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BRITISH COLUMBIA REGIONAL GEOCHEMICAL SURVEY

VERNON (NTS 82L)

STREAM SEDIMENT AND WATER GEOCHEMICAL DATA

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INTRODUCTION

Open File package BC RGS 32 / GSC 2357 a joint federal-provincial initiative, contains new data for gold and 25 other elements obtained by re-analyzing stream sediments collected in 1976 from the Vernon map-sheet area (NTS 82L). Also included are the original analytical data from GSC Open File 410 published in 1979 for 10 elements in sediments, and uranium, fluoride and pH values in concomitant waters.

The original reconnaissance survey was undertaken in 1976 by the Geological Survey of Canada (GSC) in conjunction with the British Columbia Ministry of Energy, Mines and Petroleum Resources (MEMPR) under the Canada-British Columbia Uranium Reconnaissance Program. In 1990, under the MEMPR RGS Archive Program, the samples collected in 1976 were analysed by instrumental neutron activation (INAA). This initiative was funded in part by the Canada/British Columbia Mineral Development Agreement (1985-1990).

Analytical results and field observations from these regional geochemical surveys are used to build both a provincial and national geochemical database for resource assessment, mineral exploration, geological mapping and environmental studies. Sample collection, preparation and analytical methods are closely monitored to ensure consistency and conformance to national standards.

ACKNOWLEDGEMENTS

1976 STREAM SEDIMENT AND WATER SURVEY

E.H.W. Hornbrook directed GSC activities and *A. Sutherland Brown, N.C. Carter* and *P.A. Christopher* directed MEMPR activities.

Contracts were let to the following companies for sample collection, preparation and analysis and were managed by staff of the GSC or MEMPR.

COLLECTION : Semco, Ltd. Vancouver, B.C.
S.B. Ballantyne (GSC) and T.E. Kalnins (MEMPR)

PREPARATION : Golder Associates, Ottawa.
J.J. Lynch (GSC)

ANALYSIS : Chemex Laboratories Ltd., Vancouver. (Sediments)
Atomic Energy of Canada, Ltd., Ottawa. (U in Sediments)
Bondar-Clegg, Ltd., North Vancouver. (U in Waters)
J.J. Lynch (GSC) and W.M. Johnson (MEMPR)

1990 RGS ARCHIVE PROGRAM

The RGS Archive Program was managed by Geological Survey Branch staff of the British Columbia Ministry of Energy Mines and Petroleum Resources.

P.F. Matysek coordinated the operational activities of contract and MEMPR staff. *W. Jackaman* coordinated and prepared the production of the open-file. *S.J. Sibbick* and *J.L. Gravel* provided analysis and interpretation of the data. *S. Feulgen* provided computer processing support.

PREPARATION : Rob Phillips, Ottawa, Ont.

ANALYSIS : Becquerel Laboratories, Mississauga, Ont.

OPEN FILE FORMAT

Open File RGS 32 / GSC 2357 includes a data booklet, map booklet and a floppy diskette.

The data booklet provides details of the sample collection, preparation and analysis programs plus data listings, statistics and interpretations.

The map booklet consists of :

- 4 - 1: 100 000 scale sample location maps.
- 1 - 1: 500 000 scale sample location clear mylar overlay and map.
- 1 - 1: 500 000 scale bedrock geology clear mylar overlay and map.
- 1 - 1: 500 000 scale surficial geology map.
- 39 - 1: 500 000 scale symbol and value maps for individual elements in stream sediments and waters.
- 1 - 1: 500 000 base metal anomaly map.
- 1 - 1: 500 000 precious metal anomaly map.

A 5^{1/4}" 1.2 Mb (high density) floppy diskette containing data files in ASCII format.

SURVEY DESCRIPTION

PHYSIOGRAPHY, GEOLOGY AND MINERAL POTENTIAL

The Vernon map sheet covers an area of approximately 15,700 square kilometres. Physiographically, the eastern half of the map sheet is dominated the Shuswap Highlands, which are flanked by the Okanagan Highlands and Monashee Mountains to the south and east, respectively. The Thompson Plateau composes the western half of the map sheet (Holland, 1976).

Surficial materials (Map 3 *after* Fulton *et al.*, 1984) consist of widespread deposits of till and colluvium on slopes and till and glaciofluvial sediments within valleys. Within the Okanagan Valley, extensive sequences of glaciolacustrine sediments blanket the valley floor and lower slopes.

The Vernon map sheet area is underlain by rocks ranging from late Proterozoic to Eocene in age. Near the western boundary of the map sheet lies the transition between the Intermontane and the Omineca belts. In the Omineca Belt, high-grade metamorphic rocks of the Shuswap Complex and middle Jurassic to late Cretaceous-age intrusive rocks predominate. Intermontane Belt rocks exposed within the Penticton map sheet consist mainly of unmetamorphosed to sub-greenschist grade volcanic and sedimentary rocks of Mississippian to Upper Triassic age with intrusions which are generally comagmatic with the volcanics (Thompson and Cook, 1981). The geological base map (Fig. 1 and Table A-1 in Appendix A) used for Open File RGS 32 is from Okulich and Woodsworth (1977).

Examples of mineral occurrences found within the survey area are:

- . Stratabound Zn, Pb (Big Ledge)
- . Vein Ag, Pb, Zn (Bessette Creek)
- . Vein Au, Ag, Cu, Pb, Zn (Kalamaka)
- . Vein Cu, Au, Ag (Budget)

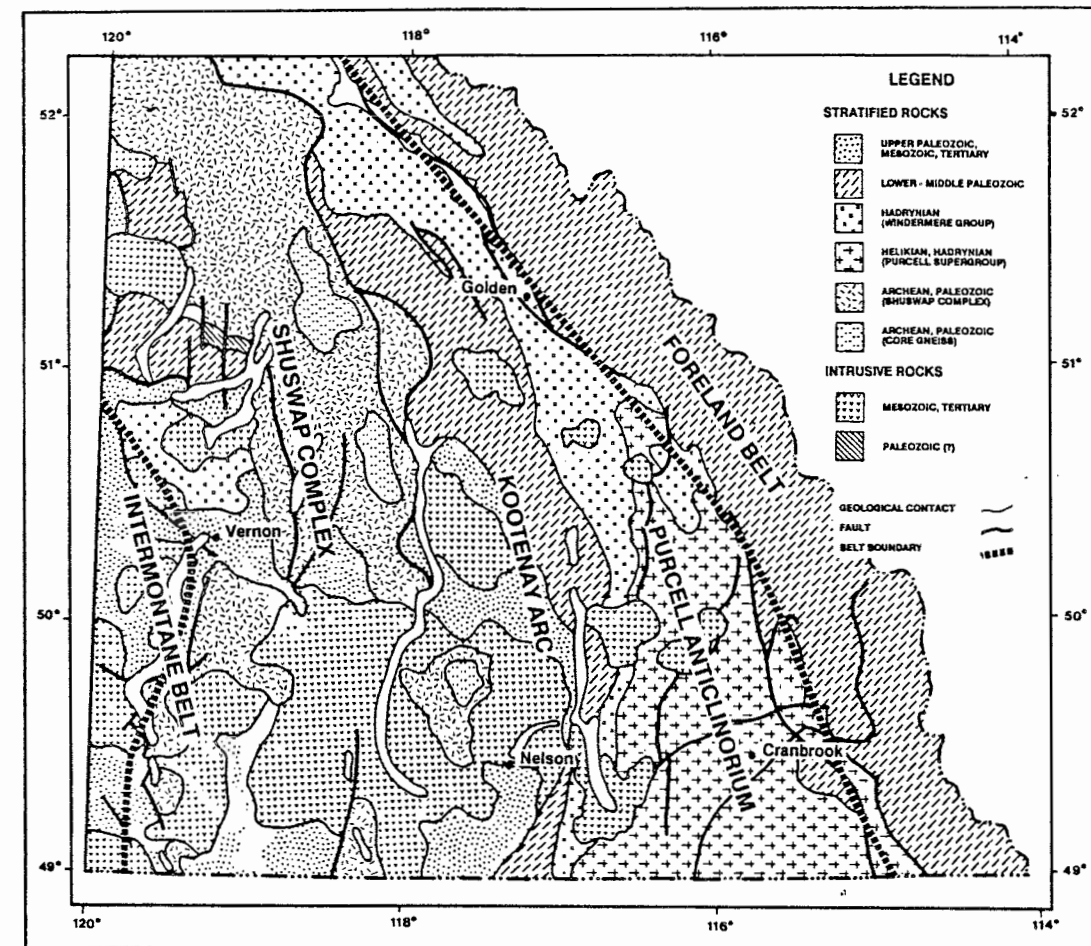


FIGURE 1 Generalized geology map of southeast British Columbia

SAMPLE COLLECTION - 1976

Helicopter and truck-supported sample collection was carried out during the summer of 1976 over the 15,700 square kilometre survey area. Stream sediment and water samples were systematically collected from 1308 sites for an average density of 1 site per 12 square kilometres. Field duplicate samples were routinely collected in each analytical block of twenty samples.

Fine grained stream sediments (< 1mm) weighing 1-2 kg were obtained from the active (subject to annual flooding) stream channel and placed in kraft bags. Unfiltered water samples were collected in 250 ml bottles, precautions were taken to exclude suspended solids when possible. Field observations regarding sample media, sample site and local terrain (Table A-2) were recorded.

SAMPLE PREPARATION - 1976

Field dried sediment samples were shipped to Golder Associates, in Ottawa, Ontario for final processing. The samples were air-dried and the -80 mesh (<177 microns) fraction was obtained and ball-milled for subsequent analyses. Quality control reference standards and blind duplicates were inserted into each analytical block of twenty sediment samples. Any -80 mesh sediment remaining after analyses was archived for future studies.

SAMPLE PREPARATION - 1990

The archived -80 mesh stream sediment pulps were retrieved for instrumental neutron activation analysis from the Geological Survey of Canada warehouse in Ottawa. New quality control reference standards were inserted into each analytical block of twenty samples. Existing analytical and field site duplicates contained within the samples sequences were checked and verified.

SAMPLE ANALYSIS - 1976

Chemex Laboratories (North Vancouver), analysed sediment samples for: copper, cobalt, iron, lead, manganese, molybdenum, nickel, silver and zinc. Uranium in stream sediments was determined by Atomic Energy of Canada (Ottawa). Water samples were analyzed for fluorine, uranium, and pH by Bondar-Clegg (North Vancouver). Table A-3 summarizes analytical methods, specifications and reported detection limits for the various determinations. Concentrations below the reported detection limit were assigned a value equivalent to one-half of the detection limit.

SAMPLE ANALYSIS - 1990

Becquerel Laboratories (Mississauga), carried out instrumental neutron activation analysis (INAA) of archived stream sediment samples. Samples weighing 20 grams on average were epithermally irradiated for twenty minutes in a neutron flux of 10^{11} neutrons/cm²/sec. After a decay period of approximately one week, gamma-ray emissions for the elements of interest were measured using a gamma-ray spectrometer with a high resolution, coaxial germanium detector. Counting time was approximately fifteen minutes per sample. Counting data was compiled on a computer and later converted to concentrations. Numerous international reference samples were irradiated within each analytical batch. Sediments were analysed for antimony, arsenic, barium, bromine, cerium, cesium, chromium, cobalt, gold, hafnium, iron, lanthanum, lutetium, molybdenum, nickel, rubidium, samarium, scandium, sodium, tantalum, terbium, thorium, tungsten, uranium, ytterbium and zirconium. Concentrations below the reported detection limit were assigned a value equivalent to one-half of the detection limit.

RGS DATA EVALUATION

The ability to discriminate real trends related to geological and geochemical causes from those that result from spurious factors such as sampling and analytical errors is of considerable importance in the success of geochemical data interpretation. An estimate of the reproducibility (precision) allows the quantification of variation due to sampling and analysis, and is an integral part of the evaluation of geochemical data. Estimates of analytical precision and trace element variability within and between sample sites can be determined by utilizing analytical duplicate and field duplicate data.

In order to make these assessments, control reference standard materials and analytical duplicates are routinely inserted to monitor and assess precision and accuracy of analytical results. Each analytical batch of twenty sediment and water samples consists of :

- 17 - Routine samples
- 1 - Field duplicate sample collected adjacent to one of the 17 routine samples (Listed in Appendix A - Field observations and analytical data).
- 1 - Quality control reference standard sample containing sediment of certified element concentrations and known reproducibility.
- 1 - Analytical duplicate sample; a subsample from one of the 17 routine samples (Listed in Appendix B).

SUMMARY STATISTICS

Univariate statistics are presented in Appendix C for element concentrations within stream sediments and waters in order to establish some measure of the range of background levels and thresholds. Statistics were calculated for the total data set and on subsets (N>10) based on lithological units underlying the sample site.

Statistics determined include: minimum and maximum values; range; mode; median; arithmetic and logarithmic means, standard deviations and coefficients of variation; as well as percentile values. Depending upon the element the distribution of element values are also graphically displayed as logarithmic or arithmetic histograms. Please note, these calculations do not include the second values from analytical and field duplicate pairs.

PRECISION ESTIMATES OF SELECTED ELEMENTS

Precision estimates for selected elements were calculated using 169 analytical duplicate pairs from RGS 29 and 32 (NTS 82E and 82L) using the Thompson and Howarth (1973, 1976, 1978) method. Analytical duplicate INAA data for 82L are listed in Appendix B.

Briefly, their method involves dividing 50 or more analytical duplicate pairs (x_1 , x_2) into groups with narrow concentration ranges. For each group, the median value of absolute differences between duplicate pairs ($|x_1 - x_2|$) is used as an estimation of the standard deviation (s), whereas the mean value of all the duplicate pair means $(x_1 + x_2)/2$ is used as an estimation of the average concentration. Repetition of this procedure for a successive group of concentration ranges obtains a set of corresponding mean concentration and standard deviation estimates for the entire range of data. Linear regression of the estimates provides slope and intercept values from which precision of the dataset can be calculated using the equation:

$$P_c = 200(K/c + S_0)$$

where S_0 (coefficient of slope) is the standard deviation at zero concentration and K (intercept) is a constant. This linear function has been determined in many practical cases (Matysek and Sinclair, 1984) to be a satisfactory model for the expression of variation.

Precision estimates for INAA elements were calculated as follows:

- Step 1. A list of duplicate means and corresponding absolute differences were calculated.
- Step 2. The list was sorted in increasing order of concentration means.
- Step 3. The mean concentration and the median difference between pairs for the first group of 11* stream sediments were determined, respectively.
- Step 4. Step 3 was repeated for each successive group of 11 stream sediment analytical pairs ignoring any remainder less than 11*.
- Step 5. The linear regression of the median differences on the means was calculated. The resultant intercept and coefficient of the calculated line are multiplied by 1.048 and were used to estimate precision.

**Note: Groups of 9 and 13 pairs were used on occasion to improve the regression line fit.*

Precision estimates were determined for Ba, Br, Ce, Cr, La, Rb, Sm, Sc, Th and U only. This particular suite of elements was selected on the following basis:

- Their distributions approximated a Gaussian (normal) curve
- The majority of their concentrations were well above their detection limits.

Precision estimates were not determined for elements characterized by non-Gaussian distributions. These distributions are recognized when the following conditions arise:

- Element abundances are dependent on rare grains
- Concentration levels are near or at the detection limit
- Data contains outliers

RESULTS

Precision estimates obtained from the Thompson and Howarth method are presented in Table 1. Only elements whose correlation coefficients (R-values) were significantly different from zero are listed. Precision estimates calculated by the Thompson and Howarth method for 10 different elements at different concentration levels averaged 16% at the 50th, 80th and 95th percentiles (Table 1).

Studies tailored to the evaluation of error in stream sediment surveys such as Plant (1971), Chork (1977) and Fletcher (1981) generally concluded:

- The combined variability due to local variation and analytical error ranged from 10-25% of the total error.
- Precision ranges of 10-15% at the 95% confidence level are generally encountered and considered acceptable for laboratory variability in most exploration programmes.

Precision estimates determined for these elements are of similar magnitude to those observed from other regional geochemical surveys.

TABLE 1 Thompson and Howarth precision estimates

ELEMENT	Min	Max	Inter	Slope	R-value	50	Prec	80	Prec	95	Prec
Barium	100	4000	-8.04	0.0767	0.5948	990	14.4%	1300	14.8%	1700	15.1%
Bromine	0.5	265	0.14	0.0558	0.7282	4.7	17.9%	12	14.1%	31	12.6%
Cerium	10	1500	-1.27	0.0982	0.9305	93	17.7%	170	19.0%	330	19.8%
Chromium	5	2040	3.432	0.067	0.9221	94	21.7%	190	17.8%	410	15.8%
Lanthanum	5	905	-2.58	0.1284	0.9368	58	17.6%	120	22.4%	202	24.2%
Rubidium	5	320	0.927	0.0627	0.6364	82	15.5%	110	14.9%	140	14.5%
Samarium	0.5	120	-0.05	0.0712	0.8736	8.1	13.6%	13.5	14.1%	23.8	14.5%
Scandium	0.5	42.5	0.253	0.0535	0.8098	11	16.0%	16	14.5%	21.6	13.7%
Thorium	0.5	352	-0.21	0.0879	0.9362	13	15.1%	27.6	16.9%	61.6	17.7%
Uranium	0.4	353	-0.1	0.0818	0.9367	6.2	13.9%	13	15.6%	27.2	16.4%

ESTIMATION OF REGIONAL AND SAMPLE SITE ELEMENTAL CONCENTRATION VARIABILITY

INTRODUCTION

Variations in element concentrations of stream sediments are due to regional variation (ie. diverse lithologies, mineralization and influences of the surficial environment) and sample site variation (ie. sampling and analytical variability). Regional and sample site variance components were determined for 15 elements from 76 field duplicate pairs. Selected elements include Ag, Cu, Zn, Pb, Co, Ni, Fe, Mn (1976 data) and Au, As, Sb, Cr, Mo, W, U (1990 data).

METHOD

The estimate of variance components was based on field duplicate data. Since the RGS samples are derived from a variety of lithologies and drainages containing mineral occurrences, log transformation of the data was necessary to approximate normal distributions.

- 1) Calculate VC_{site} by taking the sum of the squared differences between samples in field duplicate pairs and average the sum over the number of pairs (Mean Sum of Squares).

$$(1) VC_{site} = MSQ_{site} = \sum(x_i - \mu_i)^2 / n$$

where
 x_i = 1st and 2nd samples of each field duplicate pair
 μ_i = mean for each duplicate pair
 n = number of duplicate pairs

- 2) Calculate the total variance (VC_{total}) by taking the sum of squared differences for all samples in field duplicate pairs and dividing by the number of samples less 1.

$$(2) VC_{total} = MSQ_{total} = \sum(x_j - \mu_j)^2 / N-1$$

where
 x_j = all samples in field duplicate pairs
 μ_j = mean of all samples in field duplicate pairs
 $N-1$ = number of samples in field duplicate pairs less 1

- 3) Calculate $VC_{regional}$ by subtracting VC_{site} from VC_{total} .

$$(3) VC_{regional} = VC_{total} - VC_{site}$$

4) Equate variance components to percentages by dividing each component (regional and site) by the total and multiply by 100.

$$(4) VC_{\text{regional}} = \frac{VC_{\text{regional}}}{VC_{\text{total}}} * 100$$

To determine if geochemical trends reflect actual regional variation or are an artifact of sample site variation, F ratios can be calculated between MSQ_{regional} and MSQ_{site} ;

$$F \text{ Ratio}(v1,v3) = \frac{MSQ_{\text{regional}}}{MSQ_{\text{site}}}$$

where $MSQ_{\text{regional}} = \sum \{ (x_i - \mu_i)^2 - (x_j - \mu_j)^2 \} / n - 1$

$v1 = n - 1 = \text{degrees of freedom for } MSQ_{\text{regional}}$

$v3 = n = \text{degrees of freedom for } MSQ_{\text{site}}$

Calculated F ratios greater than the critical F ratio (obtained from F tables at the 95% confidence level) indicate that regional variation exceeds sample site variation. Under these circumstances observed regional geochemical trends are not considered to be artefacts of sampling or analytical methods.

RESULTS

Figure 2a presents site and regional variation components . Some general similarities are noted:

- In general, most of the selected elements show low sample site variability (<10%). As a result a high measure of confidence is given to observed elemental regional trends.
- Elements displaying high sample site variance components (>10%) suffer from either nugget effect (Au, W) or characterized by numerous near detection limit values (Ag, Pb, Mo). Observed geochemical trends for these elements should be treated with less confidence.

Figure 2b presents F ratios for the selected elements, F_{crit} at the 95% confidence limit for given degrees of freedom is 1.50. All elements surpass this value.

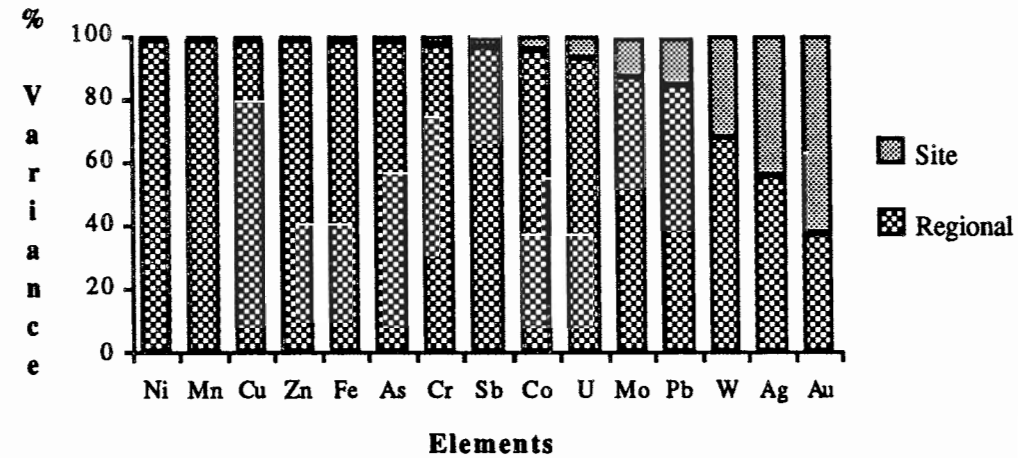


Figure 2a Variance Components for selected elements

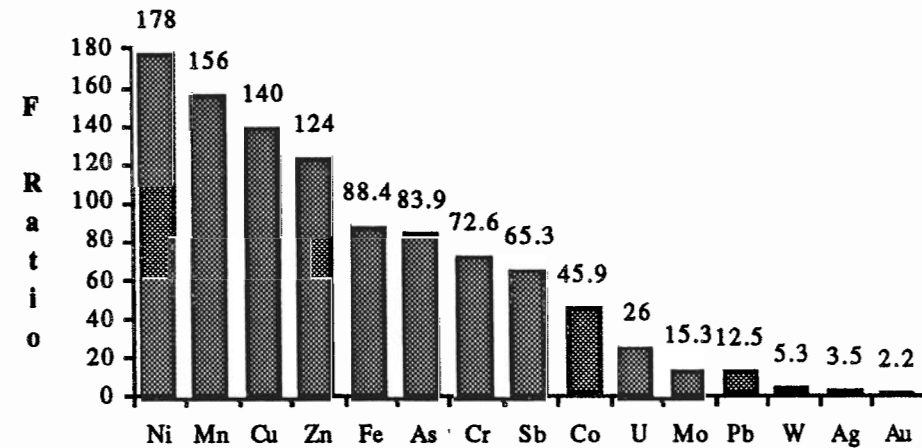


Figure 2b F ratios for selected elements

COMPARISON OF INAA VERSUS AAS TECHNIQUES

Several elements (Co, Fe, Mo and Ni) were determined by both atomic absorption spectroscopy (AAS) and by instrumental neutron activation analysis (INAA). Concentration variations observed between original (AAS) and subsequent (INAA) results are due largely to the analytical methods. AAS requires dissolution of the sample with acids prior to analysis. Aqua regia, a combination of hydrochloric and nitric acids, was primarily used to dissolve RGS sediment samples. Gold and sulphide minerals are dissolved, whereas silicates and some oxides (*ie.* magnetite) are only partially digested. Conversely, INAA does not require sample digestion prior to analysis. Concentrations determined by INAA generally represent the *total* content of that element in the sample. Due to this difference between methods, INAA generally reports slightly higher concentrations than *aqua regia* - AAS.

Figures 3a and 3b represent a comparison of the two techniques for iron and nickel, using data from RGS 30 (NTS 82F). In both cases, INAA gives higher results. A strong correlation is noted for nickel ($r = .958$); slightly higher INAA results are due to the presence of minute quantities of nickel within the lattices of silicates (*ie.* feldspars). Iron, however, demonstrates substantial concentration differences between analytical methods and a weaker correlation ($r = .646$), likely due to the presence of variable amounts of magnetite and hematite commonly found in stream sediment samples.

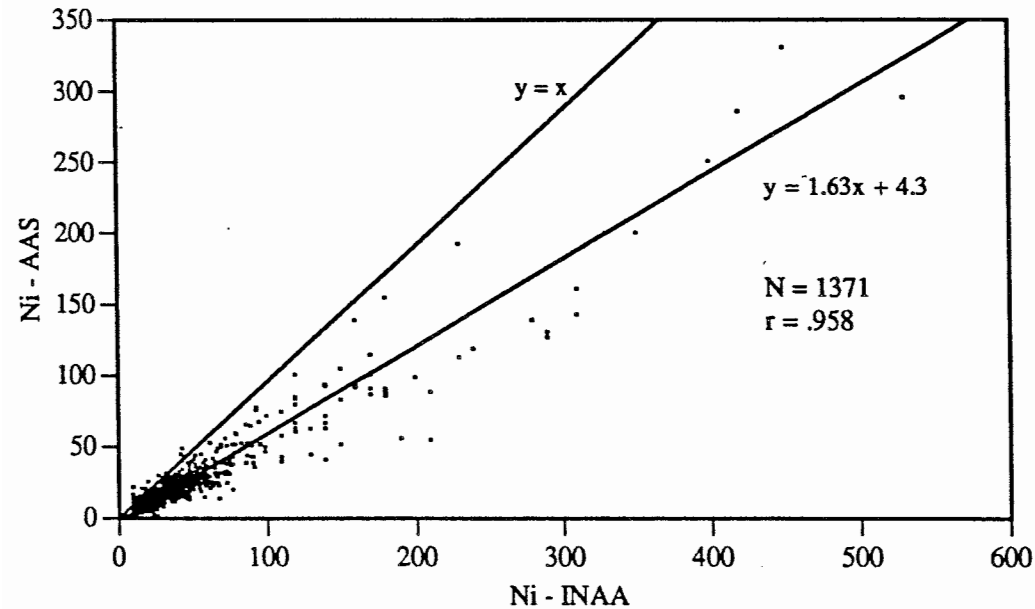


Figure 3a Scatterplot comparing INAA versus AAS results for Ni

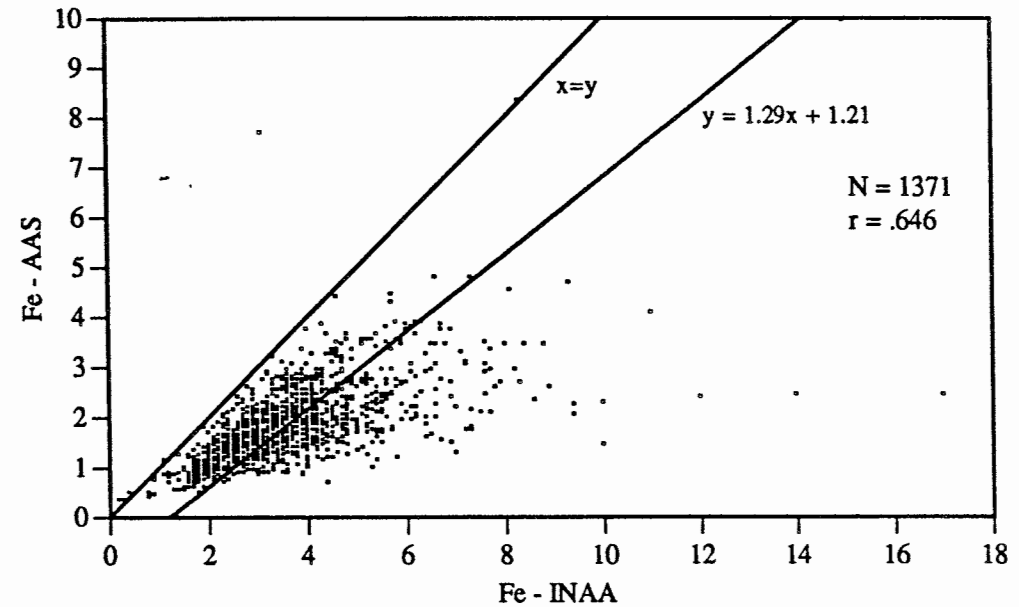


Figure 3b Scatterplot comparing INAA versus AAS results for Fe

BASE AND PRECIOUS METAL ANOMALY RATING METHOD

INTRODUCTION

Stream sediments collected downstream from mineralized sources commonly exhibit enhanced concentrations for a particular suite of elements. An interpretive technique has been developed that reduces the data set and highlights stream sediment sites characterized by anomalous, multi-element signatures associated with particular mineral deposits. As an example of this methodology, sample evaluation charts and 1:500 000 scale anomaly maps have been produced which outline areas considered to have high base metal and precious metal potential.

METHODOLOGY

Data Subsetting on underlying geological formation

Analytical results for stream sediment samples typically reflect the underlying geology found within the drainage basins. Considerable variability in element concentrations exist between different lithologies. This variability must be considered in order to distinguish anomalous samples from background concentrations. Consequently, analytical data was initially subset on the basis of underlying lithology of the sample site. To better estimate element variability within lithologies, data from adjoining survey areas (RGS 27, 28, 29, 30, 31, 32, 33) were also included.

Threshold Calculations - Sample Evaluation Charts - Anomaly Maps

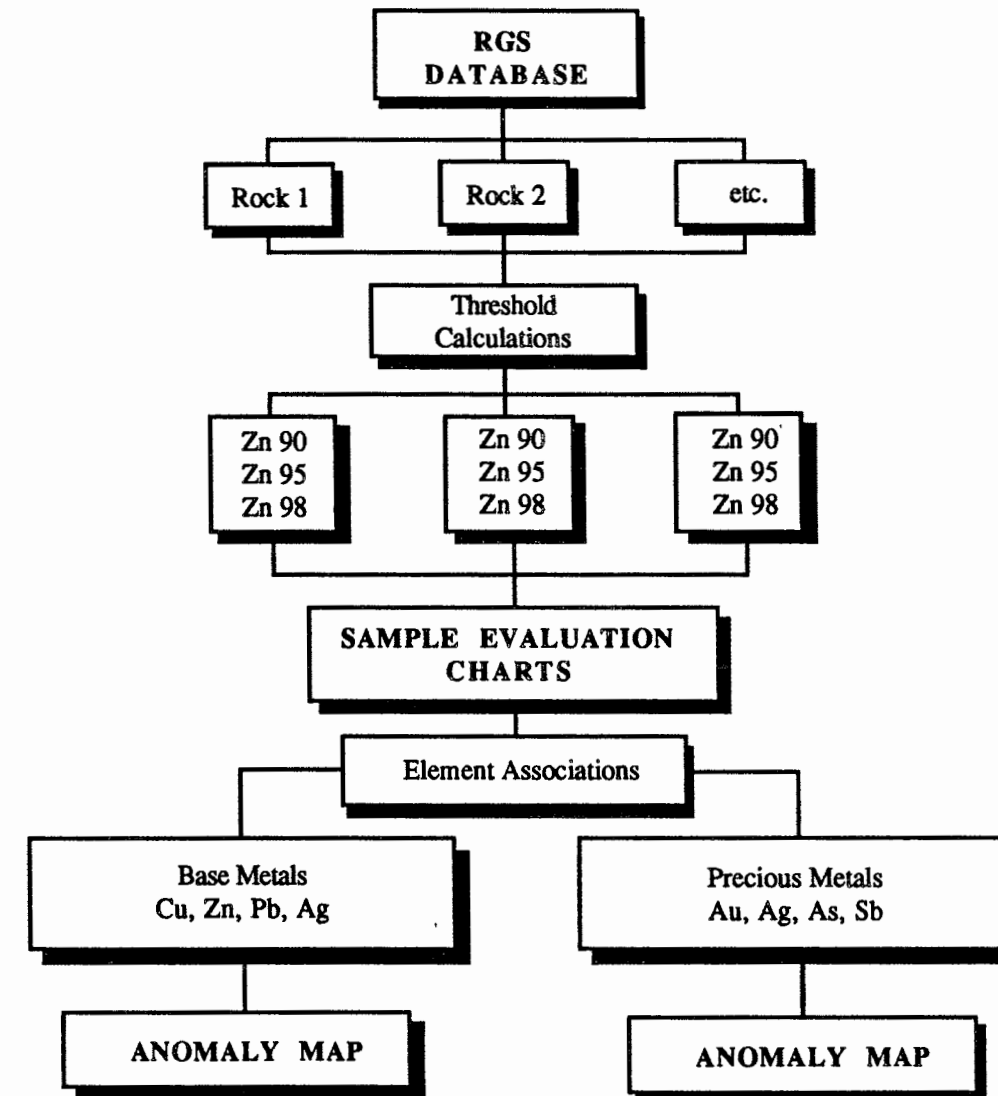
In order to assess the anomalous nature of individual samples, the 90th, 95th and 98th percentiles were calculated for lithologies having 10 or more sample sites and are provided in a threshold table (Appendix D).

Using the calculated thresholds, individual samples were assigned the following anomaly ratings :

- an anomaly rating of 1 for concentrations \geq 90th but $<$ 95th percentile,
- an anomaly rating of 2 for concentrations \geq 95th but $<$ 98th percentile,
- an anomaly rating of 3 for concentrations \geq 98th percentile.

Sample evaluation charts (Appendix D) graphically display the anomaly rating for individual elements. In addition, the summed element ratings provide a measure of the anomalous multi-element nature of each sample. Samples must have a minimum rating of 3 to be included in the chart. Anomaly maps produced from the sample evaluation charts highlight the spatial relationships between anomalous samples.

Utilizing the above technique, sample evaluation charts and anomaly maps have been generated to aid the user in identifying potential base metal and precious metal targets. The element suite used for the identification of base and precious metal multi-element anomalies include Cu - Zn - Pb - Ag and Au - Ag - As - Sb, respectively.



COMMENTS ON THE INTERPRETATION OF GOLD DATA

Understanding gold geochemical data from regional stream sediment surveys requires an understanding of the chemical and physical characteristics of gold in the surficial environment.

Gold is a soft, malleable element of high density (19.3 g/cm³). Under normal conditions it is chemically inert, most commonly occurring in native form (pure Au) or as electrum (alloyed with silver). Sub-micron sized gold is often bound to clays, adsorbed onto Fe-Mn oxides or contained within organic colloids. At normal surface temperatures, gold will dissolve under rare conditions of high oxidation potential and high acidity where ions such as chloride (Cl⁻), thiosulphate (S₂O₃⁻²) or cyanide (CN⁻) are present. Normal background concentrations for gold in bedrock vary, but are generally less than 5 ppb. Background levels encountered for stream sediments seldom exceed 10 ppb and commonly are near the detection limit of 1 ppb.

Under normal conditions, gold occurs as rare, discrete particles. In many instances a geochemical subsample may or may not contain a gold grain. This is known as the 'nugget effect'. Generally, larger geochemical sample sizes are required to minimize the nugget effect and more accurately represent gold concentrations. (Clifton *et al.*, 1969; Harris, 1982). Neutron activation analyses for the 1990 RGS Archive program utilized samples weighing on average 20 grams.

Follow-up investigations of gold anomalies should be based on careful consideration of related geological and geochemical information and an understanding of the variability of gold geochemical data. Once an anomalous area has been identified, field investigations should be designed to include detailed geochemical follow-up surveys and collection of large, representative samples. Analysis of field duplicates and blind (subsample) duplicates will increase the reliability of gold results, allowing for improved data interpretation.

Presentation of gold data within the map booklet differs from other elements as follows:

- Analytical duplicate pairs are listed in brackets following the initial determination.
- Results for field duplicate pairs are listed separated by a slash "/".
- Symbol size represents the highest value in field duplicate and blind duplicate analytical pairs.

- Possible variations in map format presentation:

+	Data < 50th percentile
+ 77.....	Single analysis > 95th percentile
+ 103(42)...	Analytical duplicate pair
+ 103/42....	Field duplicate pair

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APPENDIX A

Field Observations and Analytical Data

Notes : Values less than detection limit recorded as 1/2 detection limit value.

Table A-1 Reference Guide for Geological Formations (after Okulltch and Woodsworth, 1977)

Formation	Description	Formation	Description	Formation	Description
<u>STRATIFIED ROCKS</u>		<u>STRATIFIED ROCKS</u>		<u>INTRUSIVE ROCKS</u>	
CENOZOIC		PALEOZOIC		MESOZOIC - CENOZOIC	
TERTIARY		LOWER CAMBRIAN		CRETACEOUS AND/OR TERTIARY	
EOCENE - OLILOCENE		IEs quartzite, limestone, phyllite, argillite HAMILL and GOG Group; EAGER, BADSHOT, MOHICAN, DONALD, RENO, LAIB & QUARTZITE RANGE Fms.; Maitien Phyllite, Emerald & Reeves Limestone Members		LATE CRETACEOUS AND/OR EARLY TERTIARY	
eoTv basalt, andesite, volcanoclastic and flow rocks, minor sediments KAMLOOPS and PHOENIX Groups; SANPOIL Volcanics, KLONDIKE Mtn. and O'BRIEN Ck. Fms.		PALEOZOIC (AND OLDER?)		KTm CORYELL INTRUSIONS: monzonite, monzodiorite; lesser syenite, diorite, granodiorite, quartz monzonite	
MESOZOIC		Pns orthogneiss, foliated and massive granitic rocks, schist, paragneiss, minor amphibolite and marble OKANAGAN Metamorphic and Plutonic Complex		MESOZOIC	
TRIASSIC - JURASSIC		PROTEROZOIC - PALEOZOIC		CRETACEOUS	
T Jv greenstone, tuff, sediments NICOLA and ROSSLAND Groups; ELISE and ARCHIBALD Fms.		PPns paragneiss, schist, amphibolite, marble, orthogneiss, pegmatite SHUSWAP Metamorphic Complex		EARLY AND/OR MID-CRETACEOUS	
T Js shale, argillite, limestone, conglomerate, schist, sandstone NICOLA, SLOCAN, ROSSLAND and YMIR Groups; SICAMOUS and ARCHIBALD Fms.		PPgn gneissic granitoid rocks, layered gneiss Core Zones of Thor-Odin and Frenchman's Cap Domes SHUWAP Metamorphic Complex		EKgd granodiorite, quartz diorite; lesser quartz monzonite	
PALEOZOIC - MESOZOIC		PROTEROZOIC		JURASSIC	
PERMIAN - TRIASSIC		HADRYNIAN (WINDERMERE)		MIDDLE AND/OR LATE JURASSIC	
PTv greenstone, basalt, andesite, lava, tuff, breccia, serpentinite KASLO Group; TSALKOM Fm.		Hs sandstone, conglomerate, limestone, grit, minor volcanic rocks MIETTE and HORSETHIEF Ck. Groups; TOBY, SHEDROOF and MONK Fms.; IRENE and LEOLA Volcanics; SILVER Ck. and CHASE Fms. near Shuswap Lake		Jqm quartz monzonite, lesser granodiorite	
PALEOZOIC				Jg granodiorite, quartz diorite, lesser quartz monzonite	
CARBONIFEROUS - PERMIAN				PALEOZOIC	
PPT argillite, quartzite, greenstone, limestone, conglomerate THOMPSON Assemblage (including CACHE CK -eastern facies), CHAPPERON, KOBAN and ANARCHIST Groups; MT. ROBERTS Fm.				DEVONIAN	
IPs argillite, limestone, schist, phyllite, greenstone LARDEAU Group; BROADVIEW, EAGLE BAY, NELWAY, ACTIVE and METALINE Fms.; Ledbetter Slate, Grass Mtn. Sequence				MPgd THOR-ORDIN Orthogneiss	

Table A-2 Reference Guide for Field Observations

Column	Definition and Descriptions	Column	Definition and Descriptions	Column	Definition and Descriptions
MAP	1:50 000 NTS map sheet number	SED COL	Sediment Colour: B = Black R = Red G = Grey-Blue T = Tan-Brown O = Olive-Green W = White-Buffer P = Pink Y = Yellow	CHL PTN	Channel Pattern: S=Shoots-Pools M=Meandering B=Braided D=Disturbed
SAMPLE ID	Sample number			ELEV	Elevation: in metres
UTM ZONE	UTM Zone Number			SED PPT	Sediment Precipitate: N = None (otherwise same as SED COL)
UTM EAST	UTM East Coordinate	CON	Contamination: N = None D = Domestic P = Possible F = Forestry A = Agricultural M = Mining		
UTM NORTH	UTM North Coordinate	SED COMP	Sediment Composition: estimate of Sand-Fines-Organic content 0 = Absent 1 = Minor (<1/3 of total) 2 = Moderate (>1/3 but <2/3) 3 = Major (>2/3 of total)	DRN	Drainage Pattern: D=Dendritic H=Herringbone G=Glacially deranged I=Interrupted R=Rectangular
STA	Replicate Sample Status: 0 = Routine Sample 1 = 1st Field Duplicate 2 = 2nd Field Duplicate 8 = Blind Duplicate 9 = Control Reference			STRM WPTH	Stream Width: in metres
MED	Sample Media Collected: 1 = Stream Sediment only 6 = Stream Sediment & Water 7 = Moss-Mat Sediment only 8 = Moss-Mat Sediment & Water	STRM DPTH	Stream Depth: in centimetres	ODR	Stream Order: 1=Primary 3=Tertiary 2=Secondary 4=Quaternary
FORMATION ROCK TYPE AGE	{ see Table A-1 }	BNK	Bank Composition: A = Alluvium R = Rock C = Colluvium S = Talus G = Outwash T = Till O = Organic U = Unknown		
WAT COL	Water Colour: 0 = Colourless 2 = White Cloudy 1 = Brown Clear 3 = Brown Cloudy	BNK PPT	Bank Precipitate: N = None (otherwise same as SED COL)	SRC	Stream Source: G=Groundwater S=Spring runoff M=Melt water U=Unknown
FLW	Water Flow Rate: 0 = Stagnant 3 = Fast 1 = Slow 4 = Torrent 2 = Moderate	CHL BED	Channel Bed: B = Boulders S = Gravel-Sand F = Silt-Clay O = Organics		

METHODS OF SAMPLE ANALYSIS

1976 Program

Co, Cu, Fe, Pb, Mn, Ni, Ag and Zn were determined as follows: a one gram sample was reacted with 3 ml of concentrated HNO₃ for 30 minutes at 90°C. 1 ml concentrated HCL was added and the digestion was continued at 90°C for an additional 90 minutes. The sample solution was then diluted to 20 ml with metal free water and mixed. Concentrations were determined by AAS using an air-acetylene flame. Background corrections were made for Pb, Ni, Co and Ag.

Mo was determined by AAS using a nitrous oxide - acetylene flame. A 0.5 gram sample was reacted with 1.5 ml concentrated HNO₃ at 90°C for 30 minutes. At this point 0.5 ml concentrated HCl was added and the digestion continued for an additional 90 minutes. After cooling, 8 ml of 1250 ppm Al solution was added and the sample solution diluted to 10 ml before aspiration into the AAS.

U in sediments was determined using instrumental neutron activation analysis (INAA) with delayed neutron counting. A 1 gram sample was sealed into a 7-dram polyethylene vial. Irradiation was provided by a Slowpoke Reactor with an operating flux of 10¹² neutrons/cm²/sec. Each sample was irradiated for 60 seconds. Following a 20-second delay, the sample was counted with 6 BF₃ detector tubes embedded in paraffin for 60 seconds.

U in water was determined by a fluorometric method. Uranium was initially preconcentrated by evaporation. The residue was fused with a mixture of Na₂CO₃, K₂CO₃ and NaF in a platinum dish. After cooling, the fluorescence of the fused pellet was measured using a Turner Fluorometer.

F in water was determined using a specific ion electrode. An aliquot of the sample was mixed with an equal volume of TISAB II solution (total ionic strength adjustment buffer). Fluoride content was measured using a Corning 101 Electrometer with an Orion Fluoride Electrode.

For the determination of pH an aliquot of water was transferred to a clean dry beaker. pH was measured using a Fisher Accumet pH Meter.

Element	Detection Limits	Sample Weight	Determination Method	
Cobalt	2 ppm	1 g	AAS	Atomic Absorption Spectrophotometry
Copper	2 ppm			
Iron	0.02 pct			
Lead	2 ppm			
Manganese	5 ppm			
Nickel	1 ppm			
Silver	0.2 ppm			
Zinc	2 ppm			
Molybdenum	2 ppm			
Uranium	0.2 ppm	0.5 g	NADNC	Neutron Activation
pH - water	0.1 pH unit	25 ml	GCE	Fisher Accumet pH meter
U - water	0.05 ppb	5 ml	LIF	Fluorometric Method
F - water	20 ppb	25 ml	ION	Fluorine Ion Specific Electrode

Table A-3 1976/1977 Routine RGS Analytical Methods

1990 Archive Program

Becquerel Laboratories (Mississauga), Ltd. carried out instrumental neutron activation analysis (INAA) of archived stream sediment sample splits. Samples weighing 20 grams on average were irradiated epithermally for twenty minutes in a neutron flux of 10¹¹ neutrons/cm²/sec. After a decay period of approximately one week, gamma-ray emissions for the elements of interest were measured using a gamma-ray spectrometer with a high resolution, coaxial germanium detector. Counting time was approximately fifteen minutes per sample. Counting data was compiled on a computer and later converted to concentrations. Numerous international reference samples were irradiated within each analytical batch.

Sediments were analyzed for antimony, arsenic, barium, bromine, cerium, cesium, chromium, cobalt, gold, hafnium, iron, lanthanum, lutetium, molybdenum, nickel, rubidium, samarium, scandium, sodium, tantalum, terbium, thorium, tungsten, uranium, ytterbium and zirconium. Concentrations below the reported detection limit were assigned a value equivalent to one-half of the detection limit. Detection limits for these elements are listed in Table A-4.

Element	Detection Limits	Element	Detection Limits
Gold	2 ppb	Molybdenum	1 ppm
Antimony	0.1 ppm	Nickel	10 ppm
Arsenic	0.5 ppm	Rubidium	5 ppm
Barium	100 ppm	Samarium	0.5 ppm
Bromine	0.5 ppm	Scandium	0.5 ppm
Cerium	10 ppm	Sodium	0.1 pct
Cesium	0.5 ppm	Tantalum	0.5 ppm
Chromium	5 ppm	Terbium	0.5 ppm
Cobalt	5 ppm	Thorium	0.5 ppm
Hafnium	1 ppm	Tungsten	2 ppm
Iron	0.2 pct	Uranium	0.2 ppm
Lanthanum	5 ppm	Ytterbium	2 ppm
Lutetium	0.2 ppm	Zirconium	200 ppm

Table A-4 1990 INAA Detection Limits

1976 Field Observations and Analytical Results

MAP	SAMPLE ID	UTM ZONE	UTM EAST	UTM NORTH	STA	MED	FM	WAT COL	FLW	SED PPT	CON	SED COMP	STRM WDT	STRM DPTH	BNK	DATE	Water			Stream Sediment										:DL :Unit :Mthd
																	FW 20 ppb TON	UW 0.05 ppb LIF	pH 0.1 GCE	Co 2 ppm AAS	Cu 2 ppm AAS	Fe 0.02 pct AAS	Pb 2 ppm AAS	Mn 5 ppm AAS	Mo 2 ppm AAS	Ni 2 ppm AAS	Ag 0.2 ppm AAS	U 0.2 ppm MADNC	Zn 2 ppm AAS	
82L02	761003	11	366068	5543110		6	Pns	0	3	N	P	211	3.0	46	T	0807	30	0.02	7.0	10	12	1.90	1	515	2	10	0.1	6.0	41	
82L04	761004	11	305141	5543631	1	6	PPT	0	2	N	N	121	1.2	15	T	0907	68	0.02	7.6	6	22	1.65	3	300	2	8	0.1	2.7	44	
82L04	761005	11	305141	5543631	2	6	PPT	0	2	N	N	121	1.2	15	T	0907	68	0.02	7.6	6	23	1.80	1	300	1	9	0.1	3.0	42	
82L04	761006	11	305091	5544243		6	PPT	0	3	N	N	211	3.7	30	T	0907	40	0.02	7.6	7	17	1.85	1	365	2	9	0.1	3.1	40	
82L04	761007	11	306757	5545893		6	PPT	0	2	N	N	211	2.4	30	T	0907	42	0.02	7.6	5	13	1.50	1	510	1	7	0.1	5.9	38	
82L04	761008	11	308938	5542535		6	PPT	0	2	N	N	121	1.2	15	T	0907	86	0.05	8.1	5	11	1.40	2	230	1	7	0.1	2.4	37	
82L04	761009	11	316474	5551600		6	Jqm	0	2	N	N	211	1.5	15	T	0907	62	0.05	7.6	7	9	2.95	5	1600	2	13	0.1	10.9	50	
82L04	761010	11	314509	5553122		6	eoTv	0	3	N	N	121	1.8	30	T	0907	62	0.02	7.5	9	7	1.90	5	395	1	25	0.1	3.6	48	
82L04	761011	11	316681	5553512		6	Jqm	0	3	N	N	211	2.4	30	T	0907	80	1.90	7.9	5	6	1.75	5	410	3	5	0.1	4.7	36	
82L04	761012	11	316427	5554123		6	Jqm	0	3	N	N	121	1.8	15	C	0907	100	1.40	8.1	8	7	1.70	4	465	2	22	0.1	3.5	40	
82L04	761013	11	317767	5546072		6	Jqm	0	2	N	N	121	1.5	30	T	0907	130	1.60	7.8	3	3	0.95	1	190	1	1	0.1	6.0	27	
82L04	761014	11	320268	5560019		6	KTm	0	2	N	N	121	0.9	15	T	1007	340	4.60	8.6	4	19	0.90	9	470	1	7	0.1	3.0	42	
82L04	761015	11	316511	5559164		6	KTm	0	2	N	N	121	1.5	15	T	1007	160	0.32	8.1	4	20	1.05	3	135	2	6	0.1	2.2	27	
82L04	761016	11	314624	5560957		6	eoTv	0	2	N	N	121	1.2	15	C	1007	76	0.32	8.1	6	11	1.65	7	345	2	9	0.1	3.1	44	
82L04	761017	11	316810	5562985		6	Jqm	0	3	N	N	211	1.2	15	T	1007	100	0.26	8.4	8	25	2.10	7	370	2	16	0.1	3.1	42	
82L04	761018	11	318001	5565266		6	Jqm	0	3	N	N	121	4.6	46	T	1007	170	0.38	7.9	8	11	2.20	12	520	4	11	0.1	4.7	65	
82L04	761019	11	320760	5562506		6	Jqm	0	2	N	N	121	0.6	15	T	1007	460	3.20	8.5	4	18	0.75	9	305	2	6	0.1	4.1	61	
82L04	761020	11	320772	5545852		6	Jqm	0	2	N	N	211	0.6	15	T	1007	380	16.90	8.2	3	10	0.60	3	240	1	2	0.1	4.3	27	
82L04	761023	11	320650	5551851		6	Jqm	0	3	N	N	121	0.9	15	T	1107	200	7.40	8.3	3	20	0.65	3	230	5	5	0.1	6.6	25	
82L03	761024	11	322421	5564805		6	Jqm	0	1	N	N	121	0.6	15	T	1107	720	8.50	8.1	3	29	0.70	10	335	5	4	0.1	4.0	72	
82L04	761025	11	319343	5565923	1	6	Jqm	0	3	N	N	121	3.7	30	C	1107	160	0.52	8.2	6	10	1.75	4	540	1	10	0.1	4.4	50	
82L04	761026	11	319343	5565923	2	6	Jqm	0	3	N	N	121	3.7	30	C	1107	140	0.64	8.1	7	10	1.85	6	570	2	11	0.1	4.8	53	
82L04	761027	11	318168	5564747		6	Jqm	0	3	N	N	211	1.5	30	T	1107	230	0.46	8.3	7	21	1.60	8	355	3	13	0.1	2.9	38	
82L04	761028	11	315224	5565677		6	Jqm	0	3	N	N	121	0.9	15	T	1107	420	0.50	7.6	23	28	2.25	82	1900	24	22	0.6	53.7	465	
82L04	761029	11	312793	5566349		6	Jqm	0	3	N	N	121	4.6	30	C	1107	160	0.10	7.6	11	12	2.35	15	780	5	13	0.1	4.8	75	
82L04	761030	11	310953	5567219		6	Jqm	0	2	N	N	121	0.9	15	T	1107	150	0.02	7.4	17	50	3.20	10	510	3	57	0.6	4.1	61	
82L04	761031	11	311044	5566492		6	Jqm	0	3	R	N	211	1.8	15	C	1107	380	0.34	7.4	10	19	2.20	37	1140	17	14	0.2	8.9	128	
82L04	761032	11	308287	5568109		6	Jqm	0	3	N	N	310	1.5	15	C	1107	60	0.02	7.4	9	10	2.00	19	560	3	9	0.1	4.2	48	
82L04	761033	11	308617	5567279		6	Jqm	0	3	R	N	211	3.7	30	C	1107	66	0.02	7.8	13	11	3.00	6	900	2	15	0.1	3.2	65	
82L04	761034	11	307488	5565961		6	eoTv	0	3	N	P	121	3.0	15	T	1107	42	0.02	7.6	3	10	2.55	2	870	2	15	0.1	2.6	60	
82L04	761035	11	305682	5565497		6	eoTv	0	2	N	P	121	0.9	15	T	1107	32	0.02	7.9	7	9	2.00	4	700	1	22	0.1	3.3	39	
82L05	761036	11	300436	5592807		6	eoTv	0	2	N	N	121	0.6	15	C	1507	170	1.20	8.6	8	10	1.75	3	240	2	17	0.1	2.1	39	
82L05	761037	11	298982	5589854		6	eoTv	0	1	N	N	121	0.3	15	A	1507	170	3.30	8.4	10	9	2.30	4	370	3	14	0.1	2.4	51	
82L05	761038	11	297996	5584403		6	eoTv	0	3	N	N	121	1.5	30	C	1507	140	0.12	8.0	9	12	1.90	2	460	1	16	0.1	2.5	48	
82L05	761039	11	293015	5584203		6	TJs	0	2	N	N	211	1.8	15	T	1507	200	0.34	8.0	11	14	1.80	3	460	2	25	0.1	3.0	42	
82L05	761040	11	302041	5587339		6	eoTv	0	0	N	N	112	0.3	15	A	1507	340	3.10	8.2	7	22	1.50	2	280	2	40	0.1	1.6	32	
82L05	761042	11	304859	5587449	1	6	eoTv	0	2	N	N	112	0.6	15	A	1507	180	0.16	8.2	12	18	2.45	3	2150	1	20	0.1	2.7	58	
82L05	761043	11	304859	5587449	2	6	eoTv	0	2	N	N	112	0.6	15	A	1507	170	0.22	8.2	13	19	2.60	2	2250	2	21	0.1	3.0	60	
82L05	761044	11	302311	5586226		6	eoTv	0	2	N	N	211	0.6	15	A	1607	240	1.00	8.3	14	16	2.50	3	640	2	33	0.1	1.9	55	
82L05	761045	11	301015	5579419		6	eoTv	0	1	N	N	112	1.2	15	T	1607	130	0.22	7.8	9	21	2.50	2	520	1	21	0.1	6.1	49	

1990 Analytical Results

										Stream Sediment																									
MAP	SAMPLE ID	UTM ZONE	UTM EAST	UTM NORTH	STA	MED	FM	Au 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 0.001 g INAA	:DL :Unit :Mthd
82L02	761003	11	366068	5543110		6	Pns	2	0.1	1.0	1700	1.6	93	1.2	100	13	6	3.9	47	0.3	1	10	88	6.9	12.0	3.3	1.2	1.0	10.0	2	2.8	2	200	34.990	
82L04	761004	11	305141	5543631	1	6	PPT	2	0.3	2.2	1000	3.4	44	2.1	160	8	5	4.0	21	0.4	1	18	63	5.6	16.0	2.8	1.2	0.8	4.8	3	3.4	3	350	33.940	
82L04	761005	11	305141	5543631	2	6	PPT	4	0.3	2.3	1000	4.5	40	2.2	180	12	6	4.4	24	0.4	1	18	55	6.1	17.0	2.8	1.7	0.8	5.1	4	3.7	3	340	28.090	
82L04	761006	11	305091	5544243		6	PPT	4	0.3	2.9	800	2.6	59	2.5	350	9	7	5.9	27	0.4	1	25	51	7.0	15.0	2.6	2.3	1.2	6.2	7	3.7	4	400	20.910	
82L04	761007	11	306757	5545893		6	PPT	5	0.2	2.4	700	5.9	56	3.2	350	12	10	4.1	30	0.3	1	27	65	7.6	16.0	2.5	2.5	1.1	7.1	7	6.2	3	710	18.600	
82L04	761008	11	308938	5542535		6	PPT	2	0.4	2.5	1100	1.5	64	2.9	150	7	6	3.3	32	0.3	1	10	100	5.7	10.0	2.9	1.9	0.8	7.8	2	3.1	2	310	23.910	
82L04	761009	11	316474	5551600		6	Jqm	3	0.3	2.4	780	6.3	120	5.3	92	8	7	4.4	71	0.2	1	10	110	10.5	11.0	1.9	1.9	1.4	18.0	2	11.0	3	480	7.580	
82L04	761010	11	314509	5553122		6	eoTv	2	0.2	2.2	1500	0.8	130	2.2	782	20	9	4.1	66	0.2	1	30	120	10.4	16.0	2.2	2.7	1.3	13.0	2	4.0	2	620	18.640	
82L04	761011	11	316681	5553512		6	Jqm	2	0.8	2.1	1100	2.4	71	4.0	60	5	9	3.7	39	0.2	1	10	110	7.4	5.5	2.5	2.7	0.9	13.0	2	6.0	2	700	25.510	
82L04	761012	11	316427	5554123		6	Jqm	3	0.2	2.1	1700	0.5	120	2.8	579	17	10	4.4	61	0.3	1	30	130	10.0	16.0	2.7	2.8	1.3	15.0	2	4.6	2	430	26.390	
82L04	761013	11	317767	5546072		6	Jqm	2	0.4	0.8	1100	3.8	65	3.6	62	5	11	2.3	35	0.2	1	10	110	6.2	5.7	3.3	2.3	0.9	10.0	2	8.0	2	520	32.590	
82L04	761014	11	320268	5560019		6	KTm	2	0.3	1.6	710	10.0	52	2.2	96	7	6	2.2	28	0.3	1	10	87	4.6	7.2	2.2	0.9	0.8	8.1	2	3.5	2	390	18.200	
82L04	761015	11	316511	5559164		6	KTm	2	0.3	1.2	770	6.8	45	2.6	250	6	7	2.7	23	0.3	1	19	80	4.2	11.0	2.9	1.1	0.7	5.9	2	2.4	2	400	21.990	
82L04	761016	11	314624	5560957		6	eoTv	2	0.4	2.5	1300	1.8	110	2.8	180	11	6	3.4	54	0.3	1	10	110	7.1	13.0	2.9	1.6	0.8	12.0	2	3.9	2	380	34.460	
82L04	761017	11	316810	5562985		6	Jqm	6	0.5	3.0	880	0.5	73	2.0	410	11	9	4.2	36	0.3	1	26	120	5.4	13.0	2.8	1.4	0.9	10.0	2	3.4	2	400	17.640	
82L04	761018	11	318001	5565266		6	Jqm	2	0.8	4.9	1200	1.6	95	3.2	360	14	11	5.5	52	0.3	2	10	120	7.1	14.0	2.5	2.1	1.1	14.0	2	5.1	2	570	23.390	
82L04	761019	11	320760	5562506		6	Jqm	4	0.3	0.9	610	23.0	40	2.9	100	5	3	1.8	21	0.2	1	10	55	3.0	5.7	1.4	0.5	0.5	4.8	2	4.4	2	370	19.950	
82L04	761020	11	320772	5545852		6	Jqm	2	0.2	0.9	660	22.0	49	2.0	26	5	4	1.9	25	0.2	1	10	73	3.9	5.9	1.9	1.2	0.5	6.5	2	5.0	2	200	17.150	
82L04	761023	11	320650	5551851		6	Jqm	2	0.3	0.9	330	26.0	34	1.7	76	5	4	1.6	23	0.2	1	13	35	3.4	4.1	0.9	0.9	0.5	5.1	2	6.2	2	440	7.450	
82L03	761024	11	322421	5564805		6	Jqm	2	0.5	1.7	350	49.0	27	3.9	62	5	1	1.6	10	0.2	2	10	43	1.5	4.6	0.9	0.5	0.5	3.1	2	4.2	2	270	7.850	
82L04	761025	11	319343	5565923	1	6	Jqm	2	1.0	2.4	1400	3.6	110	7.4	190	11	8	4.7	56	0.3	1	15	130	7.7	10.0	2.8	2.1	1.0	14.0	2	5.7	3	610	32.430	
82L04	761026	11	319343	5565923	2	6	Jqm	11	1.0	2.2	1400	3.8	110	8.2	150	11	8	4.4	57	0.2	1	15	150	7.7	11.0	2.8	2.0	0.9	14.0	2	5.9	3	400	25.730	
82L04	761027	11	318168	5564747		6	Jqm	8	0.5	3.0	1100	0.8	77	2.4	260	11	8	3.8	37	0.3	1	20	130	6.0	13.0	3.0	1.7	0.9	11.0	2	3.7	3	370	31.010	
82L04	761028	11	315224	5565677		6	Jqm	7	0.4	2.0	130	16.0	290	4.2	99	28	22	3.5	160	0.2	17	27	120	20.6	7.9	1.4	2.6	2.7	43.2	3	56.2	8	1000	13.030	
82L04	761029	11	312793	5566349		6	Jqm	41	0.9	6.5	1400	3.0	120	3.9	370	15	12	5.6	59	0.3	4	23	140	8.6	16.0	2.5	2.4	0.8	17.0	2	6.4	2	530	33.350	
82L04	761030	11	310953	5567219		6	Jqm	8	0.9	7.4	820	5.2	81	8.0	998	28	4	6.1	59	0.3	1	99	100	10.9	19.0	1.4	0.7	1.4	7.9	2	4.6	3	200	11.830	
82L04	761031	11	311044	5566492		6	Jqm	5	0.7	4.2	810	2.4	110	3.3	120	12	13	3.2	60	0.2	18	19	150	7.0	8.2	1.8	2.8	1.2	21.3	4	10.0	2	450	16.680	
82L04	761032	11	308287	5568109		6	Jqm	10	2.8	14.0	1300	1.4	82	6.4	140	12	6	3.5	46	0.2	1	10	130	8.6	8.8	2.0	1.5	1.0	12.0	2	4.9	2	200	17.030	
82L04	761033	11	308617	5567279		6	Jqm	2	0.4	5.3	1700	5.2	92	3.5	460	20	7	7.0	44	0.2	1	18	110	8.2	18.0	2.0	1.3	1.2	11.0	2	4.0	2	420	21.970	
82L04	761034	11	307488	5565961		6	eoTv	9	0.3	4.2	1900	0.9	84	2.9	460	24	6	6.7	43	0.3	1	31	120	8.0	20.7	2.3	1.5	1.1	11.0	2	3.6	2	200	27.700	
82L04	761035	11	305682	5565497		6	eoTv	2	0.2	1.7	1000	4.6	54	2.5	1020	18	5	4.8	32	0.3	1	32	79	6.5	19.0	2.0	1.2	0.9	7.2	2	3.5	2	200	15.810	
82L05	761036	11	300436	5592807		6	eoTv	2	0.4	1.4	1200	14.0	47	2.9	599	20	5	5.6	23	0.2	1	25	89	4.7	24.6	2.2	0.9	0.8	5.9	2	2.7	2	200	26.980	
82L05	761037	11	298982	5589854		6	eoTv	10	0.3	1.6	1500	20.0	56	3.1	661	23	5	5.7	24	0.3	1	36	96	5.3	28.0	1.6	1.0	0.9	7.1	2	2.9	2	200	27.760	
82L05	761038	11	297996	5584403		6	eoTv	2	0.3	1.6	1800	2.7	87	2.2	370	18	7	4.8	43	0.3	1	35	100	7.6	20.0	2.5	1.6	1.0	11.0	2	3.2	3	470	35.190	
82L05	761039	11	293015	5584203		6	Tjs	2	0.2	1.9	1400	3.7	65	2.3	420	16	4	4.2	33	0.3	1	34	87	6.6	19.0	2.1	0.7	0.9	6.9	2	3.6	2	200	18.920	
82L05	761040	11	302041	5587339		6	eoTv	2	0.3	1.2	750	16.0	34	2.1	634	13	3	3.8	19	0.2	1	50	56	3.8	15.0	1.6	0.7	0.5	4.2	2	2.0	2	320	15.270	
82L05	761042	11	304859	5587449	1	6	eoTv	2	0.3	3.1	940	7.4	63	2.3	270	17	4	4.4	25	0.2	1	33	62	5.0	15.0	1.5	0.9	0.8	6.3	2	3.3	2	200	15.890	
82L05	761043	11	304859	5587449	2	6	eoTv	2	0.3	3.5	1000	8.9	54	2.3	280	18	4	4.5	24	0.2	1	24	57	5.5	15.0	1.4	1.2	0.8	6.8	2	3.8	2	290	14.080	
82L05	761044	11	302311	5586226		6	eoTv	43	0.3	1.6	1500	2.0	71	2.6	693	23	5	5.0	35	0.3	1	44	85	6.6	21.1	1.8	1.1	1.0	8.6	2	2.3	2	340	14.360	
82L05	761045	11	301015	5579419		6	eoTv	2	0.3	2.3	820	6.7	67	5.0	190	16	4	4.6	32	0.3	1	30	78	7.0	19.0	1.5	0.6	1.1	7.8	2	7.2	4	200	11.450	