrian basement or tectonically reworked Precambrian basement or Proterozoic continent-derived clastic sedimentary rocks (Figure 4).

LEAD-ZINC-COPPER DEPOSITS

Lead-zinc-copper accumulations occur in many geological environments, forming carbonate-hosted (Mississippi Valley type) deposits, volcanogenic massive sulphide deposits (Kuroko type, Beshi type, *etc.*), sedimentary exhalative deposits (Sullivan type), skarns, mantos and veins. Trace metals, in particular gallium and germanium, can be concentrated in these deposits, commonly within the sphalerite lattice or as discrete mineral grains (*e.g.* germanite) forming inclusions within sphalerite or along sphalerite grain boundaries, however, concentrations vary greatly from deposit to deposit. Carbonate-hosted deposits, as a class, have the best potential for containing anomalous germanium concentrations. Zinc concentrates from these deposits may contain as much as 6000 ppm germanium. Individual carbonate-hosted or sedimentary exhalative deposits can be extremely anomalous with respect to gallium (in excess of 600 ppm Ga in sphalerite concentrates), but volcanogenic massive sulphide deposits, on average, have higher gallium contents (Leighton *et al.*, 1989).

It is beyond the scope of this review to deal in detail with all lead-zinc deposits. Because of the wide range of geologic environments in which they form, they are found in a variety of localities and associated with rocks of varying ages. Studies to date (Leighton *et al.*, 1989) indicate that, in British Columbia, carbonate-hosted deposits contain the greatest concentrations of gallium and germanium. These trace metal enriched deposits, for example the Cay prospect in the Robb Lake belt, are commonly characterized by the presence of distinctive reddish orange sphalerite, an abundance of pyrobitumen and silicification. Any lead-zinc-copper prospect should be checked for the presence of trace metals; elevated concentrations of elements such as gallium and germanium could potentially raise a marginal prospect to economic status.

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Vein-type tungsten deposits of China and adjoining regions*

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ABSTRACT

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Taking the South China Tungsten Province as representative, this paper deals systematically with the geological setting, geometry, paragenesis, wallrock alteration, and geochemical characteristics of Asian vein-type tungsten deposits on the basis of data acquired since the 1970's. The regional metallogenic conditions and the genesis of the deposits are discussed. The large-scale distribution of vein-type tungsten deposits in Asia is inferred to be controlled by tungsten-enriched formations, multi-period and multi-stage granitic activity, and favourable tectonic environment. The deposits are not only controlled by magmatic differentiation, but also by the overall evolution of the continental crust.

Introduction

Asia is the world's dominant tungsten producing area, accounting for more than half of all tungsten reserves. South China is celebrated for its wolframite-quartz vein systems related to granitic intrusion, an important type of tungsten deposit in most other producing countries of Asia. However, tungsten vein deposits in South China exhibit a far more concentrated distribution than in the other regions, and include a greater proportion of large deposits. The present paper, however, considers the deposits to be representative, and discusses their common characteristics and metallogenesis.

*Due to different systems of transliterating Chinese into English, the spellings of proper names of people, geographic locations and stratigraphic units in this paper may be different from that used other papers; in particular, Xu K.Q. is the same person as the Hu K.Q. or Hsu K.Q. in other publications. [Editor's note].

General distribution of tungsten deposits in Asia

Tungsten deposits in Asia are mostly distributed in two continent-scale belts, namely the "Europe–Asia parallel belt" and the West Pacific "girdle". There is also minor tungsten mineralization in inner China and in the Indian subcontinent (Fig. 1).

The Europe–Asia parallel belt traverses Eurasia, lying mainly between 40° and 50°N and with an E–W strike. In Asia, it extends from Turkey through central Asia, Altai and Sayan ranges, Tienshan range, Mongolia, Transbaikal area, Yinshan range, and ends in Daxing'anling of China.

The West Pacific girdle is the most important tungsten belt in the world. It has more than half of the world's reserves and now accounts for close to one-half of the world's production, much of which is derived from wolframite-quartz vein deposits. The belt stretches from the Russian Far East, through northeastern China, the Korean peninsula, Japan, South

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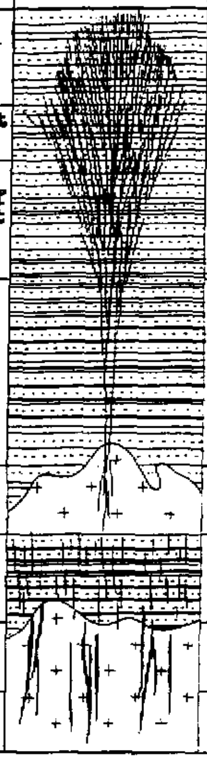

Type	Zoning		Cross section of deposit	Vertical distance, m	Width of vein zone, m	Total thickness of veins, m	Average thickness of vein, m	Numbers of vein per m	Wallrock alteration	Major metal minerals
Deposits of outer contact zone	I	Thread zone		1100–200	10–30	0.15–1.00	0.003–0.007	3–8	Tourmalinization Muscovitization Fluoritization	(1) Cassiterite Wolframite
	II	Veinlet zone		50–150	15–30	0.70–5.00	0.02–0.05	2.5–6	Muscovitization Silicification Tourmalinization	(2) Wolframite Cassiterite Sulfides etc.
	III	Mixing zone of veinlet-thick veins		150–250	5–15	0.85–5.50	0.40–0.20	1.5–2.5	Silicification Sericitization Biotitization Pyritization K-feldspathization	(3) Wolframite Scheelite Cassiterite Bismuthine Sulfides etc.
	IV	Thick vein zone		200–450	2–6	0.90–5.80	0.35–0.60	1–2	Silicification Muscovitization Biotitization	(4) Wolframite Scheelite Sulfides Molybdenite etc.
	V	Thin out zone		> 50	3–8	0.60–4.00	0.10–0.25	1.5–3	Silicification Greisenization K-feldspathization	(1) Molybdenite Wolframite Pyrite
Deposits of inner contact zone	I	Thread or veinlet zone		30–250	20–40	0.20–1.00	0.005–0.02	1–2	Muscovitization Tourmalinization Silicification	(1) Minor sulfides
	II	thick vein zone		50–120					Greisenization Silicification Albitization	(3) Wolframite Cassiterite Beryl etc. Nb,Ta minerals
	III	Thin out zone		>100					Silicification K-feldspathization	(1) Sulfides Molybdenite REE minerals

Fig. 4. Vertical zoning of vein-type tungsten deposits of South China (modified by Gu, 1982). Economic significance: (1) no value; (2) minor; (3) important; (4) the most important.

TABLE 4

Relation of the vertical mineralized span to shape and size of the vein-type tungsten deposits of South China

Type	Size of deposit			Shape of deposit (ratios)		
	mineralized span (m)	rich-ore span (m)	quantity of veins	depth: length	width: length	depth: width
Outer contact zone	400–800 (1100)	300–700 (1000)	30–100 (50–150)	0.5 (0.65)	0.21 (0.2)	2.9 (3.1)
Contact zone	300–600 (900)	300–450 (800)	divided between outer and inner contact zones			
Inner contact zone	250–500 (800)	40–200 (600)	100–500 (500–1000)	0.21 (0.26)	1.9 (1.9)	0.12 (0.14)

paragenesis of vein-type tungsten deposits. The association of tungsten and tin is a typical case. In the vein-type tungsten deposits of the Russian Far East, southwestern China and Southeast Asia, cassiterite is an economically important associated mineral, whereas it is usually secondary and no industrial value in other areas of Asia. Mo, Sb and rare metals display similar variations. Scheelite distribution is influenced by wall-rock lithology. In most cases,

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APPENDIX E

Element Maps

Sample Locations			Map	1
Bedrock Geology/Mineral Occurrences			Map	2
Gold	Au	INAA	Map	3
Antimony	Sb	INAA	Map	4
Arsenic	As	INAA	Map	5
Barium	Ba	INAA	Map	6
Bromine	Br	INAA	Map	7
Cerium	Ce	INAA	Map	8
Cesium	Cs	INAA	Map	9
Chromium	Cr	INAA	Map	10
Cobalt	Co	INAA	Map	11
Hafnium	Hf	INAA	Map	12
Iron	Fe	INAA	Map	13
Lanthanum	La	INAA	Map	14
Lutetium	Lu	INAA	Map	15
Molybdenum	Mo	INAA	Map	16
Nickel	Ni	INAA	Map	17
Rubidium	Rb	INAA	Map	18
Samarium	Sm	INAA	Map	19
Scandium	Sc	INAA	Map	20
Sodium	Na	INAA	Map	21
Tantalum	Ta	INAA	Map	22
Terbium	Tb	INAA	Map	23
Thorium	Th	INAA	Map	24
Tungsten	W	INAA	Map	25
Uranium	U	INAA	Map	26
Ytterbium	Yb	INAA	Map	27
Zirconium	Zr	INAA	Map	28
Cobalt	Co	AAS	Map	29
Copper	Cu	AAS	Map	30
Iron	Fe	AAS	Map	31
Lead	Pb	AAS	Map	32
Manganese	Mn	AAS	Map	33
Mercury	Hg	AAS-F	Map	34
Molybdenum	Mo	AAS	Map	35
Nickel	Ni	AAS	Map	36
Silver	Ag	AAS	Map	37
Tin	Sn	AAS	Map	38
Tungsten	w	COLOR	Map	39
Uranium	U	NADNC	Map	40
Zinc	Zn	AAS	Map	41
Uranium (waters)	UW	LIF	Map	42
Fluoride (waters)	FW	ION	Map	43
pH (waters)	pH	GCE	Map	44
Base Metal Anomaly Map			Map	45
Precious Metal Anomaly Map			Map	46
Sample Location Clear Overlay			in pocket	
Bedrock Geology Overlay			in pocket	
Mineral Tenure Overlay			in pocket	

Notes ...

- Concentration ranges listed on maps have been calculated using the raw 104N data set and are based on the 50th, 70th, 90th and 95th percentiles for all elements except pH. Concentration ranges for ph are based on the 5th, 15th, 85th and 95th percentiles.
- Only analytical results for the first sample of a field duplicate pair (REP = 10) are included on the maps. Results for the second sample (REP = 20) are ignored for all elements except gold. The gold map (Map 3) reports the field duplicate sample (REP = 10 or 20) or analytical duplicate sample (Au or Au2) returning the highest gold concentration.
- Sample site locations (UTM East, UTM North) are presented on the map as •.
- Refer to open file text for additional information on the interpretation of gold data, drainage basins and details on anomaly map methodology.

British Columbia Regional Geochemical Survey

BC RGS 51

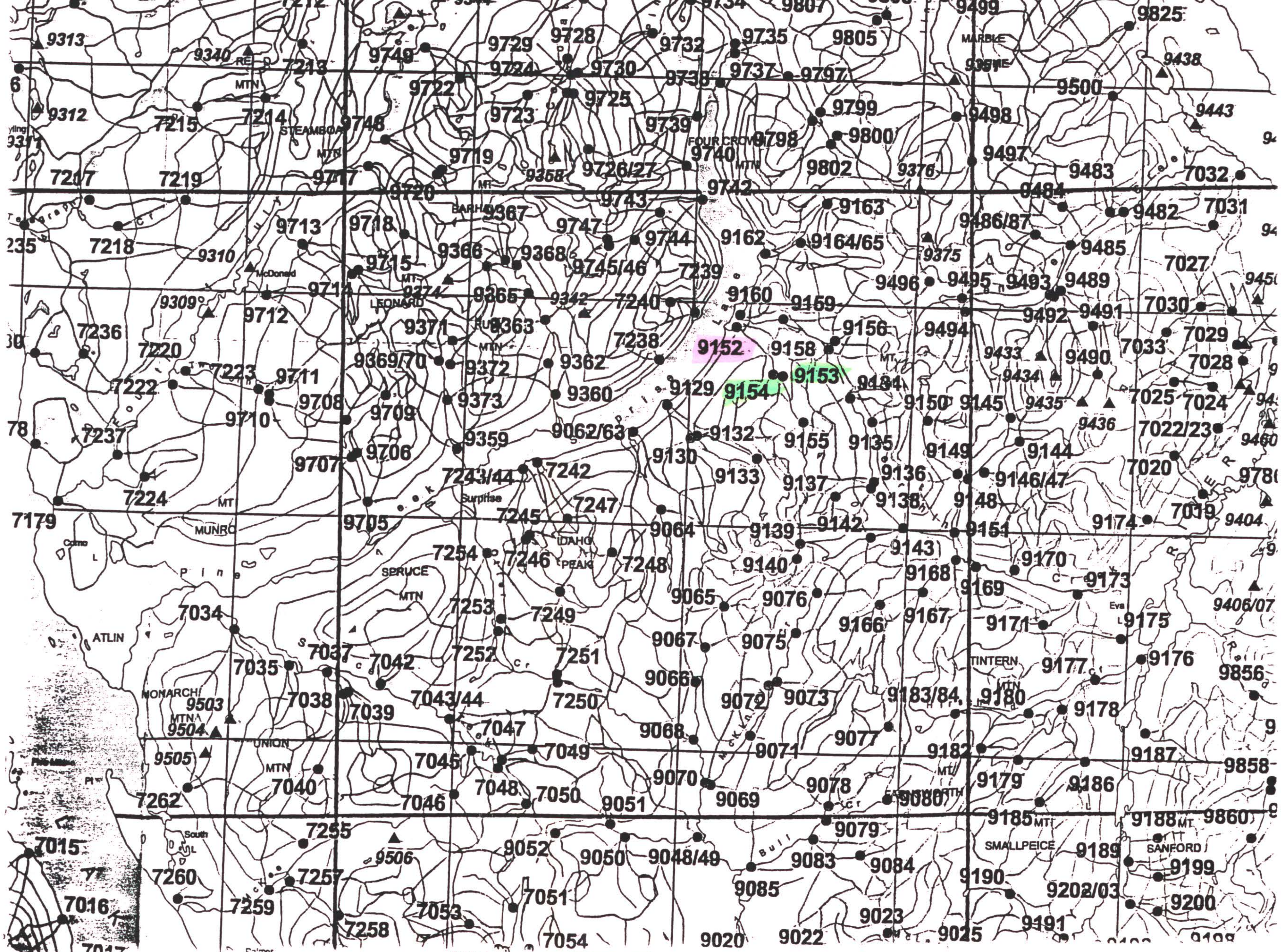
NTS 104N - Atlin

Appendix A

Field Observations and Analytical Data

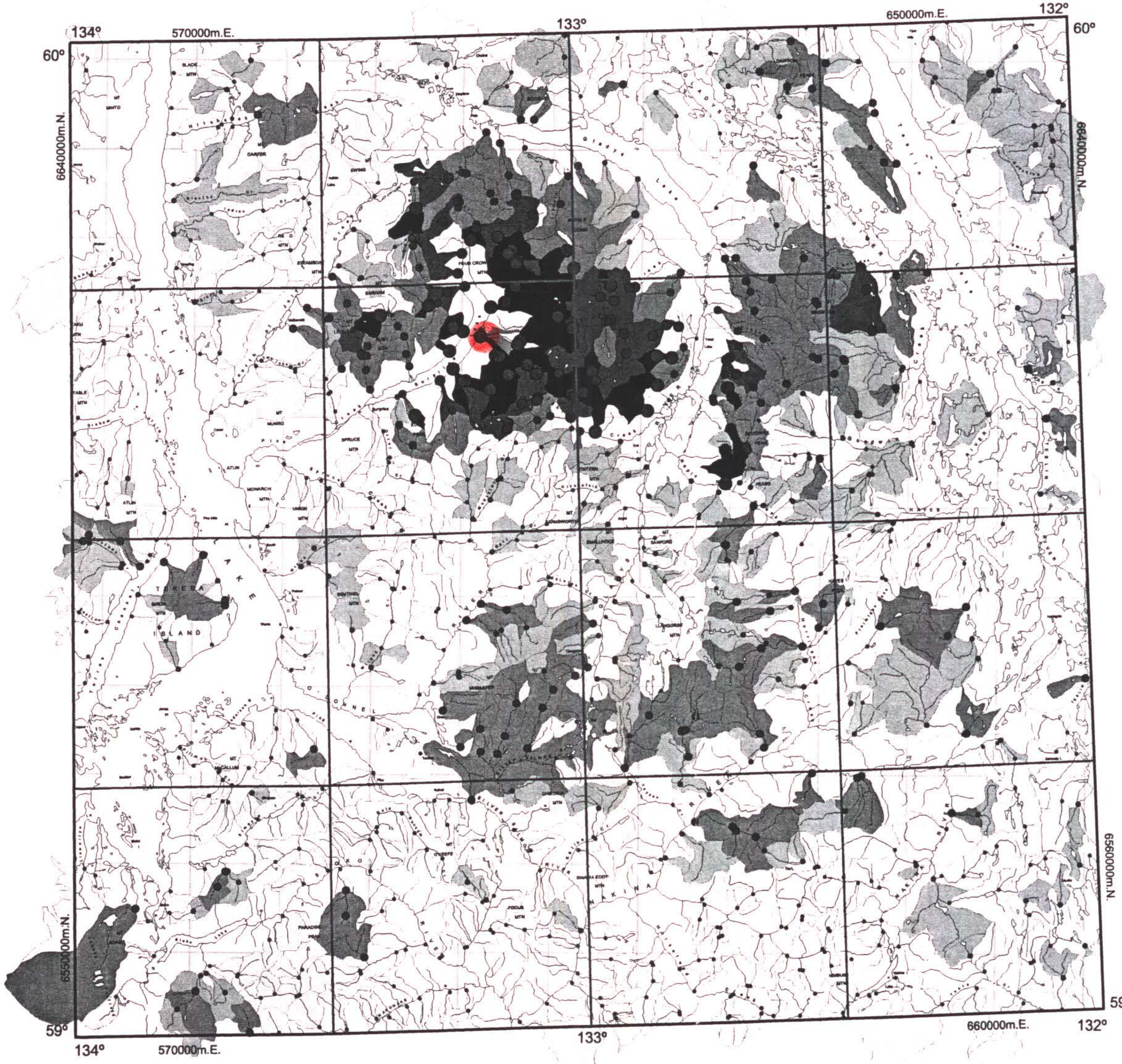
Notes:

- AAS data determined at levels below detection limit are listed as ½ the reported detection limit.
- Analytical duplicate data for gold is listed as Au2.
- Missing data is listed as blank.



01-33
(6)

9152 BEST SILT Ta, Sn, W, Th, U



B.C. Geological Survey Branch

British Columbia Regional Geochemical Survey

NTS 104N - Atlin

BC RGS 51

0 10 20 30

Kilometres

UTM Zone 8
NAD 83

HORSE CREEK PROJECT

Ta (ppm)

Stream Sediments

Concentration	Frequency
7.8 to 76.0	n = 43 (5.0%)
5.0 to 7.7	n = 40 (4.7%)
1.5 to 4.9	n = 164 (19.2%)
1.1 to 1.4	n = 164 (19.2%)
0.5 to 1.0	n = 443 (51.9%)

854 Sample Sites

01-33

Tantalum by INAA

(7)

Tantalum by INAA > 95th Percentile (7.7 ppm)

Stream Sediment and Water

MAP	SAMPLE ID	UTMZ ZONE	UTM EAST NAD83	UTM NORTH NAD83	STA	Au1 2 ppb INAA	Au2 2 ppb INAA	Sb 0.1 ppm INAA	As 0.5 ppm INAA	Ba 100 ppm INAA	Br 0.5 ppm INAA	Ce 10 ppm INAA	Cs 0.5 ppm INAA	Cr 5 ppm INAA	Co 5 ppm INAA	Hf 1 ppm INAA	Fe 0.2 % INAA	La 5 ppm INAA	Lu 0.2 ppm INAA	Mo 1 ppm INAA	Ni 10 ppm INAA	Rb 5 ppm INAA	Sm 0.5 ppm INAA	Sc 0.5 ppm INAA	Na 0.1 % INAA	* Ta 0.5 ppm INAA	Tb 0.5 ppm INAA	Th 0.5 ppm INAA	W 2 ppm INAA	U 0.2 ppm INAA	Yb 2 ppm INAA	Zr 200 ppm INAA	Wt 0.01 g	Co 2 ppm AAS	Cu 2 ppm AAS	Fe 0.02 % AAS	Pb 2 ppm AAS	Mn 5 ppm AAS	Hg 10 ppb AASF	Mo 2 ppm AAS	Ni 2 ppm AAS	Ag 0.2 ppm AAS	Sn 2 ppm AAS	W 2 ppm COLOR	U 0.5 ppm NADNC	Zn 2 ppm AAS	UW 0.05 ppb LIF	FW 20 ppb ION	pH 0.1 GCE
104N11	779152	8	602008	6618951	00	7		0.5	4.0	100	18.0	610	4.7	1180	12	104	4.5	346	10.0	1	59	170	56.1	10.0	1.8	76.0	12.0	189.0	507	142.0	41	4300	11.04	4	14	1.80	9	235	30	2	34	0.1	520	275	115.0	80	0.72	680	7.0
104N11	779148	8	612642	6612313	00	2	3	0.5	11.0	100	5.1	380	7.5	86	5	86	2.2	170	4.5	1	10	340	22.9	6.9	2.8	21.0	4.5	144.0	34	84.4	21	2600	12.92	2	10	0.90	24	150	10	1	2	0.1	120	20	75.0	285	1.00	780	6.6
104N11	779134	8	607218	6615819	00	2		0.5	3.8	740	3.7	360	5.9	78	5	74	3.7	160	2.7	1	10	190	22.5	12.0	2.6	18.0	3.8	52.3	13	32.2	14	3300	19.56	2	6	1.05	9	150	10	2	2	0.1	17	8	27.8	42	0.32	700	7.0
104N14	779498	8	611515	6628599	00	2		0.5	6.1	100	15.0	370	6.6	87	12	36	2.9	150	4.2	1	10	230	25.1	5.6	2.6	18.0	6.0	120.0	31	83.0	32	1500	5.62	5	12	2.45	15	525	50	4	8	0.1	3	35	81.2	98	0.90	560	6.5
104N11	779496	8	610581	6621180	00	2		0.3	2.3	100	7.9	280	8.0	46	5	37	1.5	120	3.6	1	13	310	17.3	3.6	2.9	17.0	3.6	91.2	74	63.3	17	1300	17.83	2	16	0.95	9	190	20	4	4	0.2	45	24	52.1	72	0.62	380	6.8
104N14	779798	8	605037	6628195	00	9		0.6	2.6	110	5.4	260	10.0	69	5	31	1.9	130	0.2	1	10	260	19.1	3.2	2.5	17.0	2.6	108.0	21	55.2	9	610	27.75	1	6	1.35	5	180	10	1	4	0.1	10	18	40.4	46	1.10	300	6.6
104N11	779495	8	612086	6620472	00	2		0.3	4.1	100	10.0	290	8.6	72	5	41	1.7	120	6.7	1	10	340	21.7	2.9	2.5	16.0	4.6	123.0	61	93.8	17	1600	25.18	2	18	1.15	13	325	20	4	4	0.2	40	26	71.4	110	0.74	700	6.7
104N11	777238	8	598579	6617375	00	2		1.5	60.0	100	1.7	110	23.0	46	5	11	1.4	49	5.3	1	10	503	18.4	3.5	2.8	15.0	4.7	65.2	16	79.6	21	200	24.04	1	14	1.15	72	335	10	4	6	0.1	15	18	56.6	182	2.20	2140	7.0
104N10	777020	8	621803	6613574	00	5		1.1	10.0	100	2.6	160	24.0	54	5	7	2.6	91	0.2	8	10	440	13.1	6.0	1.8	15.0	6.6	124.0	30	101.0	27	200	16.22	2	295	2.35	33	280	30	6	3	0.1	13	28	95.0	158	1.00	610	6.0
104N10	779146	8	613399	6612661	10	2		0.6	4.3	220	5.9	614	7.8	88	5	105	4.0	265	3.2	1	15	180	33.6	14.0	2.6	14.0	5.5	112.0	17	65.6	22	4000	7.62	2	10	1.70	22	255	5	2	4	0.1	12	18	57.5	80	0.50	1100	6.6
104N11	777240	8	598973	6619978	00	4		2.4	60.1	100	4.1	160	21.0	79	5	16	1.6	63	6.1	1	25	525	21.2	3.5	2.5	13.0	5.4	101.0	10	97.9	23	200	25.83	1	36	1.05	33	285	10	3	7	0.1	10	6	58.0	445	1.80	2250	6.4
104N11	779155	8	605143	6614701	00	2		0.4	8.7	100	7.8	390	9.1	73	5	55	1.9	190	4.8	1	10	260	28.5	6.3	3.0	12.0	5.1	117.0	19	79.6	21	2300	17.41	2	14	1.40	15	250	10	1	2	0.2	36	16	67.5	192	0.80	740	6.1
104N11	777247	8	594764	6610162	00	9		0.9	7.4	640	4.2	380	9.2	220	8	30	3.1	180	4.3	1	37	150	36.0	8.4	2.3	12.0	5.4	90.3	4	45.5	17	580	22.55	5	20	1.80	7	290	50	1	22	0.1	3	2	31.9	108	0.34	210	7.0
104N11	779153	8	604153	6616755	00	2		0.3	5.7	100	11.0	310	7.8	61	5	46	1.7	150	2.2	1	10	230	25.8	4.6	2.3	12.0	5.0	97.9	32	70.4	14	2000	12.99	2	10	1.25	12	200	10	2	2	0.1	44	28	58.6	138	0.78	1240	6.4
104N11	779156	8	606407	6618428	00	2		0.3	2.5	100	12.0	400	6.2	120	5	41	1.9	190	3.0	1	10	260	26.8	4.6	2.7	11.0	4.7	105.0	6	67.3	18	1600	12.36	2	8	1.20	22	215	10	1	4	0.1	21	6	58.9	148	1.30	760	6.6
104N11	779366	8	590772	6621351	00	5		2.4	71.9	340	1.4	150	6.4	53	5	21	1.5	67	1.1	99	10	370	13.1	3.0	1.7	11.0	2.3	48.9	221	30.2	7	1100	30.49	2	28	0.95	44	250	10	63	6	0.2	2	260	22.0	60	0.12	370	6.6
104N10	779170	8	614882	6608344	00	4		1.0	9.2	660	0.6	420	9.0	160	5	58	3.1	201	3.9	1	10	220	29.7	9.1	2.9	10.0	4.9	98.7	8	46.0	20	2100	31.24	3	16	1.60	57	300	10	1	8	0.1	12	10	32.9	108	0.08	520	6.9
104N11	779162	8	603159	6622223	00	2		0.4	1.4	100	8.1	200	5.0	180	5	20	1.8	97	0.5	1	10	230	13.0	3.0	2.9	10.0	2.3	55.2	6	67.4	13	1100	13.33	2	6	1.15	8	230	10	1	12	0.1	4	8	58.8	50	1.90	700	8.0
104N11	779158	8	606158	6618041	00	2		0.4	2.8	770	2.6	320	4.5	78	5	67	3.8	150	2.3	1	10	160	24.1	12.0	2.7	10.0	4.2	58.5	6	24.4	16	3100	18.98	2	6	1.25	8	200	10	1	2	0.1	7	2	19.6	56	0.50	370	7.2
104N11	779132	8	600390	6614026	00	2		0.4	4.2	100	7.7	380	6.9	74	5	43	1.3	190	5.2	1	10	250	25.9	4.6	2.6	10.0	4.5	67.4	17	113.0	13	1600	29.98	1	6	0.95	6	155	10	1	4	0.1	4	16	85.1	52	3.20	1500	7.1
104N14	779497	8	612323	6626629	00	9	2	0.3	1.7	100	6.6	190	8.5	22	5	16	1.6	70	1.1	1	10	270	10.7	3.7	2.6	10.0	2.5	75.7	6	60.8	15	600	7.72	2	8	1.20	11	175	20	2	6	0.1	4	6	58.7	94	0.82	520	6.8
104N14	779799	8	605388	6628585	00	8		0.6	2.4	100	12.0	230	12.0	97	5	18	2.1	100	0.2	1	10	240	15.3	4.2	2.5	10.0	2.8	85.4	9	128.0	15	200	20.69	3	8	1.45	6	385	30	1	8	0.1	6	4	98.1	68	2.00	440	7.0
104N11	779494	8	612231	6619883	00	2		0.5	11.0	100	7.7	250	11.0	72	7	17	2.7	80	4.0	1	10	340	18.4	6.2	2.3	10.0	5.1	113.0	13	86.8	26	580	16.05	3	28	2.00	24	395	40	3	14	0.1	5	6	75.7	166	0.70	720	6.5
104N11	779133	8	603158	6613046	00	3		0.4	5.2	100	6.1	350	8.9	5	5	38	1.7	170	4.0	1	10	230	25.0	5.7	2.7	9.3	4.8	76.8	10	82.6	17	1500	21.39	2	6	1.25	12	175	10	2	4	0.1	5	10	73.1	78	1.80	1400	7.0
104N14	779802	8	605899	6627174	00	7	8	0.4	2.0	100	6.1	190	7.8	92	5	21	1.8	83	0.2	1	10	240	10.3	3.5	2.8	9.2	1.9	62.2	12	48.1	12	510	8.62	1	6	1.10	5	210	10	1	4	0.1	7	8	40.6	42	0.92	800	7.1
104N11	779164	8	604707	6622744	10	2		0.4	1.5	100	10.0	190	6.2	77	5	20	1.5	79	0.7	1	10	250	15.3	3.0	2.8	9.2	3.2	73.8	4	84.1	14	770	20.99	1	8	1.20	13	315	10	2	6	0.1	5	4	70.3	68	2.50	700	6.8
104N11	779129	8	599013	6615350	00	5		0.5	5.8	340	8.8	290	6.0	350	5	34	2.4	150	6.6	1	24	200	19.0	8.3	2.6	9.1	3.3	51.3	11	136.0	15	1300	24.81	4	10	1.35	6	235	20	2	20	0.1	12	8	108.0	62	5.60	950	7.0
104N11	779135	8	608224	6614786	00	2	2	0.4	4.0	590	17.0	420	6.6	45	5	48	2.5	180	1.4	1	10	170	22.1	8.8	2.6	9.0	3.6	62.4	10	32.7	12	2200	7.03	2	6	1.40	13	225	5	1	2	0.1	5	8	27.4	58	0.10	360	6.9
104N11	779149	8	612169	6612539	00	2		0.6	11.0	310	6.0	400	6.9	110	5	45	1.7	180	2.5	1	10	290	22.8	5.0	2.8	8.8	4.0	88.9	11	45.1	14	1500	16.93	1	6	0.85	18	140	10	2	4	0.1	34	8	37.0	126	0.46	860	6.6
104N11	779154	8	603718	6616829	00	4		0.4	3.2	290	21.0	370	5.9	140	5	42	2.1	180	2.7	1	10	190	25.9	7.9	2.6	8.7	4.1	72.5	48	62.2	14	1500	14.90	3	12	1.40	13	255	10	1	4	0.1	11	26	50.8	104	0.54	640	6.8
104N11	779163	8	605840	6624504	00	2		0.3	2.0	100	18.0	160	8.2	60	5	11	1.7	74	0.2	1	10	200	14.5	3.8	1.9	8.7	3.3	96.8	6	170.0	20	200	5.21	3	8	1.55	11	445	40	2	8	0.1	3	6	164.0	98	1.60	610	7.1
104N14	779738	8	600870	6629806	00	4		0.5	2.1	340	1.5	180	8.0	180	5	25	1.4	89	0.2	1	10	270	11.5	3.7	3.1	8.6	1.8	55.2	9	37.9	10	330	32.44	2	4	0.70	4	105	20	1	8	0.1	4	6	24.5	30	1.30	500	5.9
104N10	779777	8	629701	6613356	00	8		2.2	16.0	1300	1.7	290	4.5	180	10	83	5.8	130	0.2	1	31	92	24.6	18.0	1.8	8.6	3.5	48.9	5	31.0	12	1700	28.91	5	28	1.95	2	255	10	3	16	0.1	2	2	19.8	58	0.26	250	7.1
104N14	779731	8	594714	6633461	00	519		1.3	23.0	470	6.9	130	7.6	330	17	17	2.9	67	0.2	1	78	150	7.8	12.0	1.8	8.5	2.1	53.3	35	89.3	6	610	16.91	9	36	1.75	22	265	20	1	58	0.1	113	20	26.8	88	0.72	240	7.4
104N10	777025	8	621688	6616868	00	2		0.5	13.0	100	3.5	130	8.1	33	5	24	1.2	72	0.2	1	10	270	4.6	3.3	2.3	8.4	2.8	74.9	17	92.2	11	600	18.50	2	4	0.95	39	205	10	1	4	0.1	60	28	85.0	255	2.10	840	6.7
104N10	779174	8	620717	6610724	00	5		1.1	18.0	390	11.0	230	13.0	110	5	11	2.8	83	4.3	1	18	280	30.5	7.4	1.9	8.4	7.9	65.6	25	92.4	39	200	14.42	5	38	1.80	15	450	40	8	14	0.1	5	35	80.9	78	1.20	88	6.9
104N10	779484	8	616479	6624671	00	3		0.8	8.0	400	12.0	220	8.5	82	6	31	1.2	85	2.6	1	10	430	17.2	3.4	2.4	8.1	3.7	85.5	22	40.9	12	1200	26.93	2	16	0.65	13	155	10	1	6	0.1	49	16	30.8	126	0.64	770	7.0
104N11	777239	8	600094	6619544	00	2	3	1.4	38.0	100	5.5	100	12.0	120	5	12	1.2	52	4.3	1	39	330	19.1	2.6	2.0	8.1	5.0	65.7	6	82.6	15	200	14.54	3	18	1.10	25	250	10	1	35	0.1	19	8	63.2	330	3.10	2300	7.2
104N14	779797	8	603880	6630160	00	2		0.5	2.6	160	5.8	180	8.6	92	5	18	1.7	77	0.2	1	10	260	11.0	3.5	3.0	8.0	1.6	62.7	6	45.4	10	200	26.65	2	8	1.05	6	180	10	1	6	0.1	3	6	33.9	38	1.00	460	6.9
104N10	779145	8	614484	6615134	00	2		0.5	24.0	100	5.3	230	11.0	54	7	17	2.2	89	3.2	1	10	390	17.6	5.9	2.7	8.0	4.0	98.3	13	68.2	19	510	19.52	3	32	1.45	46	310	20	3	8	0.1	8	10	58.4	505	0.98	1090	6.5
104N11	779745	8	596183	6622444	10	2		2.2	60.6	260	4.7	160	12.0	430	15	16	3.3	57	0.2	1	140	330	13.0	8.0	2.3	7.9	2.5	65.7	10	40.4	14	210	28.61	9	18	1.65	60	360	20	1	66	0.2	17	10	27.6	310	0.48	1060	7.3
104N10	777024	8	623416	6616690	00	3		0.5	12.0	100	6.0	110	6.8	76	5	17	1.4	77	0.2	1	10	210	3.7	5.6	2.0	7.9	2.6	59.5	20	102.0	11	200	10.85	3	18	1.20	29	270	30	2	7	0.1	54	16	93.0	260	2.20	860	6.5
104N10	779826	8	629521	6602727	00	74		1.8	12.0	1500	1.2	110	1.6	3920	25	63	9.2	56	1.2	1	68	42	10.9	23.8	1.1	7.9	2.6	18.0	15	11.0	11	3100	10.81	9	28	3.00	2	315	10	2	32	0.1	32	10	10.0	64	0.10	78	7.5

01-33

8

MINFILE NUMBER: 104N 026 NATIONAL MINERAL INVENTORY: 104N11 Au12

NAME(S): HORSE CREEK

STATUS: Past Producer Open Pit MINING DIVISION: Atlin
NTS MAP: 104N11E UTM ZONE: 08
LATITUDE: 59 43 42 NORTHING: 6622395
LONGITUDE: 133 09 12 EASTING: 603841
ELEVATION: 1300 Metres
LOCATION ACCURACY: Within 1 KM

COMMODITIES: Gold

MINERALS
SIGNIFICANT: Gold
COMMENTS: Placer.
MINERALIZATION AGE: Unknown
ISOTOPIC AGE: DATING METHOD: Unknown MATERIAL DATED:

DEPOSIT
CHARACTER: Unconsolidated
CLASSIFICATION: Placer

HOST ROCK
DOMINANT HOST ROCK: Sedimentary

STRATIGRAPHIC AGE	GROUP	FORMATION	IGNEOUS/METAMORPHIC/OTHER
Pleistocene			Glacial/Fluvial Gravels

LITHOLOGY: Gravel

HOST ROCK COMMENTS: Placer occurrence located within the Surprise Lake Batholith.

GEOLOGICAL SETTING
TECTONIC BELT: Intermontane PHYSIOGRAPHIC AREA: Teslin Plateau
TERRANE: Cache Creek

CAPSULE GEOLOGY

Horse Creek is only about 5 kilometres long and flows west into the north end of Surprise Lake. The creek is about 35 kilometres northeast of Atlin. The creek received relatively minor prospecting from 1909 to 1916.

The creek is located well within the Late Cretaceous Surprise Lake Batholith which covers about 1100 square kilometres northeast of Atlin. The batholith is composed primarily of a leucocratic granite with abundant microcline and orthoclase with subordinate quartz. It may or may not contain plagioclase and mafic minerals, most commonly biotite. This body has intruded into Upper Paleozoic volcanic and sedimentary rocks of the Cache Creek Group.

The creek only received cursory prospecting and development work between 1909 and 1920 and around 373 grams of gold were recovered from the creek between 1916 and 1918 (Bulletin 28).

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GSC P 74-47
EMPR AR 1909-52; 1910-54; 1914-78; 1915-62; 1916-45; 1917-79
EMPR BULL 28, p. 17
EMPR MISC PUB (Stratigraphy of the Placers in Atlin, Placer Mining Camp, P.J. & W.M. Proudlock, 1976)
EMPR PF (Black, J.M., (1953): Atlin Placer Camp, Unpublished Report, 116 pages)
EMPR P 1984-2

DATE CODED: 850724 CODED BY: GSB FIELD CHECK: N
DATE REVISED: 881128 REVISED BY: MHG FIELD CHECK: N

MINFILE NUMBER: 104N 128 NATIONAL MINERAL INVENTORY:

NAME(S): QUARTZ CREEK, D & D

STATUS: Showing
NTS MAP: 104N11E
LATITUDE: 59 38 04
LONGITUDE: 133 08 52
ELEVATION: 1630 Metres
LOCATION ACCURACY: Within 500M
COMMENTS: Location from Assessment Report 7448.

MINING DIVISION: Atlin
UTM ZONE: 08
NORTHING: 6611950
EASTING: 604450

COMMODITIES: Copper Lead Zinc Tungsten Fluorite

MINERALS
SIGNIFICANT: Chalcopyrite Galena Sphalerite Wolframite Fluorite
ALTERATION: Limonite Manganite
ALTERATION TYPE: Oxidation
MINERALIZATION AGE: Unknown
ISOTOPIC AGE: DATING METHOD: Unknown MATERIAL DATED:

DEPOSIT
CHARACTER: Disseminated
CLASSIFICATION: Industrial Min.

HOST ROCK
DOMINANT HOST ROCK: Plutonic

STRATIGRAPHIC AGE	GROUP	FORMATION	IGNEOUS/METAMORPHIC/OTHER
Upper Cretaceous			Surprise Lake Batholith

ISOTOPIC AGE: 70.6 +/- 3.8 Ma
DATING METHOD: Potassium/Argon
MATERIAL DATED: Biotite

LITHOLOGY: Alaskite

HOST ROCK COMMENTS: Age date from Map 52 notes.

GEOLOGICAL SETTING
TECTONIC BELT: Intermontane
TERRANE: Plutonic Rocks
PHYSIOGRAPHIC AREA: Teslin Plateau

CAPSULE GEOLOGY

The Quartz Creek showing is located on steep bluffs on the north side of the creek, near its headwaters. The creek flows westward into Surprise Lake, approximately 35 kilometres northeast of Atlin.

The creek is located well within the Late Cretaceous Surprise Lake Batholith which covers about 1100 square kilometres northeast of Atlin. This alaskitic body has intruded into Upper Paleozoic volcanic and sedimentary rocks of the Cache Creek Group.

The area was prospected for uranium in 1979 and geologists at that time noted that the Quartz Creek bluffs are locally limonitic, manganiferous, and in places exhibit a pale green alteration. Traces of fluorite are present as well as minor amounts of chalcopyrite, galena, sphalerite and wolframite. No uranium is noted along this part of Quartz Creek.

BIBLIOGRAPHY

EMPR MAP 52 (with notes)
EMPR ASS RPT *7448
GSC MEM 307
GSC P 74-47
GSC MAP 1082A; 1418A
EMPR OF 1991-17; 1992-16

DATE CODED: 881201 CODED BY: SED FIELD CHECK: N
DATE REVISED: 881201 REVISED BY: SED FIELD CHECK: N

MINFILE NUMBER: 104N 129

NATIONAL MINERAL INVENTORY:

NAME(S): B & B

STATUS: Showing
NTS MAP: 104N11E
LATITUDE: 59 40 05
LONGITUDE: 133 07 16
ELEVATION: 1500 Metres
LOCATION ACCURACY: Within 1 KM
COMMENTS: Location from Assessment Report 7353.

MINING DIVISION: Atlin
UTM ZONE: 08
NORTHING: 6615750
EASTING: 605850

COMMODITIES: Lead

MINERALS
SIGNIFICANT: Galena Pyrite
ALTERATION: Limonite Manganite
ALTERATION TYPE: Oxidation
MINERALIZATION AGE: Unknown
ISOTOPIC AGE: DATING METHOD: Unknown MATERIAL DATED:

DEPOSIT
CHARACTER: Disseminated
CLASSIFICATION: Unknown

HOST ROCK
DOMINANT HOST ROCK: Plutonic

STRATIGRAPHIC AGE	GROUP	FORMATION	IGNEOUS/METAMORPHIC/OTHER
Upper Cretaceous			Surprise Lake Batholith

ISOTOPIC AGE: 70.6 +/- 3.8 Ma
DATING METHOD: Potassium/Argon
MATERIAL DATED: Biotite

LITHOLOGY: Alaskite

HOST ROCK COMMENTS: Age date from Map 52 notes.

GEOLOGICAL SETTING
TECTONIC BELT: Intermontane
TERRANE: Plutonic Rocks

PHYSIOGRAPHIC AREA: Teslin Plateau

CAPSULE GEOLOGY

The B & B showing is located on the north side of Horse (formerly Moose) Creek, near its headwaters. The creek flows westward into Surprise Lake, 35 kilometres northeast of Atlin.

The creek is located well within the Late Cretaceous Surprise Lake Batholith which covers about 1100 square kilometres northeast of Atlin. This alaskitic body has intruded into Upper Paleozoic volcanic and sedimentary rocks of the Cache Creek Group.

The area was prospected for uranium in 1979 and at that time geologists noted northeast trending shear zones. Locally, the rocks are limonitic and manganiferous. Traces of pyrite and galena have been noted. Uranium was identified only as small amounts in soils near the creek.

BIBLIOGRAPHY

EMPR MAP 52 (with notes)
EMPR ASS RPT *7353
GSC MEM 307
GSC P 74-47
GSC MAP 1082A; 1418A

DATE CODED: 881201 CODED BY: SED FIELD CHECK: N
DATE REVISED: REVISED BY: FIELD CHECK:

MINFILE NUMBER: 104N 130 NATIONAL MINERAL INVENTORY:

NAME(S): GRANITE CREEK

STATUS: Showing
NTS MAP: 104N11E
LATITUDE: 59 43 49
LONGITUDE: 133 07 57
ELEVATION: 1600 Metres
LOCATION ACCURACY: Within 1 KM
COMMENTS: Location from Assessment Report 7350.

MINING DIVISION: Atlin
UTM ZONE: 08
NORTHING: 6622650
EASTING: 605000

COMMODITIES: Tungsten Lead

MINERALS
SIGNIFICANT: Wolframite Galena
ASSOCIATED: Quartz
MINERALIZATION AGE: Unknown
ISOTOPIC AGE: DATING METHOD: Unknown MATERIAL DATED:

DEPOSIT
CHARACTER: Disseminated Vein
CLASSIFICATION: Unknown

HOST ROCK
DOMINANT HOST ROCK: Plutonic

STRATIGRAPHIC AGE	GROUP	FORMATION	IGNEOUS/METAMORPHIC/OTHER
Upper Cretaceous			Surprise Lake Batholith

ISOTOPIC AGE: 70.6 +/- 3.8 Ma
DATING METHOD: Potassium/Argon
MATERIAL DATED: Biotite

LITHOLOGY: Alaskite

HOST ROCK COMMENTS: Age date from Map 52 notes.

GEOLOGICAL SETTING
TECTONIC BELT: Intermontane PHYSIOGRAPHIC AREA: Teslin Plateau
TERRANE: Plutonic Rocks

CAPSULE GEOLOGY

The Granite (formerly Horse) Creek showing is located south of the creek near the headwaters. The creek flows westward into the northern end of Surprise Lake, approximately 35 kilometres northeast of Atlin.

The creek is located well within the Late Cretaceous Surprise Lake Batholith which covers about 1100 square kilometres northeast of Atlin. This alaskitic body has intruded into Upper Paleozoic volcanic and sedimentary rocks of the Cache Creek Group.

This area was prospected for uranium in 1978 and geologists at that time noted traces of wolframite and some minor quartz veining within the creek bed. Minor amounts of galena were also present in outcrops south of the creek. No uranium was noted along this part of Granite Creek.

BIBLIOGRAPHY

EMPR MAP 52 (with notes)
EMPR ASS RPT *7350
GSC MEM 307
GSC P 74-47
GSC MAP 1082A
EMPR OF 1991-17

DATE CODED: 881201 CODED BY: SED FIELD CHECK: N
DATE REVISED: REVISED BY: FIELD CHECK:

Code	Au+14 1EPI	Au+23 1EPI/MS	Au+34 1D	Au+34 1D enh.	ICP-OES 1E	ICP-OES 1E1	ICP-OES 1E2	ICP-MS Ultratrace 1	ICP+ICP-MS Ultratrace 2	Near Total 1F	Au+48 1H	Au+53 1H2	Au+63 Ultratrace 3	Hydrides 1I
					Aqua Regia Extraction						Near Total Metals			
Au	5 ppb	5 ppb	5 ppb	2 ppb				0.2 ppb	0.2 ppb		2 ppb	2 ppb	2 ppb	
Ag	0.2	0.2	5	5	0.2	0.2	0.1	0.05	0.05	0.3	0.3	0.3	0.05	
Cu	1	1			1	1	1	0.1	0.1	1	1	1	0.2	
Cd	0.5	0.5			0.5	0.5	0.2	0.1	0.1	0.3	0.3	0.3	0.1	
Mn	2	2			*2	*2	*1	*1	*1	1	1	1	1	
Mo	2	2	5	1	*2	*2	*0.5	*0.01	*0.01	1	1	1	1	
Pb	2	2			2	2	2	*0.01	0.01	3	3	3	0.5	
Ni	*1	*1	50	20	*1	*1	*1	*0.1	*0.1	1	1	1	0.5	
Zn	*1	*1	50	50	*1	*1	*1	*0.1	*0.1	1	1	1	1	
S	+100	+100			+100	+100	+10		+10	+100	+100	+100	+100	
Hg	1	1	1	1			1				1	1	1	
Hg-CV	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)	(5 ppb)
As	2	2	2	0.5		*10	*1	*0.1	*0.1		0.5	0.5	0.5	
B							*1	*1	*1					
Ba	100	100	100	50		*1	*1	*0.5	*0.5		50	50	1	
Sb	0.2	0.2	0.2	0.1		*10	*3	*0.02	*0.02		0.1	0.1	0.1	
W	4	4	4	1		*10	*1	*0.2	*0.2		1	1		
Al						*0.01%	*0.01%	*0.01%	*0.01%	*0.01%	*0.01%	*0.01%	0.01	
Be						*1	*1	*0.1	*0.1	1	1	1	0.1	
Bi		0.1				10	0.5	0.02	0.02	2	2	0.1	0.02	0.1
Br			1	0.5							0.5	0.5	0.5	
Ca		*0.01	1%	1%		*0.01%	*0.01%	0.01	*0.01%	0.01%	0.01%	0.01%	0.01%	
Ce			3	3				*0.01	*0.01		3	3	*0.1	
Co			5	1		*1	*1	*0.1	*0.1	1	1	1	0.1	
Cr			10	5		*2	*2	*0.5	*0.5	2	2	2	1	
Cs		2	2	1				*0.1	*0.1		1	1	0.05	
Dy													*0.1	
Er													*0.1	
Eu			0.2	0.2				*0.1	*0.1		0.2	0.2	0.05	
Fe		0.02%	0.02%	0.01%		*0.01%	*0.01%	*0.01%	*0.01%	*0.01%	0.01%	0.01%	0.01%	
Ga		*1					*1	*0.02	*0.02				0.1	
Gd													*0.1	
Ge		0.1						*0.1	*0.1			0.1	0.1	0.1
Hf			1	1				*0.1	*0.1		1	1	0.1	
Ho													*0.1	
In								*0.02	*0.02			0.2	0.1	
Ir			5 ppb	5 ppb							5 ppb	5 ppb	5 ppb	
K		*0.01				*0.01%	*0.01%	0.01%	*0.01%	0.01%	0.01%	0.01%	0.01%	
La			1	0.5			*1	0.5	*0.5		0.5	0.5	*0.1	
Li								*0.5	*0.5				0.5	
Lu			0.05	0.05				0.1	*0.1		0.05	0.05	*0.1	
Mg						*0.01%	*0.01%	*0.01	*0.01%	0.01%	0.01%	0.01%	0.01%	
Na			0.05%	0.01%		*0.01%	*0.001%	*0.001%	*0.001%	0.01%	0.01%	0.01%	0.01%	
Nb								*0.1	*0.1				*0.1	
Nd			5	5				*0.1	*0.1		5	5	*0.1	
P						*0.001%	*0.001%		*0.001%	0.001%	0.001%	0.001%	0.001%	
Pr													*0.1	
Rb			30	15				*0.1	*0.1		15	15	0.2	
Re								0.001	0.001				*0.001	
Sc			0.1	0.1		*1	*0.1				0.1	0.1	0.1	
Se		0.1	5	3				*0.1	*0.1		3	3	0.1	0.1
Sm			0.1	0.1				*0.1	*0.1		0.1	0.1	*0.1	
Sn			0.05%	0.02%				*0.05	*0.05		0.01%	*1	*1	
Sr			0.1%	0.05%			*1	*0.5	*0.5	1	1	1	0.2	
Ta			1	0.5				*0.05	*0.05		0.5	0.5	*0.1	
Tb			0.5	0.5				*0.1	*0.1		0.5	0.5	*0.1	
Te		0.1					*1	0.02	0.02			0.1	0.1	0.1
Th			0.5	0.2			*1	*0.1	*0.1		0.2	0.2	*0.1	
Tl		*0.1					*2	*0.02	*0.02			*0.1	0.05	
Ti						*0.01%	*0.01%		*0.01%	0.01%	0.01%	0.01%	0.01%	
Tm													*0.1	
U			0.5	0.5				*0.1	*0.1		0.5	0.5	0.1	
V						*1	*1	*1	*1	2	2	2	1	
Y						*1	*1	*0.1	*0.1	*1	*1	*1	*0.1	
Yb			0.2	0.2				*0.1	*0.1		0.2	0.2	*0.1	
Zr						*1	*1	*0.1	*0.1				*1	
Price	$18.00	$26.00	$11.75	$14.00	$ 7.75	$ 8.00	$ 9.00	$ 15.00	$ 19.00	$11.00	$21.00	$32.00	$ 32.00	$12.00
Hg-CV add-on Code 1G	$ 4.00	$ 4.00	$ 6.00	$ 6.00	$ 4.00	$ 4.00	$ 4.00	$ 4.00	$ 4.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00	$ 6.00

Elements are all in PPM except where noted.

Elements in brackets are optional - see notes, Page 10-11.

Notes

Code 1EPI

The "Au+14" group of elements provides a high quality, low cost package for epithermal gold exploration [by INAA (Au, As, Sb, Ba, Hg and W), aqua regia ICP (base metals and sulphur) and optional cold vapour FIMS (Hg)]. A sample of ~30g is used for Au analysis. An enhanced package (Code 1EPI enhanced) with better detection limits for Au (2 ppb) and As (0.5 ppm) is available for an additional $2.00 per sample. (35g required). Sulphur (+) from barite will not be reported. If total S is required, see Code 4F-S. See Code 1E for notes on base metals.

Trace Element Geochemistry

Code 1EPI-MS - The "Au+23" group of elements is similar to Code 1EPI but includes a suite of elements by ICP-MS to provide virtually all elements used for epithermal gold exploration. This package also provides the ratio of total sodium to aqua regia soluble sodium, which will provide a hydrothermal alteration index. The multielement acid attack will only dissolve the soluble forms of barium, while INAA will provide the total barium concentration. The total Ba to soluble Ba ratio will be a direct indicator of barite concentration. Code 1EPI-MS Enhanced is available which offers Au-2ppb, As-0.5ppm, Sb-0.1ppm for an additional $2.00 per sample (35 g required). See Code 1E for notes on base metals.

Code 1D - The sample is encapsulated, irradiated and measured in a multielement mode by INAA for Au+34 elements. These elements which are determined non-destructively. The total metals help the geologist determine rock types, alteration and pathfinder elements. The 30g aliquot provides a representative sample size for gold analysis (0.5 to 30g required).

Code 1D enhanced - This INAA package is similar to Code 1D but has enhanced detection limits. This package has become very popular for rock, soil, lake sediment and stream sediment samples (0.5 to 30g required).

Code 1E - This package determines a base metal suite and sulphide sulphur by an aqua regia extraction with an ICP-OES finish. If accuracy better than +/-10-15% is required for higher level samples we recommend assays (Code 8) for Cu, Zn and Ni over 10,000 ppm and certainly over 50,000 ppm. Assays are also recommended for Pb >5000 ppm and Ag >100 ppm due to potential solubility problems. Values exceeding these limits are estimates and are provided for information only. (0.5g of sample required). **Prices: for first element $ 3.50, and each additional element $ 1.50**

Code 1E1 - This analytical package uses the same digestion as Code 1E. The same comments apply as in Code 1E for base metals. In addition, a variety of other elements are obtained non-quantitatively since chromite, barite, silicates, magnetite, sphene and some other mineral phases are not soluble with this digestion. Zinc in gahnite or sphene will not be soluble in aqua regia and all Ni in silicate phases may not be totally leachable. These semi-quantitative determinations indicated with (*) are useful in detecting alteration patterns. (0.5g of sample required).

Code1E2 - This is similar to Code 1E1, but offers an enhanced list of analytes. (0.5 g of sample is required).

Code 1F - This package uses a "near total" digestion employing HF, $HClO_4$, HNO_3 and HCl to get as much of the sample into solution as possible without fusing the sample. The resulting metals are determined by ICP-OES. Aluminum (*) may not be total. The Code 1F now includes sulphur. The sulphur associated with barite will not be dissolved. Other phases which may not be totally digested include zircon, monazite, sphene, gahnite, chromite, magnetite, barite, cassiterite, ilmenite and rutile. The same comments apply as in Code 1E for base metals. (0.25g of sample required).

Code ULTRATRACE-1 - This partial extraction is analyzed by ICP-MS to provide lower detection limits. Upper limits are up to 20,000 times the detection limits. (0.5 g of sample is required).

Code ULTRATRACE-2 - This combines ULTRATRACE-1 with Code 1E2 to provide a few additional elements from the ICP-OES as well as extend the upper limits of the ULTRATRACE-2 elements. (0.5 g of sample is required).

Code 1H "Au+48" - This package provides a trace element scan for virtually all types of economic mineralization. It also provides useful information on alteration, rock types, and pathfinder elements. The Code 1D enhanced (INAA) and Code 1F (4-acid digestion ICP technique) provide 49 elements. The elements determined by INAA are Au, As, Ba, Br, Ce, Co, Cr, Cs, Eu, Fe, Hf, Hg, Ir, La, Lu, Na, Nd, Rb, Sb, Sc, Se, Sm, Sn, Ta, Th, Tb, U, W, Y and Yb. The remaining elements are determined by the 4 acid ICP (Code 1F above) technique. Aluminum (*) may not be totally digested in oxidized material. SiO_2 is not analyzed due to volatilization (0.75-35g required depending on sample size you wish to be analyzed for Au).

Code 1H2 "Au+53" - This package is similar to Code 1H but also uses ICP-MS on an acid digest solution to obtain additional elements. Aluminum, Sn and Tl may not be total. If Au is important, a larger sample size (up to 35g) should be submitted.

Code ULTRATRACE-3 - This combines INAA, 4-acid digestion ICP and ICP-MS analysis to provide the most comprehensive near total metal package available using an acid digestion. Note that this package is not suitable for chrondrite plots as not all REE are quantitatively extracted from zircon, monazite, etc. (1.0 to 35 g of sample required).

Code 1I - This package uses a proprietary digestion followed by ICP-MS analysis of the digestate. It is not influenced by high levels of Cu, Ni and Au and is a marked improvement over the old borohydride generation ICP methodology (1g required).

Which digestion do I use?

1. **Aqua regia digestion** - This leach uses a combination of concentrated hydrochloric and nitric acids to leach sulphides, some oxides and some silicates. Mineral phases which are hardly (if at all) attacked include barite, zircon, monazite, sphene, chromite, gahnite, garnet, ilmenite, rutile and cassiterite. The balance of silicates and oxides are only slightly to moderately attacked, depending on the degree of alteration. Generally, but not always, most base metals and gold are usually dissolved if the sample is ground finely enough.
2. **"Total" digestion** - This acid attack is the most vigorous used in geochemistry. It will employ hydrochloric, nitric, perchloric and hydrofluoric acids. Even with this digestion, certain minerals (barite, gahnite, chromite and cassiterite) may not go into solution. Other minerals including zircon, sphene and magnetite may not be totally dissolved. Most other silicates will be dissolved, however some elements will be erratically volatilized, including Si, As, Sb, Cr and Au. Total digestions cannot be used for accurate determinations of REE, Ta, Nb, As, Sb, Sn, Hf, Cr, Au and Si.
3. **Fusion technique** - The most aggressive fusion technique employs a lithium metaborate/tetraborate fusion. The resulting molten bead is rapidly digested in a weak nitric acid solution. The fusion ensures that the entire sample is dissolved. It is only with this attack that major oxides including SiO_2, REE and other high field strength elements are put into solution. High sulphide bearing rocks may require different treatment, but can still be adequately analyzed.

NOTE

Results from aqua regia or total digestions may be lab dependent or lab operator dependent. Actlabs has automated this aspect of digestion using a microprocessor designed hotbox to accurately reproduce digestion conditions every time.

Appendix 2

<u>STATEMENT OF QUALIFICATIONS</u>

I, John Peter Ross, do hereby certify that I:

1. am a qualified prospector with mailing address;

   B1-2002 Centennial Street
   Whitehorse, Yukon
   Canada. Y1A 3Z7

2. graduated from McGill University in 1970 with a B.Sc. General Science

3. have attended and finished completely the following courses;

   1974 - BC & Yukon Chamber of Mines, Prospecting Course
   1978 - United Keno Hill Mines Limited, Elsa, Yukon, Prospecting Course
   1987 - Yukon Chamber of Mines, Advanced Prospecting Course
   1991 - Exploration Geochemistry Workshop, GSC Canada
   1994 - Diamond Exploration Short Course, Yukon Geoscience Forum
   1994 - Yukon Chamber of Mines, Alteration and Petrology for Prospectors
   1994 - Applications of Multi-Parameter Surveys (Whitehorse), Ron Shives, GSC
   1994 - Drift Exploration in Glaciated and Mountainous Terrain, BCGS
   1995 - Applications of Multi-Parameter Surveys, (Vancouver) Ron Shives, GSC
   1995 - Diamond Theory and Exploration, Short Course # 20, GSC Canada
   1996 - New Mineral Deposit Models of the Cordillera, MDRU
   1997 - Geochemical Exploration in Tropical Environments, MDRU
   1998 - Metallogeny of Volcanic Arcs, Cordilleran Roundup Short Course
   1999 - Volcanic Massive Sulphide Deposits, Cordilleran Roundup Short Course
   1999 - Pluton-Related (Thermal Aureole) Gold, Yukon Geoscience Forum
   2000 - Sediment Hosted Gold Deposits, MDRU
   2001 - Volcanic Processes, MDRU

4. did all the work and the writing of this report

5. have been on the Yukon Prospectors Assistance and Yukon Mining Incentive Program 1986 - 2001

6. have been on the British Columbia Prospectors' Assistance Program 1989 - 1990, 2001

7. have a 100% interest in the claims described in this report at the present time

19 Jan 2002
John Peter Ross

Appendix 3

Silt/Pan Concentrate Sample Geochemistry - Assay Results

Activation Laboratories Ltd. Work Order: 22962 Report: 22632

Sample ID	Au ppb	Ag ppm	As ppm	Ba ppm	Br ppm	Ca %	Co ppm	Cr ppm	Cs ppm	Fe %	Hf ppm	Hg ppm	Ir ppb	Mo ppm
HS1	8	-5	4.9	810	18.8	-1	6	392	5	2.65	52	-1	-5	-1
HS2	361	-6	4.7	910	10.5	-1	8	681	4	3.22	103	-1	-5	-1
HS3	-2	-5	4.2	870	15.4	-1	5	455	5	2.68	50	-1	-5	-1
HS3 SAND	-2	-5	5.6	980	23.9	-1	7	502	4	2.99	41	-1	-5	-1
HS4	-2	-5	4.6	890	4.3	-1	3	97	4	1.48	32	-1	-5	-1
HS5	-2	-6	7.5	960	11.3	2	18	350	4	3.64	4	-1	-5	-1
HS6	-2	-5	4.9	730	20.2	-1	3	163	5	2.19	77	-1	-5	-1
HS7	-2	-5	5	740	23.1	-1	6	121	4	2.34	19	-1	-5	-1
HS8	-2	-5	4.7	700	19.5	-1	4	84	5	2.34	80	-1	-5	-1
HS9	78	-5	2.2	910	2.3	-1	4	310	3	3.74	204	-1	-5	-1
HS10	-2	-5	11.2	810	31.4	-1	13	314	4	3.78	11	-1	-5	-1
HS11	-2	-5	2.8	750	5	-1	4	203	4	1.92	27	-1	-5	-1
HS12	-2	-5	12.1	1100	15	-1	8	78	6	3.98	24	-1	-5	-1
HS13	-2	-5	5.2	860	3.7	-1	4	55	3	2.99	65	-1	-5	-1
HS14	-2	-5	2.2	660	12.8	-1	4	157	4	2.51	63	-1	-5	-1
HS15	22	-5	5.2	790	44.6	-1	3	39	5	2.02	48	-1	-5	-1
HS16	-2	-5	2.5	790	9.2	-1	8	440	4	1.75	22	-1	-5	-1
HS17	-2	-5	7.5	810	8.9	-1	19	980	3	3.38	11	-1	-5	-1
HPAN1	-2	-5	10.2	650	-0.5	-1	6	586	3	2.61	22	-1	-5	-1
HPAN2	23800	-5	6.4	710	-0.5	-1	9	1740	3	3.72	33	-1	-5	-1
HPAN3	102	-5	10.4	810	-0.5	-1	7	997	3	3.46	19	-1	-5	-1
HPAN4	-2	-5	4.2	650	-0.5	-1	2	130	3	1.28	24	-1	-5	6
HPAN6	13400	-5	4.9	640	-0.5	-1	6	270	4	2.39	35	-1	-5	-1
HPAN8	-2	-5	6.2	530	-0.5	-1	4	166	4	2.41	29	-1	-5	-1
HPAN9	-2	-5	-0.5	620	-0.5	-1	5	509	-1	4.84	115	-1	-5	-1
HPAN13	-2	-5	1.4	720	-0.5	-1	2	78	2	2.12	48	-1	-5	-1
HPAN14	-2	-5	1	760	-0.5	-1	6	373	4	3.85	22	-1	-5	-1
HPAN15	-2	-5	5.4	-84	-0.5	2	1	84	5	1.79	18	-1	-5	-1
HPAN16	210	-5	2.5	690	-0.5	-1	8	985	2	2.13	18	-1	-5	-1
DMMAS-18-1930	569	-5	1970	390	2.9	7	59	140	2	8.04	2	-1	-5	-3
DMMAS-18-1911	563	-5	1920	360	2.3	7	61	135	-1	8.19	3	-1	-5	-2
DMMAS-18-1931	600	12	2090	410	3.1	8	66	144	2	8.84	3	-1	-5	-2
Accepted Value-DMMAS-18B	544+-72		2020+-224	435+-150	2.5+-1.5	7+-2	58+-15	151+-20		8.05+-0.65	2+-1			

Sample ID	Na %	Ni ppm	Rb ppm	Sb ppm	Sc ppm	Se ppm	Sn %	Sr %	Ta ppm	Th ppm	U ppm	W ppm	Zn ppm	La ppm	Ce ppm
HS1	2.44	44	140	0.3	7.6	-3	-0.02	-0.05	13.4	72.6	44.6	55	113	206	327
HS2	2.4	-30	149	0.4	8.8	4	-0.01	-0.05	21.8	105	52.2	110	122	271	446
HS3	2.43	142	130	0.5	7.6	-3	-0.01	-0.05	11.2	61.1	36.4	45	143	167	282
HS3 SAND	2.2	-28	153	0.4	8.2	-3	-0.01	-0.05	17.1	72.6	46.7	79	136	200	326
HS4	2.6	-25	159	0.4	5.4	-3	-0.02	-0.05	5.5	37.2	25.4	8	81	133	186
HS5	1.56	-28	98	0.8	14.1	-3	-0.02	-0.05	1.8	18.5	60.1	-1	170	52.1	70
HS6	2.44	-30	148	0.3	7.1	4	-0.01	-0.05	14.9	92.6	48.5	67	190	235	383
HS7	1.68	-30	138	0.6	6.7	-3	-0.01	-0.05	6	33.5	28.1	7	219	121	188
HS8	2.59	-30	266	0.1	7.1	-3	-0.01	-0.05	15.4	93.1	48.6	75	207	243	406
HS9	2.35	-30	167	0.4	10	3	-0.01	-0.05	25.8	118	45.5	42	165	316	507
HS10	1.46	-31	146	0.8	11.2	-3	-0.01	-0.05	2.5	38.6	32.6	-1	325	97.2	197
HS11	2.25	-22	176	0.2	6.2	-3	-0.01	-0.05	6.8	27	15.7	7	113	82.5	133
HS12	1.81	-27	163	0.7	9.1	-3	-0.01	-0.05	5.5	43.5	21.7	9	227	99.4	163
HS13	2.21	-24	113	0.2	9.4	-3	-0.01	-0.05	9.2	31.8	28	7	141	116	190
HS14	2.02	147	121	0.3	7.5	-3	-0.01	-0.05	11.2	60.8	33.5	16	136	170	280
HS15	2.33	-29	145	0.2	6.8	-3	-0.01	-0.05	9.2	76.8	88.1	49	257	206	346
HS16	2.08	-27	129	0.4	7.9	-3	-0.01	-0.05	6.4	29.8	340	12	108	189	209
HS17	1.44	182	83	0.3	10.5	-3	-0.01	-0.05	3.8	17.5	50.8	4	138	65.2	82
HPAN1	1.51	-87	104	-0.1	7	-3	-0.01	-0.05	19.8	172	36.9	49	126	830	1270
HPAN2	1.62	-50	124	1.4	8.3	-3	-0.01	-0.05	37.4	165	50.9	94	196	638	1010
HPAN3	1.53	104	111	0.9	7.4	-3	-0.01	-0.05	28	114	38.4	100	135	496	830
HPAN4	1.83	-21	150	1.1	3.8	-3	-0.01	-0.05	4.4	38.6	9.5	6	89	178	265
HPAN6	1.84	-75	146	0.6	6.6	-3	-0.01	-0.05	18.2	130	29.6	62	110	632	1020
HPAN8	1.7	-72	135	1.1	6.4	-3	-0.01	-0.05	20.5	130	31.8	69	142	585	930
HPAN9	1.34	-38	100	0.1	10.6	-3	-0.01	-0.05	30.2	258	38.8	24	237	1180	1780
HPAN13	1.84	-27	105	-0.1	5.5	-3	-0.01	-0.05	11.8	37.6	14.4	8	107	186	308
HPAN14	1.55	-71	113	0.6	7.2	-3	-0.01	-0.05	13.7	108	19.2	15	153	640	984
HPAN15	1.74	-64	127	0.4	4.8	-3	-0.01	-0.05	12.3	96.9	21.3	42	125	505	806
HPAN16	1.74	-43	110	0.4	6.6	-3	-0.01	-0.05	10	57.2	28.3	11	103	318	552
DMMAS-18-1930	0.74	-69	40	11.3	19.9	-3	-0.03	-0.05	-0.5	1.3	-0.7	18	273	12.5	25
DMMAS-18-1911	0.78	-30	45	12.3	20.5	-3	-0.03	-0.05	-0.5	1.3	-0.5	19	237	12.4	20
DMMAS-18-1931	0.79	-31	35	12.1	21.8	-3	-0.04	-0.05	-0.5	1.5	-0.5	21	207	13	24
Accepted Value-DMMAS-18B	0.74+-0.48		38+-10	12+-3	20.5+-3.4					1.5+-0.5		19+-2	250+-50	12.2+-1.3	23+-3

Activation Laboratories Ltd. Work Order: 22962 Report: 22632

Sample ID	Au ppb	Ag ppm	As ppm	Ba ppm	Br ppm	Ca %	Co ppm	Cr ppm	Cs ppm	Fe %	Hf ppm	Hg ppm	Ir ppb	Mo ppm
HS1	6	-5	4.9	810	18.8	-1	6	392	5	2.65	52	-1	-5	-1
HS2	361	-5	4.7	910	10.5	-1	8	681	4	3.22	103	-1	-5	-1
HS3	-2	-5	4.2	870	15.4	-1	5	455	5	2.68	50	-1	-5	-1
HS3 SAND	-2	-5	5.6	980	23.9	-1	7	502	4	2.99	41	-1	-5	-1
HS4	-2	-5	4.6	890	4.3	-1	3	97	4	1.48	32	-1	-5	-1
HS5	-2	-5	7.5	960	11.3	2	18	350	4	3.64	4	-1	-5	-1
HS6	-2	-5	4.9	730	20.2	-1	3	163	5	2.19	77	-1	-5	-1
HS7	-2	-5	5	740	23.1	-1	6	121	4	2.34	19	-1	-5	-1
HS8	-2	-5	4.7	700	19.5	-1	4	84	5	2.34	80	-1	-5	-1
HS9	78	-5	2.2	910	2.3	-1	4	310	3	3.74	204	-1	-5	-1
HS10	-2	-5	11.2	810	31.4	-1	13	314	4	3.78	11	-1	-5	-1
HS11	-2	-5	2.8	750	5	-1	4	203	4	1.92	27	-1	-5	-1
HS12	-2	-5	12.1	1100	15	-1	6	78	6	3.98	24	-1	-5	-1
HS13	-2	-5	5.2	860	3.7	-1	4	65	3	2.99	65	-1	-5	-1
HS14	-2	-5	2.2	660	12.8	-1	4	157	4	2.51	63	-1	-5	-1
HS15	22	-5	5.2	790	44.6	-1	3	39	5	2.02	48	-1	-5	-1
HS16	-2	-5	2.5	790	9.2	-1	8	440	4	1.75	22	-1	-5	-1
HS17	-2	-5	7.5	810	8.9	-1	19	980	3	3.38	11	-1	-5	-1
HPAN1	-2	-5	10.2	650	-0.5	-1	6	586	3	2.61	22	-1	-5	-1
HPAN2	23800	-5	6.4	710	-0.5	-1	9	1740	3	3.72	33	-1	-5	-1
HPAN3	102	-5	10.4	810	-0.5	-1	7	997	3	3.48	19	-1	-5	-1
HPAN4	-2	-5	4.2	660	-0.5	-1	2	130	3	1.28	24	-1	-5	6
HPAN6	13400	-5	4.9	640	-0.5	-1	6	270	4	2.39	35	-1	-5	-1
HPAN8	-2	-5	6.2	530	-0.5	-1	4	166	4	2.41	29	-1	-5	-1
HPAN9	-2	-5	-0.5	620	-0.5	-1	5	509	-1	4.84	115	-1	-5	-1
HPAN13	-2	-5	1.4	720	-0.5	-1	2	78	2	2.12	46	-1	-5	-1
HPAN14	-2	-5	1	760	-0.5	-1	6	373	4	3.85	22	-1	-5	-1
HPAN15	-2	-5	5.4	-84	-0.5	2	1	84	5	1.79	18	-1	-5	-1
HPAN16	210	-5	2.5	690	-0.5	-1	8	985	2	2.13	18	-1	-5	-1
DMMAS-18-1930	569	-5	1970	390	2.9	7	59	140	2	8.04	2	-1	-5	-3
DMMAS-18-1911	563	-5	1920	360	2.3	7	61	135	-1	8.19	3	-1	-5	-2
DMMAS-18-1931	600	12	2090	410	3.1	8	66	144	2	8.84	3	-1	-5	-2
Accepted Value-DMMAS-18B	544+-72		2020+-224	435+-150	2.5+-1.5	7+-2	58+-15	151+-20		8.05+-0.85	2+-1			

Sample ID	Na %	Ni ppm	Rb ppm	Sb ppm	Sc ppm	Se ppm	Sn %	Sr %	Ta ppm	Th ppm	U ppm	W ppm	Zn ppm	La ppm	Ce ppm
HS1	2.44	44	140	0.3	7.6	-3	-0.02	-0.05	13.4	72.6	44.6	55	113	206	327
HS2	2.4	-30	149	0.4	8.8	4	-0.01	-0.05	21.8	105	52.2	110	122	271	446
HS3	2.43	142	130	0.5	7.6	-3	-0.01	-0.05	11.2	61.1	36.4	45	143	167	282
HS3 SAND	2.2	-28	153	0.4	8.2	-3	-0.01	-0.05	17.1	72.6	46.7	79	136	200	326
HS4	2.6	-25	159	0.4	5.4	-3	-0.02	-0.05	5.5	37.2	25.4	8	81	133	166
HS5	1.56	-28	98	0.8	14.1	-3	-0.02	-0.05	1.8	18.5	60.1	-1	170	52.1	70
HS6	2.44	-30	148	0.3	7.1	4	-0.01	-0.05	14.9	92.6	48.5	67	190	235	383
HS7	1.68	-30	138	0.6	6.7	-3	-0.01	-0.05	6	33.5	28.1	7	219	121	188
HS8	2.59	-30	266	0.1	7.1	-3	-0.01	-0.05	15.4	93.1	48.6	75	207	243	406
HS9	2.35	-30	167	0.4	10	3	-0.01	-0.05	25.8	118	45.5	42	165	316	507
HS10	1.46	-31	146	0.8	11.2	-3	-0.01	-0.05	2.5	38.6	32.6	-1	325	97.2	197
HS11	2.25	-22	176	0.2	6.2	-3	-0.01	-0.05	6.8	27	15.7	7	113	82.5	133
HS12	1.81	-27	163	0.7	9.1	-3	-0.01	-0.05	6.5	43.5	21.7	9	227	99.4	163
HS13	2.21	-24	113	0.2	9.4	-3	-0.01	-0.05	9.2	31.8	28	7	141	115	190
HS14	2.02	147	121	0.3	7.5	-3	-0.01	-0.05	11.2	60.8	33.5	16	136	170	280
HS15	2.33	-29	145	0.2	6.6	-3	-0.01	-0.05	9.2	76.8	88.1	49	257	206	346
HS16	2.06	-27	129	0.4	7.9	-3	-0.01	-0.05	6.4	29.8	340	12	108	169	209
HS17	1.44	182	83	0.3	10.5	-3	-0.01	-0.05	3.8	17.5	50.8	4	138	65.2	82
HPAN1	1.51	-87	104	-0.1	7	-3	-0.01	-0.05	19.9	172	38.9	49	126	830	1270
HPAN2	1.62	-50	124	1.4	8.3	-3	-0.01	-0.05	37.4	165	50.9	94	196	638	1010
HPAN3	1.53	104	111	0.9	7.4	-3	-0.01	-0.05	28	114	38.4	100	135	496	830
HPAN4	1.83	-21	150	1.1	3.8	-3	-0.01	-0.05	4.4	38.6	9.5	6	89	176	265
HPAN6	1.84	-75	146	0.6	6.8	-3	-0.01	-0.05	18.2	130	29.6	62	110	632	1020
HPAN8	1.7	-72	135	1.1	6.4	-3	-0.01	-0.05	20.5	130	31.8	69	142	585	930
HPAN9	1.34	-38	100	0.1	10.6	-3	-0.01	-0.05	30.2	258	38.8	24	237	1180	1780
HPAN13	1.84	-27	105	-0.1	6.5	-3	-0.01	-0.05	11.8	37.6	14.4	8	107	186	308
HPAN14	1.55	-71	113	0.6	7.2	-3	-0.01	-0.05	13.7	108	19.2	15	153	640	984
HPAN15	1.74	-64	127	0.4	4.8	-3	-0.01	-0.05	12.3	96.9	21.3	42	125	505	806
HPAN16	1.74	-43	110	0.4	6.6	-3	-0.01	-0.05	10	57.2	28.3	11	103	318	552
DMMAS-18-1930	0.74	-69	40	11.3	19.9	-3	-0.03	-0.05	-0.5	1.3	-0.7	18	273	12.5	25
DMMAS-18-1911	0.78	-30	45	12.3	20.5	-3	-0.03	-0.05	-0.5	1.3	-0.5	19	237	12.4	20
DMMAS-18-1931	0.79	-31	35	12.1	21.8	-3	-0.04	-0.06	-0.5	1.5	-0.5	21	207	13	24
Accepted Value-DMMAS-18B	0.74+-0.48		38+-10	12+-3	20.5+-3.4					1.5+-0.5		19+-2	250+-50	12.2+-1.3	23+-3

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Sample ID	Nd ppm	Sm ppm	Eu ppm	Tb ppm	Yb ppm	Lu ppm	Mass g
HS1	110	22.7	0.3	3.8	17	2.5	34.77
HS2	160	30.6	0.6	5.3	27.4	4.2	34.67
HS3	100	20.2	0.2	3.7	15	2.46	31.89
HS3 SAND	120	23.1	1	3.7	17.6	2.59	32.15
HS4	76	15.3	1	2.2	9	1.45	31.73
HS5	38	9.6	1.2	1.2	6.8	1.1	23.09
HS6	130	26.5	-0.2	4.1	20.8	3.12	29.62
HS7	73	16.7	1.1	2	9.8	1.5	18.06
HS8	150	27.8	0.2	4.2	23.2	3.42	30.62
HS9	163	34.1	-0.2	5.1	27.5	4.15	37.99
HS10	70	15.2	1.1	2.3	11.1	1.67	19.39
HS11	50	10.2	0.8	1.3	7.2	1.13	36.03
HS12	61	13.2	-0.2	1.5	7.5	1.21	26.03
HS13	74	16.7	0.9	3	10.8	1.62	35.88
HS14	90	19.9	-0.2	3	13	2.09	34.43
HS15	120	24.6	-0.2	4	16	2.52	28.46
HS16	86	19.6	1.5	1.7	12.9	2	29.6
HS17	33	8.6	0.9	1.2	6.7	1.02	32.8
HPAN1	365	58.5	1.2	4.7	16.7	2.46	47.46
HPAN2	323	61.1	-0.2	6.5	23.8	3.6	45.1
HPAN3	261	41	-0.2	4.5	20	3	39.44
HPAN4	86	13.6	0.4	1.5	5.3	0.81	41.79
HPAN6	314	46.2	0.7	5.8	17.1	2.51	41.93
HPAN8	303	44.6	-0.2	6	18	2.64	41.31
HPAN9	569	76.8	-0.2	7.9	23.2	3.53	41.24
HPAN13	100	17.2	0.5	2.4	8.6	1.27	42.87
HPAN14	291	38.6	0.7	3.9	10.3	1.63	44.29
HPAN15	265	37	0.4	4.2	11.7	1.81	46.05
HPAN16	176	25.2	0.7	3.1	9.5	1.6	43.75
DMMAS-18-1930	9	4.1	1.1	-0.5	3.7	0.55	25.22
DMMAS-18-1911	12	4	1.3	0.8	3.8	0.56	25.41
DMMAS-18-1931	11	4.2	1.4	-0.5	3.6	0.54	25.52
Accepted Value-DMMAS-18B	11+-3	4.1+-0.5	1.2+-0.2	0.8+-0.35	3.5+-0.6	0.54+-0.05	

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Sample ID	Au	Ag	As	Ba	Br	Ca	Co	Cr	Cs	Fe	Hf	Hg	Ir	Mo	Na	Ni	Rb	Sb	Sc	Se	Sn	Sr	Ta	Th	U	W	Zn	La	Ce
	ppb	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm	%	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
HF44	-2	-5	4	1300	-1	-1	-5	220	3	1.28	4	-1	-5	-5	2.02	-50	130	0.2	1.8	-5	-0.05	-0.1	-0.5	13.8	2.9	-4	-50	74.3	118
HF45	3	-5	4	600	-1	-1	-5	229	3	1.45	4	-1	-5	8	1.9	-50	109	-0.1	0.9	-5	-0.05	-0.1	-0.5	24.3	3.4	-4	-50	158	243
HF46	2	-5	3	650	-1	-1	-5	156	6	0.86	4	-1	-5	-5	2.18	-50	145	0.2	0.7	-5	-0.05	-0.1	-0.5	54.7	10	-4	-50	43.1	72
HF47	2	-5	4	490	-1	-1	-5	170	3	1.46	5	-1	-5	-5	1.83	-50	131	0.1	2.4	-5	-0.05	-0.1	-0.5	10.2	4.3	-4	-50	31.2	52
HF48	-2	-5	4	440	-1	-1	-5	173	6	0.92	5	-1	-5	27	2.23	-50	272	0.2	1.6	-5	-0.05	-0.1	-0.5	27.5	10.2	-4	77	54.6	99
HF49	-2	-5	4	3100	-1	-1	-5	118	4	2.22	8	-1	-5	-5	4.13	-50	160	0.2	5.1	-5	-0.05	-0.1	-0.5	11	3.1	-4	-50	46.5	86
HF50	-2	-5	3	1300	-1	-1	-5	147	4	1.85	6	-1	-5	-5	2.14	-50	142	0.3	4	-5	-0.05	-0.1	2.1	13.1	4.3	-4	-50	33	89
HF51	-2	-5	3	360	-1	-1	-5	139	5	0.75	2	-1	-5	-5	1.95	-50	180	-0.1	1.1	-5	-0.05	-0.1	2	14.7	4.3	-4	-50	36	63
HF52	-2	-5	28	980	-1	-1	-5	67	3	0.61	9	-1	-5	-5	4.28	-50	267	0.2	0.7	-5	-0.05	-0.1	-0.5	13.6	3.9	-4	-50	37.1	55
HF53	-2	-5	3	200	-1	-1	-5	164	3	0.66	2	-1	-5	-5	2	-50	144	0.4	0.7	-5	-0.05	-0.1	-0.5	10	3.1	-4	-50	34.4	53
HF54	-2	-5	3	570	-1	-1	-5	184	3	0.91	3	-1	-5	-5	2.22	-50	132	0.2	1.5	-5	-0.05	-0.1	-0.5	22.3	3.5	-4	-50	16.9	33
HF55	-2	-5	4	1200	-1	-1	-5	114	-1	1.35	7	-1	-5	-5	6	-50	94	0.3	3.7	-5	-0.05	-0.1	2.2	16.9	3.9	-4	-50	29.8	55
HF56	-2	-5	2	270	-1	-1	-5	127	3	0.74	4	-1	-5	-5	2.27	-50	142	0.1	1	-5	-0.05	-0.1	-0.5	7.8	2	-4	-50	26.8	40
HF57	-2	-5	3	400	-1	-1	-5	185	2	0.82	4	-1	-5	-5	1.99	-50	102	0.2	1.4	-5	-0.05	-0.1	-0.5	12.8	3.7	-4	-50	53.8	83
HF58	-2	-5	4	-53	-1	-1	-5	63	5	1.8	7	-1	-5	-5	6.91	-50	-30	-0.1	3.9	-5	-0.05	-0.1	6.5	34.8	9.9	-4	136	59.9	97
HF59	6	-5	1	1000	-1	-1	-5	253	9	1.06	5	-1	-5	5	2.45	-50	162	0.3	1.9	-5	-0.05	-0.1	-0.5	28.5	4	-4	-50	124	200
HF60	4	-5	5	490	-1	-1	-5	309	3	0.66	3	-1	-5	-5	1.68	-50	147	0.3	1.9	-5	-0.05	-0.1	4	11.3	7.3	-4	125	27.7	47
HF61	-2	-5	2	1200	-1	-1	-5	238	4	1.74	6	-1	-5	-5	2.04	-50	125	0.3	3.8	-5	-0.05	-0.1	1.9	11.5	2.8	-4	69	72.9	123
HF62	4	-5	3	-50	-1	-1	-5	193	4	0.63	5	-1	-5	-5	2.96	-50	280	0.2	1.2	-5	-0.05	-0.1	4.8	25.3	16.6	-4	-50	14.8	30
HF63	-2	-5	32	270	-1	-1	-5	112	7	1.19	5	-1	-5	-5	2.94	-50	199	0.5	1.5	-5	-0.05	-0.1	-0.5	32	9.9	-4	91	50.4	81
HF64	-2	-5	2	1200	-1	-1	-5	122	7	0.94	4	-1	-5	-5	2.75	-50	269	0.3	2.7	-5	-0.05	-0.1	-0.5	13.7	6.7	-4	-50	35.4	55
HF65	-2	-5	18	750	-1	-1	-5	157	3	1.54	6	-1	-5	-5	2.21	-50	159	2.5	2.7	-5	-0.05	-0.1	-0.5	18.3	9	-4	114	63.2	110
HF66	4	-5	2	2200	-1	-1	-5	99	7	2.65	9	-1	-5	-5	4.29	-50	300	0.4	5.6	-5	-0.05	-0.1	-0.5	16.3	5.8	-4	-50	63.9	111
HF67	-2	-5	2	390	-1	-1	-5	117	2	0.77	5	-1	-5	-5	3.26	-50	58	0.2	1.9	-5	-0.05	-0.1	-0.5	18.3	4.6	-4	-50	46.6	101
HF68	-2	-5	10	320	-1	-1	-5	214	5	0.79	3	-1	-5	-5	1.28	-50	247	0.7	0.9	-5	-0.05	-0.1	1.3	14	5.5	-4	-50	19	33
HF69	-2	-5	2	180	-1	-1	-5	131	7	0.74	3	-1	-5	-5	2.29	-50	279	0.4	1.4	-5	-0.05	-0.1	5.2	25.2	12.4	-4	-50	17.2	35
HF70	-2	-5	11	330	-1	-1	-5	113	19	0.59	7	-1	-5	-5	3.05	-50	375	0.3	1.4	-5	-0.05	-0.1	8	29.2	22.1	-4	-50	22.5	48
HF71	-2	-5	13	410	-1	-1	-5	98	27	0.76	8	-1	-5	-5	2.84	-50	369	1.9	1.6	-5	-0.05	-0.1	17	33.2	34.7	6	-50	70.6	122
HF72	-2	-5	2	-50	-1	-1	-5	253	-1	0.19	-1	-1	-5	-5	0.02	-50	-30	0.1	0.1	-5	-0.05	-0.1	-0.5	-0.2	-0.5	-4	-50	-0.5	-3
HF73	-2	-5	2	280	-1	-1	-5	209	-1	0.6	-1	-1	-5	-5	0.08	-50	-30	-0.1	2.2	-5	-0.05	-0.1	-0.5	1.1	0.5	-4	-50	3	6
HF74	-2	-5	4	890	-1	-1	-5	146	8	0.76	5	-1	-5	-5	2.8	-50	251	0.2	2.2	-5	-0.05	-0.1	11.7	18	17.5	-4	-50	23.2	43
HF75	-2	-5	2	1600	-1	-1	-5	231	2	1.16	5	-1	-5	-5	1.67	-50	94	0.2	1.1	-5	-0.05	-0.1	-0.5	5.7	2.3	-4	-50	21.9	33
HF76	-2	-5	2	570	-1	-1	-5	153	4	0.53	2	-1	-5	-5	1	-50	175	0.2	1	-5	-0.05	-0.1	-0.5	9.7	4.2	-4	-50	24.9	40
HF77	-2	-5	5	340	-1	-1	-5	135	6	0.98	5	-1	-5	-5	2.12	-50	272	0.4	1.3	-5	-0.05	-0.1	3.1	31.1	10.3	-4	265	49.8	84
HF78	-2	-5	1	-50	-1	-1	-5	274	-1	0.22	-1	-1	-5	-5	0.02	-50	-30	1.6	0.1	-5	-0.05	-0.1	-0.5	0.6	1.1	-4	-50	2.6	4
HF79	-2	-5	2	1500	-1	-1	-5	142	3	1.77	3	-1	-5	-5	1.54	-50	90	0.2	1	-5	-0.05	-0.1	1.8	3.9	2.5	-4	90	13.6	23
HF80	-2	-5	1	1800	-1	-1	-5	133	3	1.81	7	-1	-5	-5	2.24	-50	117	-0.1	3.8	-5	-0.05	-0.1	2	9.3	3.8	-4	91	38.9	67
HF81	-2	-5	2	1600	-1	-1	-5	135	4	1.81	6	-1	-5	-5	3.12	-50	172	0.2	3.9	-5	-0.05	-0.1	2.5	15.5	3.2	-4	119	83.8	135
HF82	3	-5	2	730	-1	-1	-5	200	-1	0.94	3	-1	-5	-5	3.38	-50	-30	-0.1	1.9	-5	-0.05	-0.1	-0.5	0.9	-0.5	-4	-50	2.7	-3
HF83	-2	-5	2	1500	-1	-1	-5	103	12	1.49	5	-1	-5	-5	2.8	-50	204	0.3	3.4	-5	-0.05	-0.1	-0.5	18	6.2	-4	-50	84.1	122
HF84	2	-5	2	-50	-1	-1	-5	348	-1	0.29	-1	-1	-5	-5	0.03	-50	-30	0.1	-0.1	-5	-0.05	-0.1	-0.5	0.4	-0.5	-4	-50	0.6	-3
HS18 SILT	47	-5	5	830	4	-1	6	456	5	2.68	43	-1	-5	-5	2.58	-50	170	0.2	7.6	-5	-0.05	-0.1	20.1	74.8	43.6	67	-50	235	384
HS19	94	-5	4	1100	8	-1	9	767	4	3.88	67	-1	-5	-5	2.53	-50	182	0.2	10	-5	-0.05	-0.1	36.1	121	65.4	130	120	365	581
DMMAS-15-69	567	-5	2410	300	2	8	71	141	-1	7.9	2	-1	-5	-5	0.79	-50	78	8	19.1	-5	-0.05	-0.1	-0.6	1.4	-0.5	20	222	12.4	23
DMMAS-15-35	560	-5	2410	440	3	9	68	139	-1	7.55	2	-1	-5	-5	0.76	-50	39	8.3	18.3	-5	-0.05	-0.1	-0.6	1.4	2.5	18	242	12.2	20
DMMAS-15-34	527	-5	2400	580	4	9	69	136	2	7.95	2	-1	-5	-5	0.78	165	50	7.8	18.7	-5	-0.05	-0.1	-0.6	1.5	-0.5	17	196	12.5	20
DMMAS-15-33	500	-5	2290	500	4	8	65	127	2	7.25	2	-1	-5	-5	0.78	166	55	8.1	18.5	-5	-0.05	-0.1	-0.5	1.5	-0.5	17	127	12.1	19
Accepted Value-DMMAS-15	517+-88		2400+-250	370+-120	3.0+-1.5	8+-1.6	65+-7	132+-22	1+-0.9	7.89+-0.87	2+-1				0.75+-0.08		46+-20	8.3+-2.8	18+-2.0					1.1+-0.6		17+-4	210+-60	12+-1.5	20+-5

Activation Laboratories Ltd. Work Order: 23406 Report: 23160

Sample ID	Au	Ag	As	Ba	Br	Ca	Co	Cr	Cs	Fe	Hf	Hg	Ir	Mo	Na	Ni	Rb	Sb	Sc	Se	Sn	Sr	Ta	Th	U	W	Zn	La	Ce
	ppb	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm	%	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
HF44	-2	-5	4	1300	-1	-1	-5	220	3	1.28	4	-1	-5	-5	2.02	-50	130	0.2	1.8	-5	-0.05	-0.1	-0.5	13.8	2.9	-4	-50	74.3	118
HF45	3	-5	4	600	-1	-1	-5	229	3	1.45	4	-1	-5	8	1.9	-50	109	-0.1	0.9	-5	-0.05	-0.1	-0.5	24.3	3.4	-4	-50	158	243
HF46	2	-5	3	650	-1	-1	-5	156	6	0.86	4	-1	-5	-5	2.18	-50	145	0.2	0.7	-5	-0.05	-0.1	-0.5	54.7	10	-4	-50	43.1	72
HF47	2	-5	4	490	-1	-1	-5	170	3	1.46	5	-1	-5	-5	1.83	-50	131	0.1	2.4	-5	-0.05	-0.1	-0.5	10.2	4.3	-4	-50	31.2	52
HF48	-2	-5	4	440	-1	-1	-5	173	6	0.92	5	-1	-5	27	2.23	-50	272	0.2	1.6	-5	-0.05	-0.1	-0.5	27.5	10.2	-4	77	54.6	99
HF49	-2	-5	4	3100	-1	-1	-5	118	4	2.22	8	-1	-5	-5	4.13	-50	160	0.2	5.1	-5	-0.05	-0.1	-0.5	11	3.1	-4	-50	46.5	86
HF50	-2	-5	3	1300	-1	-1	-5	147	4	1.85	6	-1	-5	-5	2.14	-50	142	0.3	4	-5	-0.05	-0.1	2.1	13.1	4.3	-4	-50	33	89
HF51	-2	-5	3	360	-1	-1	-5	139	5	0.75	2	-1	-5	-5	1.95	-50	180	-0.1	1.1	-5	-0.05	-0.1	2	14.7	4.3	-4	-50	36	63
HF52	-2	-5	28	980	-1	-1	-5	67	3	0.61	9	-1	-5	-5	4.28	-50	267	0.2	0.7	-5	-0.05	-0.1	-0.5	13.6	3.9	-4	-50	37.1	55
HF53	-2	-5	3	200	-1	-1	-5	164	3	0.66	2	-1	-5	-5	2	-50	144	0.4	0.7	-5	-0.05	-0.1	-0.5	10	3.1	-4	-50	34.4	53
HF54	-2	-5	3	570	-1	-1	-5	184	3	0.91	3	-1	-5	-5	2.22	-50	132	0.2	1.5	-5	-0.05	-0.1	-0.5	22.3	3.5	-4	-50	16.9	33
HF55	-2	-5	4	1200	-1	-1	-5	114	-1	1.35	7	-1	-5	-5	6	-50	94	0.3	3.7	-5	-0.05	-0.1	2.2	16.9	3.9	-4	-50	29.8	55
HF56	-2	-5	2	270	-1	-1	-5	127	3	0.74	4	-1	-5	-5	2.27	-50	142	0.1	1	-5	-0.05	-0.1	-0.5	7.8	2	-4	-50	26.8	40
HF57	-2	-5	3	400	-1	-1	-5	185	2	0.82	4	-1	-5	-5	1.99	-50	102	0.2	1.4	-5	-0.05	-0.1	-0.5	12.8	3.7	-4	-50	53.8	83
HF58	-2	-5	4	-53	-1	-1	-5	63	5	1.8	7	-1	-5	-5	6.91	-50	-30	-0.1	3.9	-5	-0.05	-0.1	6.5	34.8	9.9	-4	136	59.9	97
HF59	6	-5	1	1000	-1	-1	-5	253	9	1.06	5	-1	-5	5	2.45	-50	162	0.3	1.9	-5	-0.05	-0.1	-0.5	28.5	4	-4	-50	124	200
HF60	4	-5	5	490	-1	-1	-5	309	3	0.66	3	-1	-5	-5	1.68	-50	147	0.3	1.9	-5	-0.05	-0.1	4	11.3	7.3	-4	125	27.7	47
HF61	-2	-5	2	1200	-1	-1	-5	238	4	1.74	6	-1	-5	-5	2.04	-50	125	0.3	3.8	-5	-0.05	-0.1	1.9	11.5	2.8	-4	69	72.9	123
HF62	4	-5	3	-50	-1	-1	-5	193	4	0.63	5	-1	-5	-5	2.96	-50	280	0.2	1.2	-5	-0.05	-0.1	4.8	25.3	16.6	-4	-50	14.8	30
HF63	-2	-5	32	270	-1	-1	-5	112	7	1.19	5	-1	-5	-5	2.94	-50	199	0.5	1.5	-5	-0.05	-0.1	-0.5	32	9.9	-4	91	50.4	81
HF64	-2	-5	2	1200	-1	-1	-5	122	7	0.94	4	-1	-5	-5	2.75	-50	269	0.3	2.7	-5	-0.05	-0.1	-0.5	13.7	6.7	-4	-50	35.4	55
HF65	-2	-5	18	760	-1	-1	-5	157	3	1.54	6	-1	-5	-5	2.21	-50	159	2.5	2.7	-5	-0.05	-0.1	-0.5	18.3	9	-4	114	63.2	110
HF66	4	-5	2	2200	-1	-1	-5	99	7	2.65	9	-1	-5	-5	4.29	-50	300	0.4	5.6	-5	-0.05	-0.1	-0.5	16.3	5.8	-4	-50	63.9	111
HF67	-2	-5	2	390	-1	-1	-5	117	2	0.77	5	-1	-5	-5	3.26	-50	58	0.2	1.9	-5	-0.05	-0.1	-0.5	18.3	4.6	-4	-50	46.6	101
HF68	-2	-5	10	320	-1	-1	-5	214	5	0.79	3	-1	-5	-5	1.28	-50	247	0.7	0.9	-5	-0.05	-0.1	1.3	14	5.5	-4	-50	19	33
HF69	-2	-5	2	180	-1	-1	-5	131	7	0.74	3	-1	-5	-5	2.29	-50	279	0.4	1.4	-5	-0.05	-0.1	5.2	25.2	12.4	-4	-50	17.2	35
HF70	-2	-5	11	330	-1	-1	-5	113	19	0.59	7	-1	-5	-5	3.05	-50	375	0.3	1.4	-5	-0.05	-0.1	8	29.2	22.1	-4	-50	22.5	48
HF71	-2	-5	13	410	-1	-1	-5	98	27	0.76	8	-1	-5	-5	2.84	-50	369	1.9	1.6	-5	-0.05	-0.1	17	33.2	34.7	6	-50	70.6	122
HF72	-2	-5	2	-50	-1	-1	-5	253	-1	0.19	-1	-1	-5	-5	0.02	-50	-30	0.1	0.1	-5	-0.05	-0.1	-0.5	-0.2	-0.5	-4	-50	-0.5	-3
HF73	-2	-5	2	280	-1	-1	-5	209	-1	0.6	-1	-1	-5	-5	0.08	-50	-30	-0.1	2.2	-5	-0.05	-0.1	-0.5	1.1	0.5	-4	-50	3	6
HF74	-2	-5	4	890	-1	-1	-5	146	8	0.76	5	-1	-5	-5	2.8	-50	251	0.2	2.2	-5	-0.05	-0.1	11.7	18	17.5	-4	-50	23.2	43
HF75	-2	-5	2	1600	-1	-1	-5	231	2	1.16	5	-1	-5	-5	1.67	-50	94	0.2	1.1	-5	-0.05	-0.1	-0.5	5.7	2.3	-4	-50	21.9	33
HF76	-2	-5	2	570	-1	-1	-5	153	4	0.53	2	-1	-5	-5	1	-50	175	0.2	1	-5	-0.05	-0.1	-0.5	9.7	4.2	-4	-50	24.9	40
HF77	-2	-5	5	340	-1	-1	-5	135	6	0.96	5	-1	-5	-5	2.12	-50	272	0.4	1.3	-5	-0.05	-0.1	3.1	31.1	10.3	-4	265	49.8	84
HF78	-2	-5	1	-50	-1	-1	-5	274	-1	0.22	-1	-1	-5	-5	0.02	-50	-30	1.6	0.1	-5	-0.05	-0.1	-0.5	0.6	1.1	-4	-50	2.6	4
HF79	-2	-5	2	1500	-1	-1	-5	142	3	1.77	3	-1	-5	-5	1.54	-50	90	0.2	1	-5	-0.05	-0.1	1.8	3.9	2.5	-4	90	13.6	23
HF80	-2	-5	1	1800	-1	-1	-5	133	3	1.81	7	-1	-5	-5	2.24	-50	117	-0.1	3.8	-5	-0.05	-0.1	2	9.3	3.8	-4	91	38.9	67
HF81	-2	-5	2	1600	-1	-1	-5	135	4	1.81	6	-1	-5	-5	3.12	-50	172	0.2	3.9	-5	-0.05	-0.1	2.5	15.5	3.2	-4	119	83.8	135
HF82	3	-5	2	730	-1	-1	-5	200	-1	0.94	3	-1	-5	-5	3.38	-50	-30	-0.1	1.9	-5	-0.05	-0.1	-0.5	0.9	-0.5	-4	-50	2.7	-3
HF83	-2	-5	2	1500	-1	-1	-5	103	12	1.49	5	-1	-5	-5	2.8	-50	204	0.3	3.4	-5	-0.05	-0.1	-0.5	18	6.2	-4	-50	84.1	122
HF84	2	-5	2	-50	-1	-1	-5	348	-1	0.29	-1	-1	-5	-5	0.03	-50	-30	0.1	-0.1	-5	-0.05	-0.1	-0.5	0.4	-0.5	-4	-50	0.6	-3
HS18	47	-5	5	830	4	-1	6	456	5	2.68	43	-1	-5	-5	2.58	-50	170	0.2	7.6	-5	-0.05	-0.1	20.1	74.8	43.6	67	-50	235	384
HS19 S/LT	94	-5	4	1100	8	-1	9	767	4	3.88	67	-1	-5	-5	2.53	-50	182	0.2	10	-5	-0.05	-0.1	36.1	121	65.4	130	120	365	581
DMMAS-15-69	567	-5	2410	300	2	8	71	141	-1	7.9	2	-1	-5	-5	0.79	-50	78	8	19.1	-5	-0.05	-0.1	-0.6	1.4	-0.5	20	222	12.4	23
DMMAS-15-35	560	-5	2410	440	3	9	68	139	-1	7.55	2	-1	-5	-5	0.76	-50	39	8.3	18.3	-5	-0.05	-0.1	-0.6	1.4	2.5	18	242	12.2	20
DMMAS-15-34	527	-5	2400	580	4	9	69	136	2	7.95	2	-1	-5	-5	0.78	165	50	7.8	18.7	-5	-0.05	-0.1	-0.6	1.5	-0.5	17	196	12.5	20
DMMAS-15-33	500	-5	2290	500	4	8	65	127	2	7.25	2	-1	-5	-5	0.78	186	55	8.1	18.5	-5	-0.05	-0.1	-0.5	1.5	-0.5	17	127	12.1	19
Accepted Value-DMMAS-15	517+-88		2400+-250	370+-120	3.0+-1.5	8+-1.6	65+-7	132+-22	1+-0.9	7.89+-0.87	2+-1				0.75+-0.08		46+-20	8.3+-2.8	18+-2.0					1.1+-0.6		17+-4	210+-60	12+-1.5	20+-5

Sample ID	Nd	Sm	Eu	Tb	Yb	Lu	Mass
	ppm	ppm	ppm	ppm	ppm	ppm	g
HF44	42	6.8	0.7	-0.5	1.7	0.28	23.84
HF45	69	9.7	0.4	-0.5	1.7	0.27	26.7
HF46	26	4.5	0.5	-0.5	1.6	0.24	32.43
HF47	18	3.9	0.5	-0.5	1.5	0.23	34.94
HF48	36	7.8	-0.2	1	2.9	0.44	34.81
HF49	31	8.4	1.1	1.4	3.6	0.54	32.61
HF50	21	5.5	0.6	-0.5	2.5	0.39	37.09
HF51	25	6.2	0.3	1.2	3.2	0.47	36.34
HF52	18	2.6	0.5	-0.5	1.1	0.16	34.83
HF53	15	3.7	-0.2	-0.5	2.2	0.33	38.61
HF54	13	4	0.4	-0.5	2	0.3	35.78
HF55	18	6.7	0.7	-0.5	3.3	0.49	36.23
HF56	-5	2.4	-0.2	-0.5	0.9	0.15	39.83
HF57	23	4.5	-0.2	-0.5	1.3	0.21	39.45
HF58	31	6.3	-0.2	-0.5	5.1	0.77	36.93
HF59	63	10.9	0.4	-0.5	2.6	0.4	35.65
HF60	17	4.5	-0.2	-0.5	2.8	0.42	34.88
HF61	41	8.5	0.7	-0.5	2.7	0.41	36.04
HF62	-5	4.9	-0.2	1.5	8.3	1.26	33.43
HF63	32	7.1	-0.2	-0.5	4.3	0.64	37.76
HF64	19	3.9	-0.2	-0.5	3.2	0.48	35.93
HF65	31	9.4	0.4	1.6	4.7	0.7	33.71
HF66	35	7.1	0.7	0.9	2.9	0.44	31.19
HF67	29	6.3	0.4	1	2.3	0.33	39.51
HF68	8	3.1	0.2	0.9	3	0.45	35
HF69	9	3.3	-0.2	-0.5	4.3	0.67	35.29
HF70	11	5.9	-0.2	1.8	15.8	2.35	37.65
HF71	32	7.6	-0.2	1.3	5.7	0.83	35.67
HF72	-5	-0.1	-0.2	-0.5	-0.2	-0.05	38.26
HF73	-5	0.6	-0.2	-0.5	0.2	-0.05	36.72
HF74	17	3.6	0.5	-0.5	8.2	1.3	32.85
HF75	11	2.2	0.7	-0.5	0.9	0.15	33.79
HF76	13	3.3	0.2	-0.5	1.8	0.26	38.34
HF77	29	8.2	-0.2	1.6	4.8	0.72	36.69
HF78	-5	0.6	-0.2	-0.5	-0.2	-0.05	36.5
HF79	-5	2.1	0.5	-0.5	1.2	0.19	35.3
HF80	25	5.4	0.9	0.7	2.1	0.32	36.77
HF81	46	9.3	0.9	1.2	2.4	0.39	31.98
HF82	-5	0.3	0.3	-0.5	-0.2	-0.05	34.25
HF83	55	10.1	0.7	1.5	3.9	0.58	34.24
HF84	-5	0.4	-0.2	-0.5	0.5	0.08	33.18
HS18	120	24.2	1.4	4.7	17.7	2.54	28.14
HS19	160	37.3	1.9	6.7	27.2	4.2	23.82
DMMAS-15-69	9	3.9	1.2	1.3	2.7	0.41	25.58
DMMAS-15-35	10	3.7	1.2	-0.5	2.9	0.43	25.64
DMMAS-15-34	11	3.8	0.9	-0.5	3.1	0.47	25.36
DMMAS-15-33	9	3.8	1.2	-0.5	2.9	0.45	25.4
Accepted Value-DMMAS-15	11+-4	3.5+-0.5	1.1+-0.2	0.7+-0.2	3.3+-1.0	0.49+-0.11	

Sample ID	Nd	Sm	Eu	Tb	Yb	Lu	Mass
	ppm	ppm	ppm	ppm	ppm	ppm	g
HF44	42	6.8	0.7	-0.5	1.7	0.28	23.84
HF45	69	9.7	0.4	-0.5	1.7	0.27	26.7
HF46	26	4.5	0.5	-0.5	1.6	0.24	32.43
HF47	18	3.9	0.5	-0.5	1.5	0.23	34.94
HF48	36	7.8	-0.2	1	2.9	0.44	34.81
HF49	31	8.4	1.1	1.4	3.6	0.54	32.61
HF50	21	5.5	0.6	-0.5	2.5	0.39	37.09
HF51	25	6.2	0.3	1.2	3.2	0.47	36.34
HF52	18	2.6	0.5	-0.5	1.1	0.16	34.83
HF53	15	3.7	-0.2	-0.5	2.2	0.33	38.61
HF54	13	4	0.4	-0.5	2	0.3	35.78
HF55	18	6.7	0.7	-0.5	3.3	0.49	36.23
HF56	-5	2.4	-0.2	-0.5	0.9	0.15	39.83
HF57	23	4.5	-0.2	-0.5	1.3	0.21	39.45
HF58	31	6.3	-0.2	-0.5	5.1	0.77	36.93
HF59	63	10.9	0.4	-0.5	2.6	0.4	35.65
HF60	17	4.5	-0.2	-0.5	2.8	0.42	34.88
HF61	41	8.5	0.7	-0.5	2.7	0.41	36.04
HF62	-5	4.9	-0.2	1.5	8.3	1.26	33.43
HF63	32	7.1	-0.2	-0.5	4.3	0.64	37.76
HF64	19	3.9	-0.2	-0.5	3.2	0.48	35.93
HF65	31	9.4	0.4	1.6	4.7	0.7	33.71
HF66	35	7.1	0.7	0.9	2.9	0.44	31.19
HF67	29	6.3	0.4	1	2.3	0.33	39.51
HF68	8	3.1	0.2	0.9	3	0.45	35
HF69	9	3.3	-0.2	-0.5	4.3	0.67	35.29
HF70	11	5.9	-0.2	1.8	15.8	2.35	37.65
HF71	32	7.6	-0.2	1.3	5.7	0.83	35.67
HF72	-5	-0.1	-0.2	-0.5	-0.2	-0.05	38.26
HF73	-5	0.6	-0.2	-0.5	0.2	-0.05	36.72
HF74	17	3.6	0.5	-0.5	8.2	1.3	32.85
HF75	11	2.2	0.7	-0.5	0.9	0.15	33.79
HF76	13	3.3	0.2	-0.5	1.8	0.26	38.34
HF77	29	8.2	-0.2	1.6	4.8	0.72	36.69
HF78	-5	0.6	-0.2	-0.5	-0.2	-0.05	36.5
HF79	-5	2.1	0.5	-0.5	1.2	0.19	35.3
HF80	25	5.4	0.9	0.7	2.1	0.32	36.77
HF81	46	9.3	0.9	1.2	2.4	0.39	31.98
HF82	-5	0.3	0.3	-0.5	-0.2	-0.05	34.25
HF83	55	10.1	0.7	1.5	3.9	0.58	34.24
HF84	-5	0.4	-0.2	-0.5	0.5	0.08	33.18
HS18	120	24.2	1.4	4.7	17.7	2.54	28.14
HS19	160	37.3	1.9	6.7	27.2	4.2	23.82
DMMAS-15-69	9	3.9	1.2	1.3	2.7	0.41	25.58
DMMAS-15-35	10	3.7	1.2	-0.5	2.9	0.43	25.64
DMMAS-15-34	11	3.8	0.9	-0.5	3.1	0.47	25.36
DMMAS-15-33	9	3.8	1.2	-0.5	2.9	0.45	25.4
Accepted Value-DMMAS-15	11+-4	3.5+-0.5	1.1+-0.2	0.7+-0.2	3.3+-1.0	0.49+-0.11	

Activation Laboratories Ltd. Work Order: 23406 Report: 23160B

Sample	Nb ppm	Sn ppm
HS18	97	76
HS19	158	95
Standard		
AGV-1	15	< 5
AGV-1 Cert.	15	4.2
GXR-1	2	53
GXR-1 Cert.	0.8	54
LKSD-2	9	5
LKSD-4	6	< 5
LKSD-4 Cert.	9	5
STSD-2	21	< 5
STSD-2 Cert.	29	5
STSD-4	8	< 5
STSD-4 Cert.	9	2

Appendix 4

Float Sample Geochemistry - Assay Results

Activation Laboratories Ltd. Work Order: 22960 Report: 22630

Sample ID	Au	Ag	As	Ba	Br	Ca	Co	Cr	Cs	Fe	Hf	Hg	Ir	Mo
	ppb	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm
HF 1	4	-5	1.9	2100	-0.5	-1	3	85	2	2.32	12	-1	-5	-1
HF 2	-2	-5	1.2	1300	-0.5	-1	2	144	2	1.66	8	-1	-5	-1
HF 3	-2	-5	1.6	970	-0.5	-1	3	251	5	1.66	8	-1	-5	5
HF 4	-2	-5	1.3	390	-0.5	-1	-1	203	6	0.93	6	-1	-5	-1
HF 5	-2	-5	7.5	880	-0.5	-1	-1	228	8	1.41	6	-1	-5	5
HF 6	-2	-5	1.5	990	-0.5	-1	5	233	5	2.07	8	-1	-5	4
HF 7	-2	-5	2.2	-50	-0.5	-1	2	390	-1	0.47	-1	-1	-5	-1
HF 8	2	-5	2.2	840	-0.5	-1	3	207	4	2.03	8	-1	-5	-1
HF 9	-2	-5	4.8	1700	-0.5	-1	-1	363	1	0.76	8	-1	-5	-1
HF 10	-2	-5	2.9	1000	-0.5	-1	-1	184	8	1.26	7	-1	-5	2
HF 11	-2	-5	1.7	1700	-0.5	-1	2	131	-1	2.6	10	-1	-5	-1
HF 12	-2	-5	4.1	1000	-0.5	1	5	156	7	2.83	9	-1	-5	2
HF 13	-2	-5	1.4	1000	-0.5	2	-1	136	2	2.25	11	-1	-5	-1
HF 14	-2	-5	9.9	410	-0.5	-1	-1	192	5	1.04	6	-1	-5	-1
HF 15	-2	-5	1.5	660	-0.5	-1	3	112	4	1.94	8	-1	-5	5
HF 16	-2	-5	0.8	1100	-0.5	1	4	130	4	2.26	9	-1	-5	5
HF 17	7	-5	3.9	980	1.2	-1	3	184	3	1.29	5	-1	-5	4
HF 18A	-2	-5	1.7	350	-0.5	-1	2	155	10	1.11	6	-1	-5	-1
HF 18B	-2	-5	1.6	620	-0.5	-1	2	208	6	1.07	7	-1	-5	-1
HF 19	-2	-5	4.2	770	-0.5	-1	9	86	2	5.55	21	-1	-5	-1
HF 20	4	-5	4.1	1700	-0.5	-1	3	227	4	1.24	8	-1	-5	-1
HF 21	-2	-5	2.6	420	-0.5	-1	2	221	6	1.08	3	-1	-5	5
HF 22	-2	-5	1.6	190	-0.5	-1	-1	229	2	0.75	6	-1	-5	5
HF 23	-2	-5	3.4	1400	-0.5	-1	3	263	2	1.37	6	-1	-5	-1
HF 24	-2	-5	2	440	-0.5	-1	2	331	2	0.6	3	-1	-5	1
HF 25	-2	-5	-0.5	1400	-0.5	-1	3	140	2	1.74	8	-1	-5	-1
HF 26	-2	-5	1.7	470	-0.5	-1	-1	180	5	1.13	6	-1	-5	7
HF 27	-2	-5	1.3	2300	-0.5	-1	3	126	4	1.68	6	-1	-5	5
HF 28	-2	-5	1.3	190	-0.5	-1	-1	226	5	0.89	6	-1	-5	-1
HF 30	-2	-5	1.2	630	-0.5	-1	1	135	4	1.47	8	-1	-5	9
HF 31	-2	-5	1.8	590	-0.5	-1	4	149	-1	1.55	9	-1	-5	-1
HF 32	-2	-5	6.3	360	-0.5	-1	2	278	9	0.95	6	-1	-5	-1
HF 33	-2	-5	3.7	760	-0.5	-1	2	248	3	1.08	8	-1	-5	-1
HF 34	-2	-5	1	1300	-0.5	-1	3	212	3	1.36	9	-1	-5	4
HF 35	-2	-5	5.6	1200	-0.5	-1	-1	254	4	1.55	7	-1	-5	6
HF 36	-2	-5	-0.5	1700	-0.5	-1	3	153	3	1.75	8	-1	-5	-1
HF 37	-2	-5	3.1	1000	-0.5	-1	4	151	3	3.17	11	-1	-5	-1
HF 38	-2	-5	1.5	890	-0.5	-1	3	141	3	1.22	10	-1	-5	-1
HF 39	-3	-5	10.7	1300	-0.5	-1	4	136	-1	3.08	10	-1	-5	-1
HF 40	-2	-5	2.2	1100	-0.5	-1	-1	186	3	1.44	8	-1	-5	4
HF 41	-2	-5	5.1	990	-0.5	-1	4	135	-1	2.99	15	-1	-5	4
HF 42	-2	-5	3.9	1300	-0.5	-1	3	249	2	1.65	7	-1	-5	-1
HF 43	-2	-5	-0.5	370	-0.5	-1	2	163	12	0.78	11	-1	-5	-1
DMMAS-18-1992	626	-5	1980	430	2.6	8	64	145	2	8.48	3	-1	-5	-2
DMMAS-18-1991	582	19	1940	400	3.2	7	63	143	2	8.57	2	-1	-5	-2
DMMAS-18-1990	623	-5	2040	450	-0.6	8	64	152	-1	8.95	3	-1	-5	-2
Accepted Value-DMMAS-18B	544+-72		2020+-224	435+-150	2.5+-1.5	7+-2	58+-15	151+-20		8.05+-0.85	2+-1			

Sample ID	Na	Ni	Rb	Sb	Sc	Se	Sn	Sr	Ta	Th	U	W	Zn	La	Ce
	%	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
HF 1	3.25	-23	252	1.4	5.2	-3	-0.02	-0.05	-0.5	15.2	3.4	-1	104	76.2	155
HF 2	3.11	-22	171	0.9	3.4	-3	-0.02	-0.05	1.2	12.5	3.3	-1	95	69.8	114
HF 3	2.34	-22	190	0.5	3.4	-3	-0.02	-0.05	2.7	22.6	3.4	-1	-50	90.7	151
HF 4	2.3	-21	212	0.7	2	-3	-0.02	-0.05	3.6	32	5.4	-1	-50	103	185
HF 5	2.36	-21	267	0.3	2.4	-3	-0.02	-0.05	3.4	18.4	4.1	-1	102	53	101
HF 6	2.79	-22	192	0.7	3.4	-3	-0.01	-0.05	4.2	25.4	5.4	-1	59	52	87
HF 7	0.09	-20	-15	0.2	0.6	-3	-0.01	-0.05	-0.5	0.6	-0.5	-1	-50	1.8	4
HF 8	2.87	-22	197	0.5	3.2	-3	-0.02	-0.05	2.8	26.7	4.8	-1	85	54.3	87
HF 9	2.73	-21	126	0.7	1.1	-3	-0.02	-0.05	1.4	17.5	3	-1	-50	72.2	122
HF 10	2.36	-20	208	0.1	3.2	-3	-0.02	-0.05	3.2	20.9	3.9	-1	-50	73.2	120
HF 11	4.79	-26	64	0.4	4.7	-3	-0.02	-0.05	-0.5	17.9	3.7	-1	63	98.9	177
HF 12	2.57	-20	160	0.3	5.7	-3	-0.02	-0.05	2.4	11.2	3.1	-1	61	51.3	85
HF 13	7.19	-31	40	-0.1	6	-3	-0.02	-0.05	3.8	23.3	2.4	-1	-50	99.4	184
HF 14	2.28	-20	256	0.3	1.9	3	-0.02	-0.05	1.9	37.4	9.8	-1	83	73	129
HF 15	2.81	-20	195	0.4	3.1	-3	-0.02	-0.05	5.1	31.3	7.4	-1	-50	55.8	93
HF 16	3.06	-22	182	-0.1	3.7	-3	-0.02	-0.05	3.1	27.9	5.2	-1	-50	59.8	101
HF 17	2.37	-20	103	0.4	2.4	-3	-0.02	-0.05	-0.5	30.1	3	-1	-50	73.1	114
HF 18A	2.98	-20	319	0.4	2.6	-3	-0.01	-0.05	9.4	29.7	11.5	-1	-50	23.4	45
HF 18B	2.46	-20	254	0.3	2	-3	-0.01	-0.05	2.5	19	4.1	-1	59	52.3	91
HF 19	6.31	-29	90	1	12.1	-3	-0.02	-0.05	2	15.4	4.5	-1	187	75.8	154
HF 20	2.42	-20	160	0.6	2.6	-3	-0.02	-0.05	2.2	20.4	4.2	-1	-50	51.5	90
HF 21	2.47	-20	259	0.4	1.5	-3	-0.01	-0.05	2.7	37.5	5	-1	-50	42.9	84
HF 22	5.15	-24	-15	-0.1	1.3	-3	-0.02	-0.05	2.9	26.7	5.7	-1	144	86.8	133
HF 23	2.43	-20	150	0.3	2.5	-3	-0.01	-0.05	2.1	12.7	2.5	-1	-50	40.9	65
HF 24	0.12	-20	60	0.5	0.5	-3	-0.01	-0.05	-0.5	3.8	1.3	5	-50	10.9	20
HF 25	4.27	-24	205	0.3	3.8	-3	-0.02	-0.05	-0.5	19	2.4	-1	-50	75	128
HF 26	2.3	-20	197	0.3	2.6	-3	-0.01	-0.05	2	25.6	4.8	-1	54	67.8	123
HF 27	4.18	-22	200	0.3	3.3	-3	-0.02	-0.05	-0.5	19.1	3.8	-1	-50	59.1	91
HF 28	1.86	-20	213	0.3	1.4	-3	-0.01	-0.05	2.4	26.9	5.4	-1	56	52.6	103
HF 30	3.37	-21	217	-0.1	2.9	-3	-0.02	-0.05	5.1	46.2	15.2	-1	99	73.5	141
HF 31	6.24	-26	-15	-0.1	4.6	-3	-0.02	-0.05	2.5	16	2.8	-1	-50	56.6	136
HF 32	2.57	-20	292	0.6	1.5	-3	-0.01	-0.05	3.7	25.2	4.3	-1	-50	44.8	88
HF 33	3.37	-22	191	-0.1	2.9	-3	-0.02	-0.05	1.3	25.4	4.8	-1	91	70.9	134
HF 34	2.17	-20	131	-0.1	1.6	-3	-0.01	0.09	1.1	18.2	2.2	-1	-50	34	59
HF 35	2.22	-20	158	0.3	3.4	-3	-0.01	-0.05	1.1	13.7	3.7	-1	59	52.1	97
HF 36	2.26	-20	136	-0.1	4.4	-3	-0.01	-0.05	2.4	11.1	1.9	-1	61	40.7	68
HF 37	2.72	-23	104	0.7	6.9	-3	-0.02	-0.05	3.4	21.6	3.9	-1	-50	99.8	175
HF 38	2.23	-20	142	0.2	5.7	-3	-0.01	-0.05	1.7	17	2.1	-1	-50	28.5	55
HF 39	5.22	-31	115	0.4	5.4	-3	-0.02	-0.05	-0.5	27.7	4.5	-1	1830	163	261
HF 40	2.27	-20	168	-0.1	3.5	-3	-0.02	-0.05	-0.5	17.1	4	-1	55	89.9	117
HF 41	5.03	-27	67	-0.1	7.2	-3	-0.02	-0.05	-0.5	12.7	4.6	-1	217	36.5	72
HF 42	2.35	-20	106	0.4	2.6	-3	-0.01	-0.05	-0.5	16.8	2.6	-1	-50	54.9	91
HF 43	3.59	-23	583	0.4	5.9	-3	-0.02	-0.05	24.7	26.3	8.9	-1	-50	25.1	62
DMMAS-18-1992	0.75	-30	40	13.1	20.3	-3	-0.03	-0.05	-0.5	1.5	-0.5	19	221	12.5	24
DMMAS-18-1991	0.74	-28	40	12.6	20.5	-3	-0.03	-0.05	-0.5	1.5	-0.5	19	207	12.6	24
DMMAS-18-1990	0.81	-29	35	11.8	21.2	-3	-0.03	-0.05	-0.5	1.2	-0.5	20	230	13.5	25
Accepted Value-DMMAS-18B	0.74+-0.48		38+-10	12+-3	20.5+-3.4					1.5+-0.5		19+-2	250+-50	12.2+-1.3	23+-3

Activation Laboratories Ltd. Work Order: 22960 Report: 22630

Sample ID	Au ppb	Ag ppm	As ppm	Ba ppm	Br ppm	Ca %	Co ppm	Cr ppm	Cs ppm	Fe %	Hf ppm	Hg ppm	Ir ppb	Mo ppm
HF 1	4	-5	1.9	2100	-0.5	-1	3	85	2	2.32	12	-1	-5	-1
HF 2	-2	-5	1.2	1300	-0.5	-1	2	144	2	1.66	8	-1	-5	-1
HF 3	-2	-5	1.6	970	-0.5	-1	3	251	5	1.66	8	-1	-5	5
HF 4	-2	-5	1.3	390	-0.5	-1	-1	203	6	0.93	6	-1	-5	-1
HF 5	-2	-5	7.5	880	-0.5	-1	-1	228	8	1.41	6	-1	-5	5
HF 6	-2	-5	1.5	990	-0.5	-1	5	233	5	2.07	8	-1	-5	4
HF 7	-2	-5	2.2	-50	-0.5	-1	2	390	-1	0.47	-1	-1	-5	-1
HF 8	2	-5	2.2	840	-0.5	-1	3	207	4	2.03	8	-1	-5	-1
HF 9	-2	-5	4.8	1700	-0.5	-1	-1	363	1	0.76	8	-1	-5	-1
HF 10	-2	-5	2.9	1000	-0.5	-1	-1	184	8	1.26	7	-1	-5	2
HF 11	-2	-5	1.7	1700	-0.5	-1	2	131	-1	2.6	10	-1	-5	-1
HF 12	-2	-5	4.1	1000	-0.5	1	5	156	7	2.83	9	-1	-5	2
HF 13	-2	-5	1.4	1000	-0.5	2	-1	136	2	2.25	11	-1	-5	-1
HF 14	-2	-5	9.9	410	-0.5	-1	-1	192	5	1.04	6	-1	-5	-1
HF 15	-2	-5	1.5	660	-0.5	-1	3	112	4	1.94	8	-1	-5	5
HF 16	-2	-5	0.8	1100	-0.5	1	4	130	4	2.26	9	-1	-5	5
HF 17	7	-5	3.9	980	1.2	-1	3	184	3	1.29	5	-1	-5	4
HF 18A	-2	-5	1.7	350	-0.5	-1	2	155	10	1.11	6	-1	-5	-1
HF 18B	-2	-5	1.6	620	-0.5	-1	2	208	6	1.07	7	-1	-5	-1
HF 19	-2	-5	4.2	770	-0.5	-1	9	86	2	5.55	21	-1	-5	-1
HF 20	4	-5	4.1	1700	-0.5	-1	3	227	4	1.24	8	-1	-5	-1
HF 21	-2	-5	2.6	420	-0.5	-1	2	221	6	1.08	3	-1	-5	5
HF 22	-2	-5	1.6	190	-0.5	-1	-1	229	2	0.75	6	-1	-5	5
HF 23	-2	-5	3.4	1400	-0.5	-1	3	263	2	1.37	6	-1	-5	-1
HF 24	-2	-5	2	440	-0.5	-1	2	331	2	0.6	3	-1	-5	1
HF 25	-2	-5	-0.5	1400	-0.5	-1	3	140	2	1.74	8	-1	-5	-1
HF 26	-2	-5	1.7	470	-0.5	-1	-1	180	5	1.13	6	-1	-5	7
HF 27	-2	-5	1.3	2300	-0.5	-1	3	126	4	1.68	6	-1	-5	5
HF 28	-2	-5	1.3	190	-0.5	-1	-1	226	5	0.89	6	-1	-5	-1
HF 30	-2	-5	1.2	630	-0.5	-1	1	135	4	1.47	8	-1	-5	9
HF 31	-2	-5	1.8	590	-0.5	-1	4	149	-1	1.55	9	-1	-5	-1
HF 32	-2	-5	6.3	360	-0.5	-1	2	278	9	0.95	6	-1	-5	-1
HF 33	-2	-5	3.7	760	-0.5	-1	2	248	3	1.08	8	-1	-5	-1
HF 34	-2	-5	1	1300	-0.5	-1	3	212	3	1.36	9	-1	-5	4
HF 35	-2	-5	5.6	1200	-0.5	-1	-1	254	4	1.55	7	-1	-5	6
HF 36	-2	-5	-0.5	1700	-0.5	-1	3	153	3	1.75	8	-1	-5	-1
HF 37	-2	-5	3.1	1000	-0.5	-1	4	151	3	3.17	11	-1	-5	-1
HF 38	-2	-5	1.5	890	-0.5	-1	3	141	3	1.22	10	-1	-5	-1
HF 39	-3	-5	10.7	1300	-0.5	-1	4	136	-1	3.08	10	-1	-5	-1
HF 40	-2	-5	2.2	1100	-0.5	-1	-1	186	3	1.44	8	-1	-5	4
HF 41	-2	-5	5.1	990	-0.5	-1	4	135	-1	2.99	15	-1	-5	4
HF 42	-2	-5	3.9	1300	-0.5	-1	3	249	2	1.65	7	-1	-5	-1
HF 43	-2	-5	-0.5	370	-0.5	-1	2	163	12	0.78	11	-1	-5	-1
DMMAS-18-1992	626	-5	1980	430	2.6	8	64	145	2	8.48	3	-1	-5	-2
DMMAS-18-1991	582	19	1940	400	3.2	7	63	143	2	8.57	2	-1	-5	-2
DMMAS-18-1990	623	-5	2040	450	-0.6	8	64	152	-1	8.95	3	-1	-5	-2
Accepted Value-DMMAS-18B	544+-72		2020+-224	435+-150	2.5+-1.5	7+-2	58+-15	151+-20		8.05+-0.85	2+-1			

Sample ID	Na %	Ni ppm	Rb ppm	Sb ppm	Sc ppm	Se ppm	Sn %	Sr %	Ta ppm	Th ppm	U ppm	W ppm	Zn ppm	La ppm	Ce ppm
HF 1	3.25	-23	252	1.4	5.2	-3	-0.02	-0.05	-0.5	15.2	3.4	-1	104	76.2	155
HF 2	3.11	-22	171	0.9	3.4	-3	-0.02	-0.05	1.2	12.5	3.3	-1	95	69.8	114
HF 3	2.34	-22	190	0.5	3.4	-3	-0.02	-0.05	2.7	22.6	3.4	-1	-50	90.7	151
HF 4	2.3	-21	212	0.7	2	-3	-0.02	-0.05	3.6	32	5.4	-1	-50	103	185
HF 5	2.36	-21	267	0.3	2.4	-3	-0.02	-0.05	3.4	18.4	4.1	-1	102	53	101
HF 6	2.79	-22	192	0.7	3.4	-3	-0.01	-0.05	4.2	25.4	5.4	-1	59	52	87
HF 7	0.09	-20	-15	0.2	0.6	-3	-0.01	-0.05	-0.5	0.6	-0.5	-1	-50	1.8	4
HF 8	2.87	-22	197	0.5	3.2	-3	-0.02	-0.05	2.8	26.7	4.8	-1	85	54.3	87
HF 9	2.73	-21	126	0.7	1.1	-3	-0.02	-0.05	1.4	17.5	3	-1	-50	72.2	122
HF 10	2.36	-20	208	0.1	3.2	-3	-0.02	-0.05	3.2	20.9	3.9	-1	-50	73.2	120
HF 11	4.79	-26	64	0.4	4.7	-3	-0.02	-0.05	-0.5	17.9	3.7	-1	63	98.9	177
HF 12	2.57	-20	160	0.3	5.7	-3	-0.02	-0.05	2.4	11.2	3.1	-1	61	51.3	85
HF 13	7.19	-31	40	-0.1	6	-3	-0.02	-0.05	3.8	23.3	2.4	-1	-50	99.4	184
HF 14	2.28	-20	256	0.3	1.9	3	-0.02	-0.05	1.9	37.4	9.8	-1	83	73	129
HF 15	2.81	-20	195	0.4	3.1	-3	-0.02	-0.05	5.1	31.3	7.4	-1	-50	55.8	93
HF 16	3.06	-22	182	-0.1	3.7	-3	-0.02	-0.05	3.1	27.9	5.2	-1	-50	59.8	101
HF 17	2.37	-20	103	0.4	2.4	-3	-0.02	-0.05	-0.5	30.1	3	-1	-50	73.1	114
HF 18A	2.98	-20	319	0.4	2.6	-3	-0.01	-0.05	9.4	29.7	11.5	-1	-50	23.4	45
HF 18B	2.46	-20	254	0.3	2	-3	-0.01	-0.05	2.5	19	4.1	-1	59	52.3	91
HF 19	6.31	-29	90	1	12.1	-3	-0.02	-0.05	2	15.4	4.5	-1	187	75.8	154
HF 20	2.42	-20	160	0.6	2.6	-3	-0.02	-0.05	2.2	20.4	4.2	-1	-50	51.5	90
HF 21	2.47	-20	259	0.4	1.5	-3	-0.01	-0.05	2.7	37.5	5	-1	-50	42.9	84
HF 22	5.15	-24	-15	-0.1	1.3	-3	-0.02	-0.05	2.9	26.7	5.7	-1	144	86.8	133
HF 23	2.43	-20	150	0.3	2.5	-3	-0.01	-0.05	2.1	12.7	2.5	-1	-50	40.9	65
HF 24	0.12	-20	60	0.5	0.5	-3	-0.01	-0.05	-0.5	3.8	1.3	5	-50	10.9	20
HF 25	4.27	-24	205	0.3	3.8	-3	-0.02	-0.05	-0.5	19	2.4	-1	-50	75	128
HF 26	2.3	-20	197	0.3	2.6	-3	-0.01	-0.05	2	25.6	4.8	-1	54	67.8	123
HF 27	4.18	-22	200	0.3	3.3	-3	-0.02	-0.05	-0.5	19.1	3.8	-1	-50	59.1	91
HF 28	1.86	-20	213	0.3	1.4	-3	-0.01	-0.05	2.4	26.9	5.4	-1	56	52.6	103
HF 30	3.37	-21	217	-0.1	2.9	-3	-0.02	-0.05	5.1	46.2	15.2	-1	99	73.5	141
HF 31	6.24	-26	-15	-0.1	4.6	-3	-0.02	-0.05	2.5	16	2.8	-1	-50	56.6	136
HF 32	2.57	-20	292	0.6	1.5	-3	-0.01	-0.05	3.7	25.2	4.3	-1	-50	44.8	88
HF 33	3.37	-22	191	-0.1	2.9	-3	-0.02	-0.05	1.3	25.4	4.8	-1	91	70.9	134
HF 34	2.17	-20	131	-0.1	1.6	-3	-0.01	0.09	1.1	18.2	2.2	-1	-50	34	59
HF 35	2.22	-20	158	0.3	3.4	-3	-0.01	-0.05	1.1	13.7	3.7	-1	59	52.1	97
HF 36	2.26	-20	136	-0.1	4.4	-3	-0.01	-0.05	2.4	11.1	1.9	-1	61	40.7	68
HF 37	2.72	-23	104	0.7	6.9	-3	-0.02	-0.05	3.4	21.6	3.9	-1	-50	99.8	175
HF 38	2.23	-20	142	0.2	5.7	-3	-0.01	-0.05	1.7	17	2.1	-1	-50	28.5	55
HF 39	5.22	-31	115	0.4	5.4	-3	-0.02	-0.05	-0.5	27.7	4.5	-1	1830	163	261
HF 40	2.27	-20	168	-0.1	3.5	-3	-0.02	-0.05	-0.5	17.1	4	-1	55	69.9	117
HF 41	5.03	-27	67	-0.1	7.2	-3	-0.02	-0.05	-0.5	12.7	4.6	-1	217	36.5	72
HF 42	2.35	-20	106	0.4	2.6	-3	-0.01	-0.05	-0.5	16.8	2.5	-1	-50	54.9	91
HF 43	3.59	-23	583	0.4	5.9	-3	-0.02	-0.05	24.7	26.3	8.9	-1	-50	25.1	62
DMMAS-18-1992	0.75	-30	40	13.1	20.3	-3	-0.03	-0.05	-0.5	1.5	-0.5	19	221	12.5	24
DMMAS-18-1991	0.74	-28	40	12.6	20.5	-3	-0.03	-0.05	-0.5	1.5	-0.5	19	207	12.6	24
DMMAS-18-1990	0.81	-29	35	11.8	21.2	-3	-0.03	-0.05	-0.5	1.2	-0.5	20	230	13.5	25
Accepted Value-DMMAS-18B	0.74+-0.48		38+-10	12+-3	20.5+-3.4					1.5+-0.5		19+-2	250+-50	12.2+-1.3	23+-3

Sample ID	Nd ppm	Sm ppm	Eu ppm	Tb ppm	Yb ppm	Lu ppm	Mass g
HF 1	36	5.6	1	-0.5	2.7	0.4	36.75
HF 2	31	5.2	1	1	2.5	0.4	36.09
HF 3	51	9.3	0.8	1.8	4	0.62	34.3
HF 4	74	10.5	0.4	1.8	4.7	0.73	35.34
HF 5	38	7.8	0.5	1.7	6.6	0.96	32.71
HF 6	24	4.6	0.9	-0.5	4.6	0.63	32.06
HF 7	-5	0.3	-0.2	-0.5	-0.2	-0.05	38.69
HF 8	36	4.7	0.8	1.1	4.6	0.65	32.38
HF 9	38	6.5	1	-0.5	1.3	0.2	30.5
HF 10	45	8	0.5	1.3	4.7	0.71	39.09
HF 11	66	9.5	1.1	1.8	3.8	0.56	40.98
HF 12	38	6.8	1.1	1.1	3.6	0.55	38.41
HF 13	57	11.1	0.9	-0.5	4.6	0.71	31.9
HF 14	49	9.7	-0.2	1.3	5.2	0.79	33.29
HF 15	29	5.1	0.6	-0.5	4.7	0.71	37.21
HF 16	30	5.6	0.8	1.2	4.6	0.69	31.89
HF 17	33	5.5	0.8	-0.5	2.6	0.41	33.36
HF 18A	17	4.1	0.4	0.9	8.1	1.22	35.46
HF 18B	32	5.8	0.5	1.2	4.1	0.61	32.55
HF 19	83	14.5	1.1	2.6	8.9	1.35	38.38
HF 20	25	5.8	1	1	3.6	0.54	29.16
HF 21	32	7.1	-0.2	1.6	4.8	0.74	32.83
HF 22	57	12	-0.2	2.1	4.2	0.62	33.27
HF 23	26	5.1	0.8	-0.5	2.2	0.31	31.31
HF 24	6	1.2	0.3	-0.5	1	0.16	30.61
HF 25	40	9.1	0.8	1.6	4	0.61	32.11
HF 26	41	10	0.5	1.7	5.4	0.8	32.73
HF 27	30	6.5	1.3	-0.5	3.5	0.55	32.77
HF 28	39	9.2	-0.2	1.4	5.1	0.75	33.8
HF 30	45	12.2	-0.2	2.4	9.2	1.3	34.64
HF 31	41	9	1	1.4	3.4	0.51	32.37
HF 32	32	7.2	-0.2	1.5	5.1	0.78	29.65
HF 33	38	9	0.3	1.6	5.1	0.76	29.74
HF 34	22	4.2	0.9	-0.5	1.9	0.29	34.56
HF 35	37	6.3	0.8	-0.5	2.5	0.37	32.73
HF 36	27	6.2	1	0.9	2.9	0.46	37.54
HF 37	64	12.6	1	1.9	4.7	0.72	36.33
HF 38	18	4.9	0.8	-0.5	2.9	0.45	35.34
HF 39	89	14	1.3	1.7	3.8	0.57	32.22
HF 40	51	9	0.9	1.5	3.4	0.51	33.05
HF 41	31	6.5	1.2	1.1	4	0.6	29.86
HF 42	28	4.8	1	0.6	2	0.31	34.68
HF 43	24	6.6	0.3	1.5	23.2	3.52	31.91
DMMAS-18-1992	13	4.3	1.5	-0.5	3.7	0.55	25.11
DMMAS-18-1991	11	4.2	1.3	0.9	3.8	0.56	25.14
DMMAS-18-1990	12	4	1.5	1.1	3.6	0.54	25.57
Accepted Value-DMMAS-18B	11+-3	4.1+-0.5	1.2+-0.2	0.8+-0.35	3.6+-0.6	0.54+-0.05	

Activation Laboratories Ltd. Work Order: 23406 Report: 23160

Sample ID	Au ppb	Ag ppm	As ppm	Ba ppm	Br ppm	Ca %	Co ppm	Cr ppm	Cs ppm	Fe %	Hf ppm	Hg ppm	Ir ppb	Mo ppm	Na %	Ni ppm	Rb ppm	Sb ppm	Sc ppm	Se ppm	Sn %	Sr %	Ta ppm	Th ppm	U ppm	W ppm	Zn ppm	La ppm	Ce ppm
HF44	-2	-5	4	1300	-1	-1	-5	220	3	1.28	4	-1	-5	-5	2.02	-50	130	0.2	1.8	-5	-0.05	-0.1	-0.5	13.8	2.9	-4	-50	74.3	118
HF45	3	-5	4	600	-1	-1	-5	229	3	1.45	4	-1	-5	8	1.9	-50	109	-0.1	0.9	-5	-0.05	-0.1	-0.5	24.3	3.4	-4	-50	158	243
HF46	2	-5	3	650	-1	-1	-5	156	6	0.86	4	-1	-5	-5	2.18	-50	145	0.2	0.7	-5	-0.05	-0.1	-0.5	54.7	10	-4	-50	43.1	72
HF47	2	-5	4	490	-1	-1	-5	170	3	1.46	5	-1	-5	-5	1.83	-50	131	0.1	2.4	-5	-0.05	-0.1	-0.5	10.2	4.3	-4	-50	31.2	52
HF48	-2	-5	4	440	-1	-1	-5	173	6	0.92	5	-1	-5	27	2.23	-50	272	0.2	1.6	-5	-0.05	-0.1	-0.5	27.5	10.2	-4	77	54.6	99
HF49	-2	-5	4	3100	-1	-1	-5	118	4	2.22	8	-1	-5	-5	4.13	-50	160	0.2	5.1	-5	-0.05	-0.1	-0.5	11	3.1	-4	-50	46.5	86
HF50	-2	-5	3	1300	-1	-1	-5	147	4	1.85	6	-1	-5	-5	2.14	-50	142	0.3	4	-5	-0.05	-0.1	2.1	13.1	4.3	-4	-50	33	89
HF51	-2	-5	3	360	-1	-1	-5	139	5	0.75	2	-1	-5	-5	1.95	-50	180	-0.1	1.1	-5	-0.05	-0.1	2	14.7	4.3	-4	-50	36	63
HF52	-2	-5	28	980	-1	-1	-5	67	3	0.61	9	-1	-5	-5	4.28	-50	267	0.2	0.7	-5	-0.05	-0.1	-0.5	13.6	3.9	-4	-50	37.1	55
HF53	-2	-5	3	200	-1	-1	-5	164	3	0.66	2	-1	-5	-5	2	-50	144	0.4	0.7	-5	-0.05	-0.1	-0.5	10	3.1	-4	-50	34.4	53
HF54	-2	-5	3	570	-1	-1	-5	184	3	0.91	3	-1	-5	-5	2.22	-50	132	0.2	1.5	-5	-0.05	-0.1	-0.5	22.3	3.5	-4	-50	16.9	33
HF55	-2	-5	4	1200	-1	-1	-5	114	-1	1.35	7	-1	-5	-5	6	-50	94	0.3	3.7	-5	-0.05	-0.1	2.2	16.9	3.9	-4	-50	29.8	55
HF56	-2	-5	2	270	-1	-1	-5	127	3	0.74	4	-1	-5	-5	2.27	-50	142	0.1	1	-5	-0.05	-0.1	-0.5	7.8	2	-4	-50	26.8	40
HF57	-2	-5	3	400	-1	-1	-5	185	2	0.82	4	-1	-5	-5	1.99	-50	102	0.2	1.4	-5	-0.05	-0.1	-0.5	12.8	3.7	-4	-50	53.8	83
HF58	-2	-5	4	-53	-1	-1	-5	63	5	1.8	7	-1	-5	-5	6.91	-50	-30	-0.1	3.9	-5	-0.05	-0.1	6.5	34.8	9.9	-4	136	59.9	97
HF59	6	-5	1	1000	-1	-1	-5	253	9	1.06	5	-1	-5	5	2.45	-50	162	0.3	1.9	-5	-0.05	-0.1	-0.5	28.5	4	-4	-50	124	200
HF60	4	-5	5	490	-1	-1	-5	309	3	0.66	3	-1	-5	-5	1.68	-50	147	0.3	1.9	-5	-0.05	-0.1	4	11.3	7.3	-4	125	27.7	47
HF61	-2	-5	2	1200	-1	-1	-5	238	4	1.74	6	-1	-5	-5	2.04	-50	125	0.3	3.8	-5	-0.05	-0.1	1.9	11.5	2.8	-4	69	72.9	123
HF62	4	-5	3	-50	-1	-1	-5	193	4	0.63	5	-1	-5	-5	2.96	-50	280	0.2	1.2	-5	-0.05	-0.1	4.8	25.3	16.6	-4	-50	14.8	30
HF63	-2	-5	32	270	-1	-1	-5	112	7	1.19	5	-1	-5	-5	2.94	-50	199	0.5	1.5	-5	-0.05	-0.1	-0.5	32	9.9	-4	91	50.4	81
HF64	-2	-5	2	1200	-1	-1	-5	122	7	0.94	4	-1	-5	-5	2.75	-50	269	0.3	2.7	-5	-0.05	-0.1	-0.5	13.7	6.7	-4	-50	35.4	55
HF65	-2	-5	18	750	-1	-1	-5	157	3	1.54	6	-1	-5	-5	2.21	-50	159	2.5	2.7	-5	-0.05	-0.1	-0.5	18.3	9	-4	114	63.2	110
HF66	4	-5	2	2200	-1	-1	-5	99	7	2.65	9	-1	-5	-5	4.29	-50	300	0.4	5.6	-5	-0.05	-0.1	-0.5	16.3	5.8	-4	-50	63.9	111
HF67	-2	-5	2	390	-1	-1	-5	117	2	0.77	5	-1	-5	-5	3.26	-50	58	0.2	1.9	-5	-0.05	-0.1	-0.5	18.3	4.6	-4	-50	46.6	101
HF68	-2	-5	10	320	-1	-1	-5	214	5	0.79	3	-1	-5	-5	1.28	-50	247	0.7	0.9	-5	-0.05	-0.1	1.3	14	5.5	-4	-50	19	33
HF69	-2	-5	2	180	-1	-1	-5	131	7	0.74	3	-1	-5	-5	2.29	-50	279	0.4	1.4	-5	-0.05	-0.1	5.2	25.2	12.4	-4	-50	17.2	35
HF70	-2	-5	11	330	-1	-1	-5	113	19	0.59	7	-1	-5	-5	3.05	-50	375	0.3	1.4	-5	-0.05	-0.1	8	29.2	22.1	-4	-50	22.5	48
HF71	-2	-5	13	410	-1	-1	-5	98	27	0.76	8	-1	-5	-5	2.84	-50	369	1.9	1.6	-5	-0.05	-0.1	17	33.2	34.7	6	-50	70.6	122
HF72	-2	-5	2	-50	-1	-1	-5	253	-1	0.19	-1	-1	-5	-5	0.02	-50	-30	0.1	0.1	-5	-0.05	-0.1	-0.5	-0.2	-0.5	-4	-50	-0.5	-3
HF73	-2	-5	2	280	-1	-1	-5	209	-1	0.6	-1	-1	-5	-5	0.08	-50	-30	-0.1	2.2	-5	-0.05	-0.1	-0.5	1.1	0.5	-4	-50	3	6
HF74	-2	-5	4	890	-1	-1	-5	146	8	0.76	5	-1	-5	-5	2.8	-50	251	0.2	2.2	-5	-0.05	-0.1	11.7	18	17.5	-4	-50	23.2	43
HF75	-2	-5	2	1600	-1	-1	-5	231	2	1.16	5	-1	-5	-5	1.67	-50	94	0.2	1.1	-5	-0.05	-0.1	-0.5	5.7	2.3	-4	-50	21.9	33
HF76	-2	-5	2	570	-1	-1	-5	153	4	0.53	2	-1	-5	-5	1	-50	175	0.2	1	-5	-0.05	-0.1	-0.5	9.7	4.2	-4	-50	24.9	40
HF77	-2	-5	5	340	-1	-1	-5	135	6	0.96	5	-1	-5	-5	2.12	-50	272	0.4	1.3	-5	-0.05	-0.1	3.1	31.1	10.3	-4	265	49.8	84
HF78	-2	-5	1	-50	-1	-1	-5	274	-1	0.22	-1	-1	-5	-5	0.02	-50	-30	1.6	0.1	-5	-0.05	-0.1	-0.5	0.6	1.1	-4	-50	2.6	4
HF79	-2	-5	2	1500	-1	-1	-5	142	3	1.77	3	-1	-5	-5	1.54	-50	90	0.2	1	-5	-0.05	-0.1	1.8	3.9	2.5	-4	90	13.6	23
HF80	-2	-5	1	1800	-1	-1	-5	133	3	1.81	7	-1	-5	-5	2.24	-50	117	-0.1	3.8	-5	-0.05	-0.1	2	9.3	3.8	-4	91	38.9	67
HF81	-2	-5	2	1600	-1	-1	-5	135	4	1.81	6	-1	-5	-5	3.12	-50	172	0.2	3.9	-5	-0.05	-0.1	2.5	15.5	3.2	-4	119	83.8	135
HF82	3	-5	2	730	-1	-1	-5	200	-1	0.94	3	-1	-5	-5	3.38	-50	-30	-0.1	1.9	-5	-0.05	-0.1	-0.5	0.9	-0.5	-4	-50	2.7	-3
HF83	-2	-5	2	1500	-1	-1	-5	103	12	1.49	5	-1	-5	-5	2.8	-50	204	0.3	3.4	-5	-0.05	-0.1	-0.5	18	6.2	-4	-50	84.1	122
HF84	2	-5	2	-50	-1	-1	-5	348	-1	0.29	-1	-1	-5	-5	0.03	-50	-30	0.1	-0.1	-5	-0.05	-0.1	-0.5	0.4	-0.5	-4	-50	0.6	-3
HS18 X SILT	47	-5	5	830	4	-1	6	456	5	2.68	43	-1	-5	-5	2.58	-50	170	0.2	7.6	-5	-0.05	-0.1	20.1	74.8	43.6	67	-50	235	384
HS19	94	-5	4	1100	8	-1	9	767	4	3.88	67	-1	-5	-5	2.53	-50	182	0.2	10	-5	-0.05	-0.1	36.1	121	65.4	130	120	365	581
DMMAS-15-69	567	-5	2410	300	2	8	71	141	-1	7.9	2	-1	-5	-5	0.79	-50	78	8	19.1	-5	-0.05	-0.1	-0.6	1.4	-0.5	20	222	12.4	23
DMMAS-15-35	560	-5	2410	440	3	9	68	139	-1	7.55	2	-1	-5	-5	0.76	-50	39	8.3	18.3	-5	-0.05	-0.1	-0.6	1.4	2.5	18	242	12.2	20
DMMAS-15-34	527	-5	2400	580	4	9	69	136	2	7.95	2	-1	-5	-5	0.78	165	50	7.8	18.7	-5	-0.05	-0.1	-0.6	1.5	-0.5	17	196	12.5	20
DMMAS-15-33	500	-5	2290	500	4	8	65	127	2	7.25	2	-1	-5	-5	0.78	186	55	8.1	18.5	-5	-0.05	-0.1	-0.5	1.5	-0.5	17	127	12.1	19
Accepted Value-DMMAS-15	517+-88		2400+-250	370+-120	3.0+-1.5	8+-1.6	65+-7	132+-22	1+-0.9	7.89+-0.87	2+-1				0.75+-0.08		46+-20	8.3+-2.8	18+-2.0					1.1+-0.6		17+-4	210+-60	12+-1.5	20+-5

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Sample ID	Au ppb	Ag ppm	As ppm	Ba ppm	Br ppm	Ca %	Co ppm	Cr ppm	Cs ppm	Fe %	Hf ppm	Hg ppm	Ir ppb	Mo ppm	Na %	Ni ppm	Rb ppm	Sb ppm	Sc ppm	Se ppm	Sn %	Sr %	Ta ppm	Th ppm	U ppm	W ppm	Zn ppm	La ppm	Ce ppm
HF44	-2	-5	4	1300	-1	-1	-5	220	3	1.28	4	-1	-5	-5	2.02	-50	130	0.2	1.8	-5	-0.05	-0.1	-0.5	13.8	2.9	-4	-50	74.3	118
HF45	3	-5	4	600	-1	-1	-5	229	3	1.45	4	-1	-5	8	1.9	-50	109	-0.1	0.9	-5	-0.05	-0.1	-0.5	24.3	3.4	-4	-50	158	243
HF46	2	-5	3	650	-1	-1	-5	156	6	0.86	4	-1	-5	-5	2.18	-50	145	0.2	0.7	-5	-0.05	-0.1	-0.5	54.7	10	-4	-50	43.1	72
HF47	2	-5	4	490	-1	-1	-5	170	3	1.46	5	-1	-5	-5	1.83	-50	131	0.1	2.4	-5	-0.05	-0.1	-0.5	10.2	4.3	-4	-50	31.2	52
HF48	-2	-5	4	440	-1	-1	-5	173	6	0.92	5	-1	-5	27	2.23	-50	272	0.2	1.6	-5	-0.05	-0.1	-0.5	27.5	10.2	-4	77	54.6	99
HF49	-2	-5	4	3100	-1	-1	-5	118	4	2.22	8	-1	-5	-5	4.13	-50	160	0.2	5.1	-5	-0.05	-0.1	-0.5	11	3.1	-4	-50	46.5	86
HF50	-2	-5	3	1300	-1	-1	-5	147	4	1.85	6	-1	-5	-5	2.14	-50	142	0.3	4	-5	-0.05	-0.1	2.1	13.1	4.3	-4	-50	33	89
HF51	-2	-5	3	360	-1	-1	-5	139	5	0.75	2	-1	-5	-5	1.95	-50	180	-0.1	1.1	-5	-0.05	-0.1	2	14.7	4.3	-4	-50	36	63
HF52	-2	-5	28	980	-1	-1	-5	67	3	0.61	9	-1	-5	-5	4.28	-50	267	0.2	0.7	-5	-0.05	-0.1	-0.5	13.6	3.9	-4	-50	37.1	55
HF53	-2	-5	3	200	-1	-1	-5	164	3	0.66	2	-1	-5	-5	2	-50	144	0.4	0.7	-5	-0.05	-0.1	-0.5	10	3.1	-4	-50	34.4	53
HF54	-2	-5	3	570	-1	-1	-5	184	3	0.91	3	-1	-5	-5	2.22	-50	132	0.2	1.5	-5	-0.05	-0.1	-0.5	22.3	3.5	-4	-50	16.9	33
HF55	-2	-5	4	1200	-1	-1	-5	114	-1	1.35	7	-1	-5	-5	6	-50	94	0.3	3.7	-5	-0.05	-0.1	2.2	16.9	3.9	-4	-50	29.8	55
HF56	-2	-5	2	270	-1	-1	-5	127	3	0.74	4	-1	-5	-5	2.27	-50	142	0.1	1	-5	-0.05	-0.1	-0.5	7.8	2	-4	-50	26.8	40
HF57	-2	-5	3	400	-1	-1	-5	185	2	0.82	4	-1	-5	-5	1.99	-50	102	0.2	1.4	-5	-0.05	-0.1	-0.5	12.8	3.7	-4	-50	53.8	83
HF58	-2	-5	4	-53	-1	-1	-5	63	5	1.8	7	-1	-5	-5	6.91	-50	-30	-0.1	3.9	-5	-0.05	-0.1	6.5	34.8	9.9	-4	136	59.9	97
HF59	6	-5	1	1000	-1	-1	-5	253	9	1.06	5	-1	-5	5	2.45	-50	162	0.3	1.9	-5	-0.05	-0.1	-0.5	28.5	4	-4	-50	124	200
HF60	4	-5	5	490	-1	-1	-5	309	3	0.68	3	-1	-5	-5	1.68	-50	147	0.3	1.9	-5	-0.05	-0.1	4	11.3	7.3	-4	125	27.7	47
HF61	-2	-5	2	1200	-1	-1	-5	238	4	1.74	6	-1	-5	-5	2.04	-50	125	0.3	3.8	-5	-0.05	-0.1	1.9	11.5	2.8	-4	69	72.9	123
HF62	4	-5	3	-50	-1	-1	-5	193	4	0.63	5	-1	-5	-5	2.96	-50	280	0.2	1.2	-5	-0.05	-0.1	4.8	25.3	16.6	-4	-50	14.8	30
HF63	-2	-5	32	270	-1	-1	-5	112	7	1.19	5	-1	-5	-5	2.94	-50	199	0.5	1.5	-5	-0.05	-0.1	-0.5	32	9.9	-4	91	50.4	81
HF64	-2	-5	2	1200	-1	-1	-5	122	7	0.94	4	-1	-5	-5	2.75	-50	269	0.3	2.7	-5	-0.05	-0.1	-0.5	13.7	6.7	-4	-50	35.4	55
HF65	-2	-5	18	750	-1	-1	-5	157	3	1.54	6	-1	-5	-5	2.21	-50	159	2.5	2.7	-5	-0.05	-0.1	-0.5	18.3	9	-4	114	63.2	110
HF66	4	-5	2	2200	-1	-1	-5	99	7	2.65	9	-1	-5	-5	4.29	-50	300	0.4	5.6	-5	-0.05	-0.1	-0.5	16.3	5.8	-4	-50	63.9	111
HF67	-2	-5	2	390	-1	-1	-5	117	2	0.77	5	-1	-5	-5	3.26	-50	58	0.2	1.9	-5	-0.05	-0.1	-0.5	18.3	4.6	-4	-50	46.6	101
HF68	-2	-5	10	320	-1	-1	-5	214	5	0.79	3	-1	-5	-5	1.28	-50	247	0.7	0.9	-5	-0.05	-0.1	1.3	14	5.5	-4	-50	19	33
HF69	-2	-5	2	180	-1	-1	-5	131	7	0.74	3	-1	-5	-5	2.29	-50	279	0.4	1.4	-5	-0.05	-0.1	5.2	25.2	12.4	-4	-50	17.2	35
HF70	-2	-5	11	330	-1	-1	-5	113	19	0.59	7	-1	-5	-5	3.05	-50	375	0.3	1.4	-5	-0.05	-0.1	8	29.2	22.1	-4	-50	22.5	48
HF71	-2	-5	13	410	-1	-1	-5	98	27	0.76	8	-1	-5	-5	2.84	-50	369	1.9	1.6	-5	-0.05	-0.1	17	33.2	34.7	6	-50	70.6	122
HF72	-2	-5	2	-50	-1	-1	-5	253	-1	0.19	-1	-1	-5	-5	0.02	-50	-30	0.1	0.1	-5	-0.05	-0.1	-0.5	-0.2	-0.5	-4	-50	-0.5	-3
HF73	-2	-5	2	280	-1	-1	-5	209	-1	0.6	-1	-1	-5	-5	0.08	-50	-30	-0.1	2.2	-5	-0.05	-0.1	-0.5	1.1	0.5	-4	-50	3	6
HF74	-2	-5	4	890	-1	-1	-5	146	8	0.76	5	-1	-5	-5	2.8	-50	251	0.2	2.2	-5	-0.05	-0.1	11.7	18	17.5	-4	-50	23.2	43
HF75	-2	-5	2	1600	-1	-1	-5	231	2	1.16	5	-1	-5	-5	1.67	-50	94	0.2	1.1	-5	-0.05	-0.1	-0.5	5.7	2.3	-4	-50	21.9	33
HF76	-2	-5	2	570	-1	-1	-5	153	4	0.53	2	-1	-5	-5	1	-50	175	0.2	1	-5	-0.05	-0.1	-0.5	9.7	4.2	-4	-50	24.9	40
HF77	-2	-5	5	340	-1	-1	-5	135	6	0.96	5	-1	-5	-5	2.12	-50	272	0.4	1.3	-5	-0.05	-0.1	3.1	31.1	10.3	-4	265	49.8	84
HF78	-2	-5	1	-50	-1	-1	-5	274	-1	0.22	-1	-1	-5	-5	0.02	-50	-30	1.6	0.1	-5	-0.05	-0.1	-0.5	0.6	1.1	-4	-50	2.6	4
HF79	-2	-5	2	1500	-1	-1	-5	142	3	1.77	3	-1	-5	-5	1.54	-50	90	0.2	1	-5	-0.05	-0.1	1.8	3.9	2.5	-4	90	13.6	23
HF80	-2	-5	1	1800	-1	-1	-5	133	3	1.81	7	-1	-5	-5	2.24	-50	117	-0.1	3.8	-5	-0.05	-0.1	2	9.3	3.8	-4	91	38.9	67
HF81	-2	-5	2	1600	-1	-1	-5	135	4	1.81	6	-1	-5	-5	3.12	-50	172	0.2	3.9	-5	-0.05	-0.1	2.5	15.5	3.2	-4	119	83.8	135
HF82	3	-5	2	730	-1	-1	-5	200	-1	0.94	3	-1	-5	-5	3.38	-50	-30	-0.1	1.9	-5	-0.05	-0.1	-0.5	0.9	-0.5	-4	-50	2.7	-3
HF83	-2	-5	2	1500	-1	-1	-5	103	12	1.49	5	-1	-5	-5	2.8	-50	204	0.3	3.4	-5	-0.05	-0.1	-0.5	18	6.2	-4	-50	84.1	122
HF84	2	-5	2	-50	-1	-1	-5	348	-1	0.29	-1	-1	-5	-5	0.03	-50	-30	0.1	-0.1	-5	-0.05	-0.1	-0.5	0.4	-0.5	-4	-50	0.6	-3
HS18	47	-5	5	830	4	-1	6	456	5	2.68	43	-1	-5	-5	2.58	-50	170	0.2	7.6	-5	-0.05	-0.1	20.1	74.8	43.6	67	-50	235	384
HS19	94	-5	4	1100	8	-1	9	767	4	3.88	67	-1	-5	-5	2.53	-50	182	0.2	10	-5	-0.05	-0.1	36.1	121	65.4	130	120	365	581
DMMAS-15-69	567	-5	2410	300	2	8	71	141	-1	7.9	2	-1	-5	-5	0.79	-50	78	8	19.1	-5	-0.05	-0.1	-0.6	1.4	-0.5	20	222	12.4	23
DMMAS-15-35	560	-5	2410	440	3	9	68	139	-1	7.55	2	-1	-5	-5	0.76	-50	39	8.3	18.3	-5	-0.05	-0.1	-0.6	1.4	2.5	18	242	12.2	20
DMMAS-15-34	527	-5	2400	580	4	9	69	136	2	7.95	2	-1	-5	-5	0.78	165	50	7.8	18.7	-5	-0.05	-0.1	-0.6	1.5	-0.5	17	196	12.5	20
DMMAS-15-33	500	-5	2290	500	4	8	65	127	2	7.25	2	-1	-5	-5	0.78	186	55	8.1	18.5	-5	-0.05	-0.1	-0.5	1.5	-0.5	17	127	12.1	19
Accepted Value-DMMAS-15	517+-88		2400+-250	370+-120	3.0+-1.5	8+-1.6	65+-7	132+-22	1+-0.9	7.89+-0.87	2+-1				0.75+-0.08		46+-20	8.3+-2.8	18+-2.0					1.1+-0.6		17+-4	210+-60	12+-1.5	20+-5

X SILT

Sample ID	Nd	Sm	Eu	Tb	Yb	Lu	Mass
	ppm	ppm	ppm	ppm	ppm	ppm	g
HF44	42	6.8	0.7	-0.5	1.7	0.28	23.84
HF45	69	9.7	0.4	-0.5	1.7	0.27	26.7
HF46	26	4.5	0.5	-0.5	1.6	0.24	32.43
HF47	18	3.9	0.5	-0.5	1.5	0.23	34.94
HF48	36	7.8	-0.2	1	2.9	0.44	34.81
HF49	31	8.4	1.1	1.4	3.6	0.54	32.61
HF50	21	6.5	0.6	-0.5	2.5	0.39	37.09
HF51	25	6.2	0.3	1.2	3.2	0.47	36.34
HF52	18	2.6	0.5	-0.5	1.1	0.16	34.83
HF53	15	3.7	-0.2	-0.5	2.2	0.33	38.61
HF54	13	4	0.4	-0.5	2	0.3	35.78
HF55	18	6.7	0.7	-0.5	3.3	0.49	36.23
HF56	-5	2.4	-0.2	-0.5	0.9	0.15	39.83
HF57	23	4.5	-0.2	-0.5	1.3	0.21	39.45
HF58	31	6.3	-0.2	-0.5	5.1	0.77	36.93
HF59	63	10.9	0.4	-0.5	2.6	0.4	35.65
HF60	17	4.5	-0.2	-0.5	2.8	0.42	34.88
HF61	41	8.5	0.7	-0.5	2.7	0.41	36.04
HF62	-5	4.9	-0.2	1.5	8.3	1.26	33.43
HF63	32	7.1	-0.2	-0.5	4.3	0.64	37.76
HF64	19	3.9	-0.2	-0.5	3.2	0.48	35.93
HF65	31	9.4	0.4	1.6	4.7	0.7	33.71
HF66	35	7.1	0.7	0.9	2.9	0.44	31.19
HF67	29	6.3	0.4	1	2.3	0.33	39.51
HF68	8	3.1	0.2	0.9	3	0.45	35
HF69	9	3.3	-0.2	-0.5	4.3	0.67	35.29
HF70	11	5.9	-0.2	1.8	15.8	2.36	37.65
HF71	32	7.6	-0.2	1.3	5.7	0.83	35.67
HF72	-5	-0.1	-0.2	-0.5	-0.2	-0.05	38.26
HF73	-5	0.6	-0.2	-0.5	0.2	-0.05	36.72
HF74	17	3.6	0.5	-0.5	8.2	1.3	32.85
HF75	11	2.2	0.7	-0.5	0.9	0.15	33.79
HF76	13	3.3	0.2	-0.5	1.8	0.26	38.34
HF77	29	8.2	-0.2	1.6	4.8	0.72	36.69
HF78	-5	0.6	-0.2	-0.5	-0.2	-0.05	36.5
HF79	-5	2.1	0.5	-0.5	1.2	0.19	35.3
HF80	25	5.4	0.9	0.7	2.1	0.32	36.77
HF81	46	9.3	0.9	1.2	2.4	0.39	31.98
HF82	-5	0.3	0.3	-0.5	-0.2	-0.05	34.25
HF83	55	10.1	0.7	1.5	3.9	0.58	34.24
HF84	-5	0.4	-0.2	-0.5	0.5	0.08	33.18
HS18 X SILT	120	24.2	1.4	4.7	17.7	2.54	28.14
HS19	160	37.3	1.9	6.7	27.2	4.2	23.82
DMMAS-15-69	9	3.9	1.2	1.3	2.7	0.41	25.58
DMMAS-15-35	10	3.7	1.2	-0.5	2.9	0.43	25.64
DMMAS-15-34	11	3.8	0.9	-0.5	3.1	0.47	25.36
DMMAS-15-33	9	3.8	1.2	-0.5	2.9	0.45	25.4
Accepted Value-DMMAS-15	11+-4	3.5+-0.5	1.1+-0.2	0.7+-0.2	3.3+-1.0	0.49+-0.11	

Appendix 5

Float Sample Descriptions

Sample Number	Description
HF1	Pegmatite, large angular blocky crystals - white, brown areas
HF2	Pegmatite, large angular blocky crystals - white, brown areas. Zones have flat glassy look?
HF3	Pegmatite, blocky white areas, lots of black specs
HF4	Pegmatite, white quartz silicified, rough - lots of small black crystals
HF5	Pegmatite, albite?, rough, larger crystals
HF6	Pegmatite, quartz rich - whitish, no brown, lot of small black specs
HF7	Quartz with interesting graphite zones
HF8	Pegmatite, large crystals, black grey matrix, not common in the area
HF9	Pink fluorite zones
HF10	Pegmatite, coarse grained biotite, albite crumbly
HF11	Pegmatite, hard albite
HF12	Pegmatite, lots of biotite
HF13	Pegmatite, large angular, hard, silica and pink areas
HF14	Pegmatite, hard, very rough small crystals and black specs
HF15	Very hard black rock, few very large (pink-white) crystals
HF16	Same as HF15, less black matrix
HF18 A & B	Combination quartz and pegmatite, lot of black specs and lines
HF19	Pegmatite, hard, lots of silica and black specs
HF20	Quartz, rough edges and some black specs
HF21	12" dyke and sides
HF22	Pegmatite, rough orange-brown, light green areas
HF23	Pegmatite, chips in area of silt/pan concentrate site
HF24	Quartz, interesting, quite rough
HF25	Pegmatite, rough angular, lots of quartz, black specs

Float Sample Descriptions (continued)

Sample Number	Description
HF26	Similar to HF25, blocky white chunks
HF27	Unknown
HF28	Pegmatite, 1.5" x 1.5" large angular, lots of black specs, bluish tinge, small crystals
HF30	Extremely hard rock, red-brown rough edges, white squares?
HF31	Pegmatite, silica, lots of black specs
HF32	Pegmatite, silica, lots of black specs
HF33	Pegmatite, lots of black quartz veins, (tourmaline?)
HF34	Quartz and pink (fluorite?)
HF35	Interesting quartz
HF36	Pegmatite, angular, rough ,2 stringers
HF37	Pegmatite, angular, rough , few small stringers
HF38	Pegmatite, large, 2 phases, large and small crystals, side has 2" grey quartz
HF39	Pegmatite, large, complex, 1 area
HF40	Pegmatite, large crystals and biotite, weathered out lines, large
HF41	Silicified
HF42	Pegmatite, light pink-white blocky areas, with biotite
HF43	Fine grained blue grey dyke (black specs) in a pegmatite
HF44	Quartz, 2 sides, 2"
HF45	Similar to HF44
HF46	Quartz with flat sides
HF47	Similar to HF43, small black grey quartz stringers
HF48	Granodiorite, blue grey quartz stringers
HF49	Granodiorite 6" wide, blue-grey quartz stringers (½ inch wide)
HF50	Unknown
HF51	Granodiorite, very hard, small and medium sized, black stringers
HF52	Fine grained blue grey dyke (black specs) in a pegmatite

Float Sample Descriptions (continued)

Sample Number	Description
HF53	Granodiorite, large angular, lots of black stringers
HF54	Similar to HF51. Fine grained blue grey dyke (black specs) in a pegmatite
HF55	Granodiorite ± 1" dyke pink white with black specs
HF56	Granodiorite, fine grained with blue-white stringers
HF57	Granodiorite, pink weathering, subtle 1" dyke
HF58	Unknown
HF59	Pegmatite, blue-grey stringers
HF60	Silicification and albite
HF61	Granodiorite, coarse with ½" white, blue-grey stringers
HF62	Fine grained blue grey dyke (black specs) in a pegmatite, similar to HF43
HF63	Granodiorite, 2 stringers in "X" formation
HF64	6" fine grained dyke knocked edges off
HF65	Granodiorite, 5-6 thin black thread stringers
HF66	Granodiorite, black stringers
HF67	Curious white-black stockwork
HF68	Orange and white silicification
HF69	Stockwork, white-grey, black
HF70	6" dyke with both sides
HF71	1 ½" dyke, curious black flakes and specs
HF72	Quartz, white angular
HF73	3 white-black stringers
HF74	Pink dyke 1 ¾", in rock 12" diameter
HF75	Granodiorite, very subtle 1 ½" fine grained dyke
HF76	Quartz, white, grey, interesting back zones
HF77	Granodiorite, ± 4 distinct white-grey parallel stringers
HF78	Quartz, white with limonite and black zones
HF79	Silicified dyke

Float Sample Descriptions (continued)

Sample Number	Description
HF80	Quartz layered, strange brown zones
HF81	Pegmatite, blue-black stringers
HF82	Quartz, biotite, black-brown specs
HF83	Quartz, biotite, black-brown specs
HF84	Bull quartz

Appendix 6

Bedrock Sample Geochemistry - Assay Results

Activation Laboratories Ltd. Work Order: 22961 Report: 22631

Sample ID	Au ppb	Ag ppm	As ppm	Ba ppm	Br ppm	Ca %	Co ppm	Cr ppm	Cs ppm	Fe %	Hf ppm	Hg ppm	Ir ppb	Mo ppm
HB 1	5	-5	5.2	1500	-0.5	-1	3	161	5	2.14	9	-1	-5	2
HB 2	-2	-5	2	1900	1.7	-1	3	140	4	1.95	9	-1	-5	2
HB 3	-2	-5	4.2	1700	-0.5	-1	3	172	4	1.98	9	-1	-5	3
HB 4	4	-5	2.6	1900	-0.5	-1	4	120	6	1.85	9	-1	-5	-1
HB 6A	-2	-5	1	1900	-0.5	-1	2	160	5	1.84	9	-1	-5	-1
HB 6B	8	-5	1.4	1900	-0.5	-1	4	208	3	1.99	9	-1	-5	-1
HB 6C	-2	-5	2.2	1800	-0.5	-1	4	205	2	2.17	9	-1	-5	-1
HB 6D	3	-5	1.5	2100	-0.5	-1	2	202	3	1.75	9	-1	-5	-1
HB 6-1	-2	-5	2.5	2700	-0.5	-1	6	217	2	3.41	10	-1	-5	-1
HB 6-2	-2	-5	1.5	2000	-0.5	-1	3	211	5	1.9	9	-1	-5	2
HB 8	-2	-5	2	2000	-0.5	-1	3	119	4	1.84	8	-1	-5	2
HB 9	-2	-5	2.5	2100	-0.5	-1	2	108	3	1.55	8	-1	-5	-1
HB 9A	-2	-5	9.2	1500	-0.5	-1	3	197	4	2.42	8	-1	-5	4
HB 9B	-2	-5	3.9	1600	-0.5	-1	3	158	4	1.38	7	-1	-5	-1
HB 9C	-2	-5	1.5	1900	-0.5	-1	5	149	3	1.73	8	-1	-5	-1
HB 9D	-2	-5	2.5	820	-0.5	-1	2	186	1	1.17	6	-1	-5	-1
HB 9E	-2	-5	1.9	1700	-0.5	-1	3	149	3	1.67	9	-1	-5	2
HB 9F	-2	-5	4.3	1700	-0.5	-1	4	118	2	1.58	7	-1	-5	3
HB 9G	-2	-5	4.4	1500	-0.5	-1	2	162	2	1.63	8	-1	-5	4
HB 10	-2	-5	2.4	1900	-0.5	-1	2	168	3	1.81	8	-1	-5	5
HB 11	-2	-5	2.7	2100	-0.5	1	2	228	3	1.02	5	-1	-5	-1
HB 12	-2	-5	2.5	350	-0.5	-1	2	160	3	0.99	7	-1	-5	4
HB 13	-2	-5	3.6	960	-0.5	-1	3	214	3	1.75	9	-1	-5	2
HB 14A	-2	-5	2.6	1600	-0.5	-1	3	140	3	2.07	9	-1	-5	-1
HB 14B	-2	-5	3.9	1800	-0.5	2	4	185	4	2.4	9	-1	-5	4
HB 14C	-2	-5	3	1600	-0.5	-1	4	120	3	2.52	9	-1	-5	2
HB 15	4	-5	3.1	1600	-0.5	-1	3	226	2	1.69	9	-1	-5	3
DMMAS-18-1935	587	-5	1980	450	3.3	7	63	146	-1	8.82	3	-1	-5	4
DMMAS-18-1936	617	-5	2000	440	2.6	8	64	147	3	8.53	3	-1	-5	-2
Accepted Value-DMMAS-18B	544+-72		2020+-224	435+-150	2.5+-1.5	7+-2	58+-15	151+-20		8.05+-0.85	2+-1			

Sample ID	Na %	Ni ppm	Rb ppm	Sb ppm	Sc ppm	Se ppm	Sn %	Sr %	Ta ppm	Th ppm	U ppm	W ppm	Zn ppm	La ppm	Ce ppm
HB 1	2.75	-22	149	0.7	4.3	-3	-0.02	-0.05	1.3	13.8	2.8	-1	-50	43.9	79
HB 2	2.62	-22	202	1.1	3.9	-3	-0.02	-0.05	2	15.7	2.7	-1	-50	56.5	95
HB 3	2.87	-22	180	0.5	3.8	-3	-0.02	-0.05	2	13.9	3.1	-1	-50	49.2	86
HB 4	2.37	-20	128	0.3	3.8	-3	-0.02	-0.05	1.3	12.7	3.2	-1	-50	43.1	79
HB 6A	2.82	-22	144	0.4	3.9	-3	-0.02	-0.05	2.6	12.9	2.8	-1	-50	37.5	63
HB 6B	2.85	-23	122	0.4	4.4	-3	-0.02	-0.05	-0.5	12.8	1.5	-1	-50	30.5	61
HB 6C	2.73	-23	84	0.6	4.6	4	-0.02	-0.05	-0.5	10.9	1.6	-1	-50	63.5	110
HB 6D	2.37	-20	129	0.4	3.5	-3	-0.02	-0.05	-0.5	8.2	3.4	-1	-50	29.4	52
HB 6-1	2.82	-25	113	0.1	9.8	-3	-0.02	-0.05	-0.5	7.5	1.9	-1	-50	42.3	78
HB 6-2	2.85	-23	106	0.1	4	-3	-0.02	-0.05	-0.5	14	2.5	-1	-50	50.9	85
HB 8	2.55	-20	138	0.3	4.5	-3	-0.01	-0.05	-0.5	7.9	1.2	-1	-50	34.6	66
HB 9	3.31	-22	238	0.4	3.2	-3	-0.02	-0.05	-0.5	10.3	4	-1	63	44.1	84
HB 9A	2.37	-22	124	0.6	5	-3	-0.02	-0.05	-0.5	14.2	2.5	-1	-50	52.2	95
HB 9B	2.31	-20	134	-0.1	3.1	-3	-0.02	-0.05	-0.5	18.9	6	27	-50	56	97
HB 9C	2.33	-20	121	0.5	3	-3	-0.01	-0.05	-0.5	9.1	1.5	-1	-50	32.7	57
HB 9D	1.8	-20	120	0.2	1.4	-3	-0.01	-0.05	-0.5	11.6	1.7	-1	-50	32.6	54
HB 9E	2.39	-20	164	0.2	3.6	-3	-0.01	-0.05	-0.5	9.7	3.6	-1	90	38	69
HB 9F	2.62	-25	161	-0.1	3.2	-3	-0.02	-0.05	-0.5	19.6	2.4	-1	57	146	231
HB 9G	2.76	-21	215	-0.1	2.9	-3	-0.02	-0.05	3.1	9.4	4.7	-1	79	41.5	76
HB 10	2.36	-20	115	0.3	4	-3	-0.01	-0.05	2	9.3	1.8	-1	54	40.5	72
HB 11	2.72	-21	136	0.4	1.9	-3	-0.01	-0.05	-0.5	9.5	1.3	-1	-50	29	49
HB 12	2.49	-20	206	1.2	1.7	-3	-0.01	-0.05	2.9	32.3	7	-1	-50	24.8	55
HB 13	1.84	-20	134	1.2	1.1	-3	-0.01	-0.05	1.9	14	2.9	-1	-50	46.6	77
HB 14A	2.46	-20	128	0.5	4.4	-3	-0.01	-0.05	3.2	13.2	2.4	-1	91	54.2	91
HB 14B	2.4	-20	147	1	4.8	-3	-0.02	0.06	-0.5	19.2	4	-1	-50	60.6	105
HB 14C	2.63	-20	117	0.5	5.1	-3	-0.01	-0.05	2	11.3	2	-1	-50	42.5	77
HB 15	2.48	-20	124	0.6	3.5	-3	-0.01	-0.05	-0.5	8.8	1.6	-1	-50	28.5	56
DMMAS-18-1935	0.77	-29	40	12.3	21	-3	-0.03	-0.05	-0.5	1.2	-0.5	19	227	13.4	24
DMMAS-18-1936	0.77	-30	45	12	21.2	-3	-0.04	-0.05	-0.6	1.4	-0.5	21	241	13.4	21
Accepted Value-DMMAS-18B	0.74+-0.48		38+-10	12+-3	20.5+-3.4					1.5+-0.5		19+-2	250+-50	12.2+-1.3	23+-3

Sample ID	Nd	Sm	Eu	Tb	Yb	Lu	Mass
	ppm	ppm	ppm	ppm	ppm	ppm	g
HB 1	33	6.7	1.1	0.9	4	0.63	35.49
HB 2	35	6.2	1.1	-0.5	3.8	0.57	36.02
HB 3	31	6.1	1	-0.5	4.1	0.61	34.85
HB 4	21	3.4	0.9	0.7	2	0.31	36.04
HB 6A	31	5.1	1.1	-0.5	2.8	0.43	32.94
HB 6B	22	4.4	1	-0.5	2.7	0.42	31.92
HB 6C	50	6.9	1	1.3	2.9	0.44	34.57
HB 6D	19	4.9	1.1	-0.5	2.8	0.43	34.84
HB 6-1	29	7.6	1.5	-0.5	4.2	0.64	31.29
HB 6-2	30	5.8	1.3	0.9	3	0.45	31.86
HB 8	33	6.6	1	1	3.6	0.54	39.25
HB 9	30	6.3	0.9	1	3.4	0.52	37.07
HB 9A	40	7.9	1.1	1.5	3.3	0.5	33.36
HB 9B	37	5.8	0.9	-0.5	2.5	0.38	36.02
HB 9C	20	4.2	0.9	0.8	2.2	0.34	37.26
HB 9D	17	2.8	0.6	-0.5	1.4	0.21	38.33
HB 9E	30	5.7	1	1	3	0.45	36.64
HB 9F	67	9.4	0.9	-0.5	3.3	0.51	35.21
HB 9G	30	5.8	0.9	1	3.5	0.53	35.8
HB 10	26	5.4	1.1	0.8	2.8	0.42	37.08
HB 11	14	2.9	1.1	-0.5	1.5	0.23	32.59
HB 12	17	5.3	0.4	1.3	5.6	0.84	33.72
HB 13	30	4.8	0.8	-0.5	2	0.31	35.54
HB 14A	33	6.2	1	0.9	3	0.46	36.28
HB 14B	36	5.7	1.2	0.8	3.1	0.48	34.91
HB 14C	33	5.6	1.1	1.1	3.3	0.5	41.73
HB 15	28	5.7	0.9	1	3	0.46	33.39
DMMAS-18-1935	12	4.1	1.3	-0.5	3.4	0.52	25.13
DMMAS-18-1936	11	4.2	1.3	-0.5	3.7	0.55	25.19
Accepted Value-DMMAS-18B	11+-3	4.1+-0.5	1.2+-0.2	0.8+-0.35	3.6+-0.6	0.54+-0.05	

Sample ID	Nd ppm	Sm ppm	Eu ppm	Tb ppm	Yb ppm	Lu ppm	Mass g
HB 1	33	6.7	1.1	0.9	4	0.63	35.49
HB 2	35	6.2	1.1	-0.5	3.8	0.57	36.02
HB 3	31	6.1	1	-0.5	4.1	0.61	34.85
HB 4	21	3.4	0.9	0.7	2	0.31	36.04
HB 6A	31	5.1	1.1	-0.5	2.8	0.43	32.94
HB 6B	22	4.4	1	-0.5	2.7	0.42	31.92
HB 6C	50	6.9	1	1.3	2.9	0.44	34.57
HB 6D	19	4.9	1.1	-0.5	2.8	0.43	34.84
HB 6-1	29	7.6	1.5	-0.5	4.2	0.64	31.29
HB 6-2	30	5.8	1.3	0.9	3	0.45	31.86
HB 8	33	6.6	1	1	3.6	0.54	39.25
HB 9	30	6.3	0.9	1	3.4	0.52	37.07
HB 9A	40	7.9	1.1	1.5	3.3	0.5	33.36
HB 9B	37	5.8	0.9	-0.5	2.5	0.38	36.02
HB 9C	20	4.2	0.9	0.8	2.2	0.34	37.26
HB 9D	17	2.8	0.6	-0.5	1.4	0.21	38.33
HB 9E	30	5.7	1	1	3	0.45	36.64
HB 9F	67	9.4	0.9	-0.5	3.3	0.51	35.21
HB 9G	30	5.8	0.9	1	3.5	0.53	35.8
HB 10	26	5.4	1.1	0.8	2.8	0.42	37.08
HB 11	14	2.9	1.1	-0.5	1.5	0.23	32.59
HB 12	17	5.3	0.4	1.3	5.6	0.84	33.72
HB 13	30	4.8	0.8	-0.5	2	0.31	35.54
HB 14A	33	6.2	1	0.9	3	0.46	36.28
HB 14B	36	5.7	1.2	0.8	3.1	0.48	34.91
HB 14C	33	5.6	1.1	1.1	3.3	0.5	41.73
HB 15	28	5.7	0.9	1	3	0.46	33.39
DMMAS-18-1935	12	4.1	1.3	-0.5	3.4	0.52	25.13
DMMAS-18-1936	11	4.2	1.3	-0.5	3.7	0.55	25.19
Accepted Value-DMMAS-18B	11+-3	4.1+-0.5	1.2+-0.2	0.8+-0.35	3.6+-0.6	0.54+-0.05	

Appendix 7

Bedrock Sample Descriptions

Sample Number	Description
HB1	Pegmatite, brownish crumbling with biotite
HB2	Pegmatite, brownish crumbling with biotite
HB3	Pegmatite, brownish crumbling with biotite, similar to HB2
HB4	Pegmatite, brownish crumbling
HB6 A-D	30" wide
HB6 A-grab sample	Where Paul Wodjack BC government geologist left flagging tape (with me on first day)
HB6 B	Grab sample, area had pink tinge
HB6 C	Grab sample, softer rock
HB6 D	Grab sample, harder rock
HB6 - 1	Brownish pegmatite
HB6 - 2	Collected by J.P. Ross / Paul Wodjack
HB8	Pegmatite, crumbling with biotite
HB9	Pegmatite, 3 zones (seem different), quartz and albite and vuggy areas
HB9 A	On a fracture - smooth side, albite, quartz and lot of black specs
HB9 B	4" of silica in a pegmatite
HB9 C	Pegmatite, interesting black specs, crumbling
HB9 D	1" slickensides with needle crystals and black specs
HB9 E	2-3 black surfaces (slickensides), some silica and black specs
HB9 F	30" chips, pink albite, vuggy quartz - grey
HB9 G	30" chips, pink albite, vuggy quartz - grey
HB10	pegmatite, 3 zones, pegmatite, albite and quartz
HB11	pegmatite, 3 zones, pegmatite, albite and quartz, similar to HB10
HB12	4" dyke in granodiorite (pink-grey weathering), small grained quartz and lots of small black specs
HB13	4" dyke in granodiorite (pink-grey weathering), small grained quartz and lots of small black specs, with boundaries left on the

	rock, similar to HB12
HB14 A-C	Took some photos, side of road bank
HB14 A	Left side, 36" pegmatite, crumbly biotite
HB14 B	Middle, 38" dyke (harder) lots of quartz, some red-brown areas
HB14 C	Right side, 36" pegmatite, crumbly biotite
HB15	Large angular hard 10' x 10' flat boulders or bedrock, pegmatite - biotite