Results of Bulk Sediment Sample Orientation Survey **TAM PROPERTY** Greenwood Area British Columbia 824739

> Prepared by: Barry W. Smee June 1991

Results of Bulk Sediment Sample Orientation Survey

# TAM PROPERTY

### Greenwood Area, B.C.

Prepared For: Minnova Inc. 3rd Floor, 311 Water Street Vancouver, B.C. V6B 1B8

Prepared By: Barry W. Smee, Ph.D., P.Geol. 3626 Handel Avenue Vancouver, B.C. V5S 4G8

June, 1991

### **Table of Contents**

		Page
1.0	INTRODUCTION	. 1
2.0	METHODS USED	. 4
	2.1 Field Sampling	. 4
	2.2 Analytical Methods	. 4
	2.3 Interpretation Methods	. 5
3.0	RESULTS	. 5
4.0	CONCLUSIONS	. 8

### List of Figures

Figure 1	Tam Property, Location Map page 3
Figure 2	Tam Property, Sample Location Map pocket
Figure 3	Tam Property, Gold, Arsenic, Copper Bulk Sediment Orientation Survey

#### List of Tables

Table 1	Sample Analytical Results	
	oumpro imagnour resours	· · · · · · · · · · · · · · · · · · ·

### List of Appendices

Appendix I Geochemical Analysis Certificates

#### **1.0 INTRODUCTION**

The use of stream sediment sampling as a regional exploration technique has been the mainstay of Cordilleran explorationists for decades. The routine technique of sampling -80 mesh sediment was successful in delineating many of the porphyry copper occurrences in the 1960's and early 1970's, and consequently was used throughout British Columbia and the Yukon.

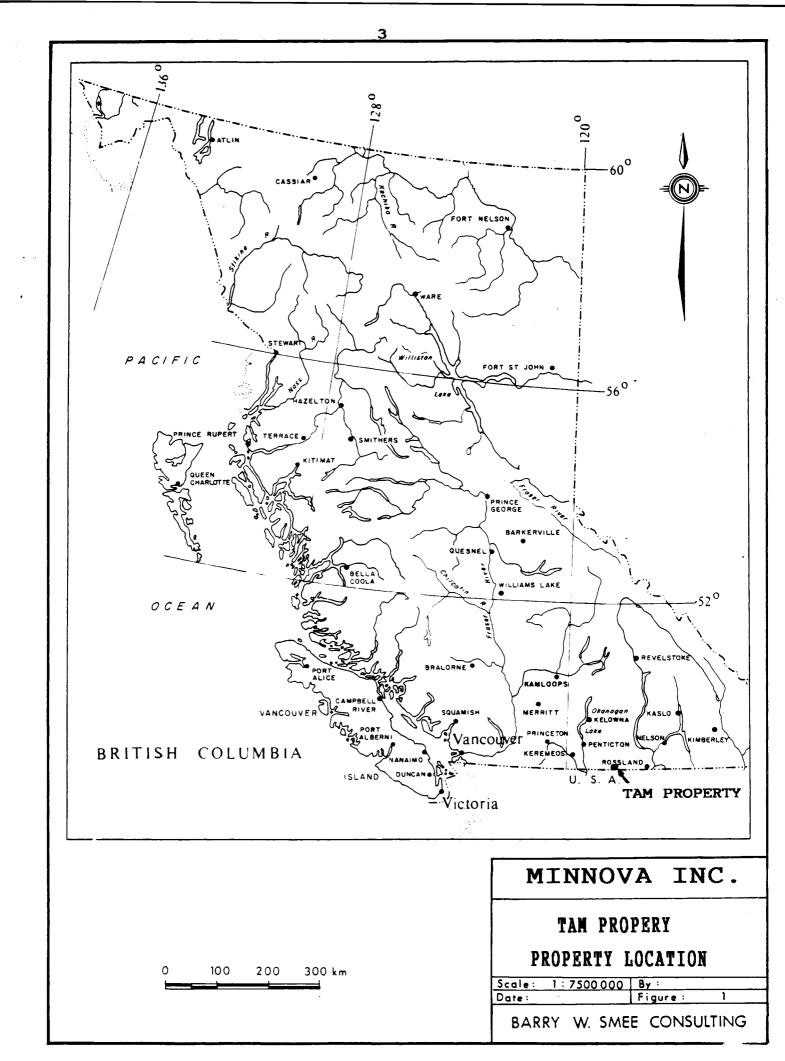
More recently, many companies have attempted to use heavy mineral sampling as their principal regional exploration tool. The purpose of this technique was:

- 1. To discover mineralization which was undetected by previous -80 mesh sampling;
- 2. To cover a larger area with fewer samples;
- 3. To detect precious metals by utilizing a larger initial sample and selectively concentrating the minerals of higher specific gravity.

Although promising in theory, many interpretational difficulties were encountered which prevented the logical follow-up of heavy mineral anomalies. These difficulties were recognized some time ago by Dr. Kay Fletcher of U.B.C. Dr. Fletcher initiated a long term study of Cordilleran fluvial clastic dispersion and collection processes and has recently published the results of the first few years of work. Some of his conclusions impact adversely on the methods which have been in use by most exploration companies, however, his results also suggest a preferred method of sample collection and analysis. His suggested methods should produce results which can be followed up to source and which lesson the impact of severe nugget effects within the sediment samples. These methods were used by the author in an orientation area during the summer of 1990. The results were extremely promising, with several different styles of sulphide and precious metal mineralization clearly outlined. Upstream cut-offs were sharp and occurred near the metal source. Precious metal anomalies were repeatable when a second sample split was reanalyzed.

A proposal was submitted to Minnova in February, 1991 which suggested that these methods could be of use to the Minnova exploration effort. The proposal suggested that an orientation area be chosen by Minnova to test the applicability of the techniques under conditions which would provide useful information to Minnova's ongoing exploration program.

The proposal was accepted and an orientation area was chosen. This area covered two main drainages originating from the Tam Project near Greenwood, B.C. (Figure 1). This report presents the results of this orientation sampling program which was undertaken from June 4 to 6, 1991.



#### 2.0 METHODS USED

#### 2.1 Field Sampling

Sample locations were chosen at 1-kilometre intervals along the stream courses of Ingram and Jolly Jack Creeks, and their tributaries. Each sample site was located at the downstream end of a gravel bed whenever possible. These occurred usually on the inside of bends or where the streams changed either flow pattern or speed.

A vertical hole was dug through the gravel bar to a depth of approximately 20-30 centimetres. Each shovelful of sediment was placed on a 15-inch diameter stainless steel -6 mesh screen and wet sieved into an aluminum catchment bucket. Approximately 4 kilograms of sample was collected, then transferred into a 10" x 17" Hubco sand bag. A total of 26 samples were taken over a two-day period. The sample sites are plotted on Figure 2.

#### 2.2 Analytical Methods

The samples were submitted to Chemex Labs Ltd., Vancouver. Each sample was air dried and then sieved to -150 mesh. Three 30-gram splits were analyzed for gold using neutron activation, which produces a 1 ppb detection limit. An analytical package was chosen to reflect both the epithermal and skarn-type of target thought to be possible on the Tam property. The elements Sb, As, Bi, Cu, Pb, Hg, Mo, Ag, and Zn were included utilizing techniques which provided the detection limits necessary to establish background concentrations.

Three separate analysis for gold were selected to provide information on sample reproducibility and nugget effect problems. Although sample weight was in excess of 4 kilograms, four out of 26 samples contained insufficient -150 mesh material to provide a third set of gold analysis. This confirms that the original sample weight is the minimum necessary to undertake a regional sampling program for precious metals.

#### **2.3** Interpretation Methods

All analytical data was entered into a database and is listed as Table 1. The three sets of gold analysis were averaged to produce a value for plotting on the maps. Variation in the three analysis suggests the presence of nugget effects, and by inference, native gold particles. The threshold chosen for arsenic is 7 ppm, and for copper, 25 ppm. No other elements in this data set produce clear anomalies which might be related to either epithermal or skarn-type mineralization.

The gold, arsenic, and copper values were plotted on Figure 3. Gold is colour coded according to concentration as shown in the legend. Anomalous arsenic and copper are shown as underlined values.

#### 3.0 RESULTS

Ingram Creek is clearly anomalous in gold near its confluence with the Kettle River. An attempt to obtain a sample between MM-01 and MM-03 proved futile, as a steep canyon prevented access. It is doubtful that a suitable sample site would have been found in the canyon at any event. The western tributary to Ingram Creek is clearly

#### MINNOVA INC. TAM PROPERTY, GREENWOOD B.C. BULK SEDIMENT ORIENTATION SURVEY

SAM	IPLE	ppb	ppb	ppb	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm
NUM	<u>BER</u>	<u>AU1</u>	AU2	<u>AU3</u>	<u>AU AVG</u>	AG	<u>AS</u>	BI	<u>CU</u>	HG	MO	<u>PB</u>
MM	-1	62	372	735	390	0.10	4.5	-0.2	20.0	-0.1	0.5	21
MM	-2	70	117	NSF	62	0.05	5.0	0.6	13.5	-0.1	0.5	11
MM	-3	58	29	17	35	0.05	3.5	0.2	13.0	-0.1	0.5	14
MM	-4	17	51	66	45	0.15	4.0	-0.2	32.5	-0.1	0.5	12
MM	-5	371	94	353	273	0.05	7.5	0.2	20.5	-0.1	0.5	10
MM	-6	141	432	34	202	0.10	7.0	0.2	25.5	-0.1	0.5	17
MM	-7	20	11	11	14	0.10	2.0	-0.2	27.5	-0.1	-0.5	9
MM	-8	13	11	9	11	0.10	14.5	-0.2	32.0	-0.1	6.0	8
MM	-9	25	212	31	89	0.10	4.0	-0.2	14.0	0.1	0.5	25
MM	-10	8	23	NSF	10	0.10	4.0	-0.2	12.0	-0.1	0.5	16
MM	-11	3	1	13	6	0.05	2.5	-0.2	30.5	-0.1	0.5	15
MM	-12	143	53	12	69	0.05	3.5	-0.2	12.5	-0.1	0.5	14
MM	-13	698	16	21	245	0.05	2.5	-0.2	11.5	-0.1	0.5	13
MM	-14	15	8	33	19	0.05	2.0	-0.2	10.5	-0.1	0.5	10
MM	-15	17	5	42	21	0.15	2.5	-0.2	24.5	0.1	0.5	11
MM	-16	-1	7	NSF	2	0.05	4.0	-0.2	16.Ū	-0.1	0.5	16
MM	-17	17	1	2	7	0.05	2.0	-0.2	13.0	-0.1	-0.5	10
MM	-18	151	106	207	155	0.05	2.0	-0.2	17.0	-0.1	0.5	14
MM	-19	1	-1	-1	0	0.05	1.5	-0.2	14.5	-0.1	0.5	11
MM	-20	18	-1	2	6	-0.05	1.0	-0.2	10.5	-0.1	0.5	11
MM	-21	5	3	4	4	0.05	2.0	-0.2	20.0	-0.1	-0.5	11
MM	-22	20	5	11	12	0.05	1.0	-0.2	14.0	-0.1	-0.5	12
MM	-23	2	1	2	2	0.05	1.0	-0.2	15.5	-0.1	0.5	11
MM	-24	4	-1	NSF	1	0.10	2.0	-0.2	18.0	-0.1	-0.5	22
MM	-25	14	10	8	11	0.15	1.5	-0.2	55.5	-0.1	0.5	16
MM	-26	2	2	14	6	0.05	-0.5	-0.2	14.0	-0.1	-0.5	13

NEGATIVE VALUE= BELOW DETECTION LIMIT NSF= NOT SUFFICIENT SAMPLE

.

28-Jun-91

SAN	<b>IPLE</b>	ppm	ppm	SAMPLE
NUM	IBER	SB	ZN	QUALITY
MM	-1	0.2	71	GOOD
MM	-2	-0.2	78	GOOD
ММ	-3	0.4	62	GOOD
MM	-4	0.2	60	GOOD
MM	-5	-0.2	55	GOOD
MM	-6	0.2	65	GOOD
MM	-7	-0.2	29	GOOD
MM	-8	-0.2	45	MODERATE
MM	-9	-0.2	104	GOOD
MM	-10	-0.2	60	GOOD
MM	-11	-0.2	51	POOR
MM	-12	-0.2	53	GOOD
MM	-13	-0.2	57	GOOD
MM	-14	-0.2	49	GOOD
MM	-15	0.2	40	MODERATE
MM	-16	-0.2	62	GOOD
MM	-17	-0.2	58	GOOD
MM	-18	-0.2	60	GOOD
MM	-19	-0.2	49	MODERATE
MM	-20	-0.2	54	POOR
MM	-21	-0.2	50	POOR
MM	-22	-0.2	50	GOOD
MM	-23	-0.2	45	GOOD
MM	-24	-0.2	54	GOOD
MM	-25	-0.2	<b>49</b>	GOOD
MM	-26	-0.2	53	MODERATE

7

.

anomalous in gold, arsenic, and copper. The intensity of the average gold value increases to the north, suggesting a source entering that drainage. These are the only sample sites which exhibit a multi-element signature with gold. A skarn-type of mineralization would be consistent with a copper-arsenic-gold association.

The main fork of Ingram Creek also contains anomalous gold, and one high copper value. Sample MM-13 shows a marked nugget effect, but tributaries from the east and upstream do not contain anomalous gold or pathfinder elements. This suggests that the source of the gold is originating from the west, and could be the same source which is contributing to samples MM-02 to MM-08. Had this orientation been part of a regional program, the area upstream from MM-05 and between Ingram Creek would certainly have been chosen for follow-up.

Only one sample on Jolly Jack Creek contained anomalous gold, but no pathfinder elements. Sample MM-18 in located in the immediate vicinity of the road and might be caused by contamination from road fill, however, all three sample splits were anomalous. The sample must be taken seriously, with the source located somewhere between sample MM-18 and MM-21.

A weak copper anomaly occurs in sample MM-25, but no other element supports the copper. This response may reflect a rock type change. There does not appear to be a significant source of precious metal entering the Jolly Jack drainage.

#### 4.0 CONCLUSIONS

1. At least 4 kilograms of -6 mesh sediment must be collected in the Greenwood area in order to obtain sufficient -150 mesh material for three 30-gram gold analysis.

- 2. The Ingram Creek drainage contains a source of precious metal mineralization. This survey suggests that the mineralization is entering the drainage from the west bank, about two-thirds of the way up Ingram Creek. Weak copper and arsenic values suggest a skarn-type source.
- 3. No obvious source of mineralization was detected in Jolly Jack Creek. One high gold sample was cut-off upstream, suggesting a source near the lower part of the creek. Contamination from road fill cannot be discounted.
- 4. The validity of these targets must be determined by Minnova geologists prior to undertaking further sampling. Should the interpretation prove valid, further sampling using these techniques should be undertaken on smaller tributaries to Ingram Creek.

Respectfully submitted,

Barry W. Smee, Ph.D., P.Geol.

### **APPENDIX I**

### **GEOCHEMICAL ANALYSIS CERTIFICATES**



Analytical Chemists \* Geochemists \* Registered Assayers

212 Brooksbank Ave., North Vancouver British Columbia, Canada V7J 2C1 PHONE: 604-984-0221 10: SMEE, BARRY

3626 HANDEL AVE. VANCOUVER, BC V5S 4G8

Comments: CC: MINNOVA

#### CERTIFICATE

A9116064

#### SMEE, BARRY

Project: TAM P.O. # :

Samples submitted to our lab in Vancouver, BC. This report was printed on 27-JUN-91.

	SAMPLE PREPARATION									
CHEMEX	NUMBER SAMPLES	DESCRIPTION								
216 240 202	26 26 26	sieve to -150 mesh Surcharge: -10 mesh sieve save reject								
* NOTE	1:									

The 32 element ICP package is suitable for trace metals in soil and rock samples. Elements for which the nitric-aqua regia digestion is possibly incomplete are: Al, Ba, Be, Ca, Cr, Ga, K, La, Mg, Na, Sr, Ti, Tl, W.

,			ANALYTICAL	PROCEDURES	3	
	NUMBER SAMPLES		DESCRIPTION	METHOD	DETECTION LIMIT	upper Limit
993 1941 1092 1094 1097 1935 1939 1933 1089 1946	26 26 26 26 26 26 26 26 26	Ag ppm: As ppm: Bi ppm: Cu ppm: Hg ppm: Mo ppm: Pb ppm: Sb ppm:	Fuse 30 g sample Ultra trace package Ultra trace package	FA-NAA BXT-ICP EXT-ICP EXT-ICP EXT-ICP EXT-ICP EXT-ICP EXT-ICP EXT-ICP EXT-ICP EXT-ICP	1 0.05 0.5 0.2 0.5 0.1 0.5 1 0.2 1	10000 200 5000 5000 5000 5000 1000 5000

A9116064



Analytical Chemists \* Geochemists \* Registered Assayers

212 Brooksbank Ave., North Vancouver British Columbia, Canada V7J 2C1 PHONE: 604-984-0221

10: SMEE, BARRY

3626 HANDEL AVE. VANCOUVER, BC V5S 4G8

٠

Page Nunter :1 Total Pages :1 Certificate Date: 27-JUN-91 Invoice No. :19116064 P.O. Number :

Project : TAM Comments: CC: MINNOVA

	<u></u>					CERTIFIC		NALYSIS	<b>A9</b> 1	16064	
SAMPLE DESCRIPTION	PREP CODE	Au NAA ppb	Ag ppm	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
MM-01 A MM-02 A MM-03 A MM-04 A MM-05 A	216 240 216 240 216 240 216 240 216 240 216 240	62 70 58 17 371	0.10 0.05 0.05 0.15 0.05	4.5 5.0 3.5 4.0 7.5	< 0.2 0.6 0.2 < 0.2 0.2	20.0 13.5 13.0 32.5 20.5	<pre>&lt; 0.1 &lt; 0.1 &lt; 0.1 &lt; 0.1 &lt; 0.1 &lt; 0.1 &lt; 0.1</pre>	0.5 0.5 0.5 0.5 0.5	21 11 14 12 10	0.2 < 0.2 0.4 0.2 < 0.2	71 78 62 60 55
MM-06 A MM-07 A MM-08 A MM-09 A MM-10 A	216 240 216 240 216 240 216 240 216 240 216 240	141 20 13 25 8	0.10 0.10 0.10 0.10 0.10 0.10	7.0 2.0 14.5 4.0 4.0	0.2 < 0.2 < 0.2 < 0.2 < 0.2 < 0.2	25.5 27.5 32.0 14.0 12.0	<pre>&lt; 0.1 &lt; 0.1 &lt; 0.1 &lt; 0.1 0.1 &lt; 0.1</pre>	0.5 < 0.5 6.0 0.5 0.5	17 9 8 25 16	0.2 < 0.2 < 0.2 < 0.2 < 0.2 < 0.2	65 29 45 104 60
MM-11 A MM-12 A MM-13 A MM-14 A MM-15 A	216 240 216 240 216 240 216 240 216 240 216 240	3 143 698 15 17	0.05 0.05 0.05 0.05 0.15	2.5 3.5 2.5 2.0 2.5	<pre>&lt; 0.2 &lt; 0.2</pre>	30.5 12.5 11.5 10.5 24.5	<pre>&lt; 0.1 &lt; 0.1 &lt; 0.1 &lt; 0.1 &lt; 0.1 &lt; 0.1 0.1</pre>	0.5 0.5 0.5 0.5 0.5	15 14 13 10 11	<pre>&lt; 0.2 &lt; 0.2 &lt; 0.2 &lt; 0.2 &lt; 0.2 &lt; 0.2 0.2</pre>	51 53 57 49 40
MM-16 A MM-17 A MM-18 A MM-19 A MM-20 A	216 240 216 240 216 240 216 240 216 240 216 240	<pre>&lt; 1     17     151     1     18</pre>	0.05 0.05 0.05 0.05 < 0.05 < 0.05	4.0 2.0 2.0 1.5 1.0	< 0.2 < 0.2 < 0.2 < 0.2 < 0.2 < 0.2	16.0 13.0 17.0 14.5 10.5	<pre>&lt; 0.1 &lt; 0.1</pre>	0.5 < 0.5 0.5 0.5 0.5	16 10 14 11 11	<pre>&lt; 0.2 &lt; 0.2</pre>	62 58 60 49 54
MM-21 A MM-22 A MM-23 A MM-24 A MM-25 A	216 240 216 240 216 240 216 240 216 240 216 240	5 20 2 4 14	0.05 0.05 0.05 0.10 0.15	2.0 1.0 1.0 2.0 1.5	< 0.2 < 0.2 < 0.2 < 0.2 < 0.2 < 0.2 < 0.2	20.0 14.0 15.5 18.0 55.5	<pre>&lt; 0.1 &lt; 0.1</pre>	< 0.5 < 0.5 0.5 < 0.5 < 0.5 0.5	11 12 11 22 16	< 0.2 < 0.2 < 0.2 < 0.2 < 0.2 < 0.2 < 0.2	50 50 45 54 49
MM-26 A	216 240	2	0.05	< 0.5	< 0.2	14.0	< 0.1	< 0.5	13	< 0.2	53
						L	<u> </u>		- Th	an V	mh



## **Chemex Labs Ltd.**

Analytical Chemists \* Geochemists \* Registered Assayers

212 Brooksbank Ave., North Vancouver British Columbia, Canada V7J 2C1 PHONE: 604-984-0221

10: SMEE, BARRY

3626 HANDEL AVE. VANCOUVER, BC V5S 4G8

A9116306

Comments: CC: MINNOVA

CERTIFICATE A9116306					ANALYTICAL	PROCEDURES		
SMEE, BA Project: P.O. # :	ARRY TAM NONE		CHEMEX	NUMBER SAMPLES	DESCRIPTION	METHOD	DETECTION LIMIT	upper Limit
		ed to our lab in Vancouver, BC. printed on 27-JUN-91.	993	26	Au ppb: Fuse 30 g sample	<b>га-наа</b>	1	10000
	SAM	PLE PREPARATION						
CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION		-				
299	26	Sample split from other certif						
,								
	•							
				-				



Analytical Chemists \* Geochemists \* Registered Assayers

212 Brooksbank Ave., North Vancouver British Columbia, Canada V7J 2C1 PHONE: 604-984-0221 To: SMEE, BARRY

3626 HANDEL AVE. VANCOUVER, BC V5S 4G8 +

Page Number :1 Total Pages :1 Certificate Date:27-JUN-91 Invoice No. :19116306 P.O. Number :NONE

				CERTIFIC	ATE OF A	NALYSIS	<b>A9</b> 1	16306	
SAMPLE DESCRIPTION	PREP CODE	Au NAA ppb							
MM-01 B MM-02 B MM-03 B MM-04 B MM-05 B	299 299 299 299 299	372 117 29 51 94							
MM-06 B MM-07 B MM-08 B MM-09 B MM-10 B	299 299 299 299 299 299	432 11 11 212 23							
MM-11 B MM-12 B MM-13 B MM-14 B MM-15 B	299 299 299 299 299 299	1 53 16 8 5							
MM-16 B MM-17 B MM-18 B MM-19 B MM-20 B	299 299 299 299 299	7 1 106 < 1 < 1							
MM-21 B MM-22 B MM-23 B MM-23 B MM-24 B MM-25 B	299 299 299 299 299 299	3 5 1 < 1 10							
ММ-26 В	299	2							



CERTIFICATE

### **Chemex Labs Ltd.**

Analytical Chemists \* Geochemists \* Registered Assayers

212 Brooksbank Ave., North Vancouver British Columbia, Canada V7J 2C1 PHONE: 604-984-0221 10: SMEE, BARRY

3626 HANDEL AVE. VANCOUVER, BC V5S 4G8

A9116310

Comments: CC: MINNOVA

A9116310					ANALYTIC	AL PROCEDURES		
	CHEMEX CODE	NUMBER SAMPLES		•	DESCRIPTION	METHOD	DETECTION LIMIT	UPPER LIMIT
couver, BC. L.	993	22	Au ppb: F	'use :	30 g sample	FA-NAA	1	10000
N								
IPTION		-						
ther certif								
							· · · · · · · · · · · · · · · · · · ·	

SMEE, BARRY

Project: TAM P.O. # : NONE

Samples submitted to our lab in Vancouver, BC. This report was printed on 27-JUN-91.

SAMPLE PREPARATION							
CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION					
299	26	Sample split from other certif					



Analytical Chemists \* Geochemists \* Registered Assayers

212 Brooksbank Ave., North Vancouver British Columbia, Canada V7J 2C1 PHONE: 604-984-0221 10: SMEE, BARRY

3626 HANDEL AVE. VANCOUVER, BC V5S 4G8 \*

Page Nuncor :1 Total Pages :1 Certificate Date:27-JUN-91 Invoice No. :19116310 P.O. Number :NONE

Project :	TAM
Comments:	CC: MINNOVA

				CERTIFIC	ATE OF ANALYSIS	A91	A9116310		
SAMPLE DESCRIPTION	PREP CODE	Au NAA ppb							
MM-01 C MM-02 C MM-03 C MM-04 C MM-05 C	299 299 299 299 299 299	735 not/ss 17 66 353							
MM-06 C MM-07 C MM-08 C MM-09 C MM-10 C	299 299 299 299 299 299	34 11 9 31 not/ss				-			
MM-11 C MM-12 C MM-13 C MM-14 C MM-15 C	299 299 299 299 299	13 12 21 33 42	•						
MM-16 C MM-17 C MM-18 C MM-19 C MM-20 C	299 299 299 299 299 299	not/ss 2 207 < 1 2							
MM-21 C MM-22 C MM-23 C MM-24 C MM-25 C	299 295 295 295 295	4 11 2 not/ss 8							
MM-26 C	299	14							

CERTIFICATION:

The Vinh

