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TILL GEOCHEMISTRY OF THE ADAMS LAKE PLATEAU - NORTH BARRIERE LAKE AREA (82M/4 AND 5)

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INTRODUCTION

This report provides the final results, discussion and interpretation of a drift exploration program conducted northeast of Kamloops by the British Columbia Geological Survey Branch (Figure 1). The till geochemistry project discussed here represents the end product of field investigations undertaken during the summer of 1996 as part of a larger, multidisciplinary, integrated resource assessment program the aim of which was to define the mineral potential of this part of the province (*see* Nelson *et al.* 1997). Centred on the southern part of the Eagle Bay Assemblage and Fennell Formation of the Kootenay Terrain, the "Eagle Bay" drift prospecting program is one of several provincial till geochemistry surveys (*e.g.* Bobrowsky and Sibbick, 1996 on northern Vancouver Island) which have been ongoing since 1990 to demonstrate the utility of integrating surficial geology mapping and exploration geochemical methods to locate buried mineral deposits in areas of drift-covered terrain (*see* Bobrowsky *et al.*, 1995 for a review).

Surficial geological mapping and drift exploration work was completed northeast of Kamloops in NTS map sheets 82M/4 (Adams Plateau) and 82M/5 (North Barriere Lake). The map area encompasses some 2000 square kilometres of rugged drift-covered terrain (Figure 2) overlying economically interesting Devono-Mississippian low-grade metamorphic rocks of the Eagle Bay Assemblage. Previous mining operations in volcanogenic sulphide-barite deposits such as Samatosum Mountain (MINFILE 082M 244) and Homestake (MINFILE 082M 025) confirm the high mineral potential of the region (Figure 3). Published detailed bedrock mapping of the area by Schiarizza and Preto (1987) and recent successful mineral discoveries in correlative rocks located in the Yukon (*i.e.* Kudz Ze Kayah and Wolverine) provided the primary impetus for renewed exploration activity in this area for VMS type mineralization. This exploration included mineral deposit studies (Höy, 1997), a stream water survey and geochemical orientation (Sibbick *et al.*, 1997), as well as 1:50 000 scale surficial mapping and drift exploration sampling. The latter two components provide vital information for mineral exploration in regions where unconsolidated sediments of variable thickness mask the underlying bedrock.

Drift exploration integrates two allied components: surficial geology mapping and till geochemistry sampling. With this in mind, the objectives of the drift exploration project were to:

- identify types and character of surficial deposits present;
- estimate overburden thickness based on landform assemblage associations;
- define new anomalies which may be used in the discovery of mineralization targets;
- stimulate new exploration and economic activity;
- provide information that will be of use in all areas where mineral exploration has been hampered by thick glacial drift cover and where traditional prospecting and exploration techniques have proven unsuccessful despite indications of high mineral potential.

The purpose of the surficial mapping component was to document the variability in the types of sediments observed, including their distribution and general character for this particular area. These data, including origin and age of unconsolidated sediments in the area of glaciated terrain, provide critical constraints to a successful drift exploration program. Quaternary geologic history consisting of local and regional stratigraphy, sedimentology and glacial ice dynamics are the focus of much of the work, since the understanding of these parameters provides a framework for a complementary till geochemistry and pebble lithology sampling program (Salonen, 1988). The till geochemistry consisted of a systematic sampling program (1-5 kilograms) collecting primary basal till, ablation till and colluviated till deposits which were first identified and then targeted during the surficial mapping. Pebble lithology studies consisted of the collection and subsequent identification of 100 clasts at about 95 of the till sample stations.

The integration of surficial mapping and till geochemistry with mineral deposit studies and detailed bedrock mapping addresses the main objective of drift prospecting: to provide data that will lead to the discovery of economic mineralization in areas now covered by a blanket of unconsolidated sediments. We do this by interpreting down-ice glacial dispersal patterns (mechanical dispersal trains) that will help locate the sources of geochemical anomalies and clast lithologies (*see* Coker and DiLabio, 1989). For the Eagle Bay area, detailed bedrock mapping has already been completed by Schriazzia and Preto (1987) and is available for integration. Mineral deposit work is now being pursued regionally by Höy (1997). Regional Geochemical Survey data (Matysek *et al.*, 1991) are also available, and water chemistry basin analysis data will soon be available

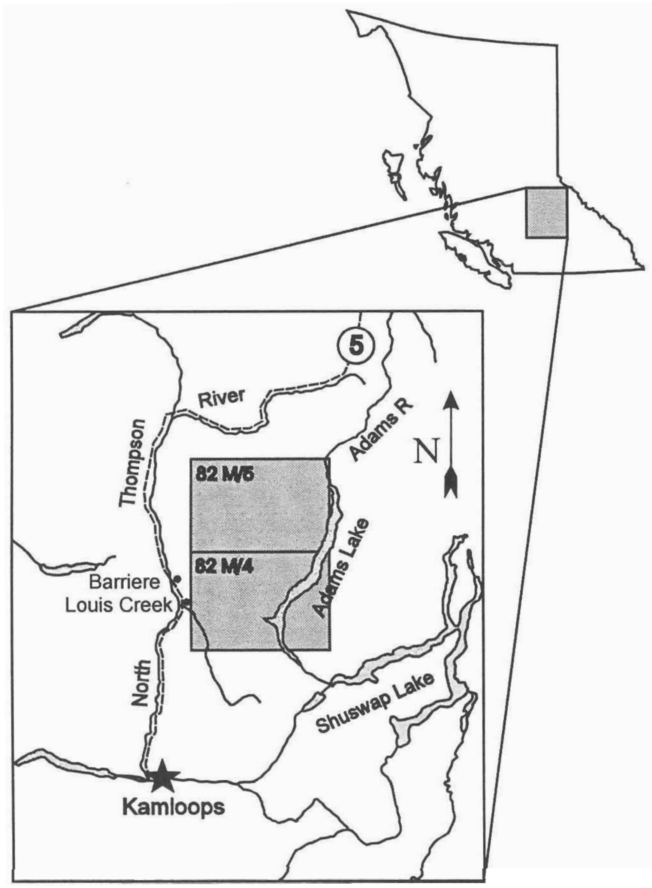

Figure 1. Location of the Eagle Bay drift exploration project study area in south-central British Columbia. Adams Plateau (82M/4) and North Barriere Lake (82M/5).

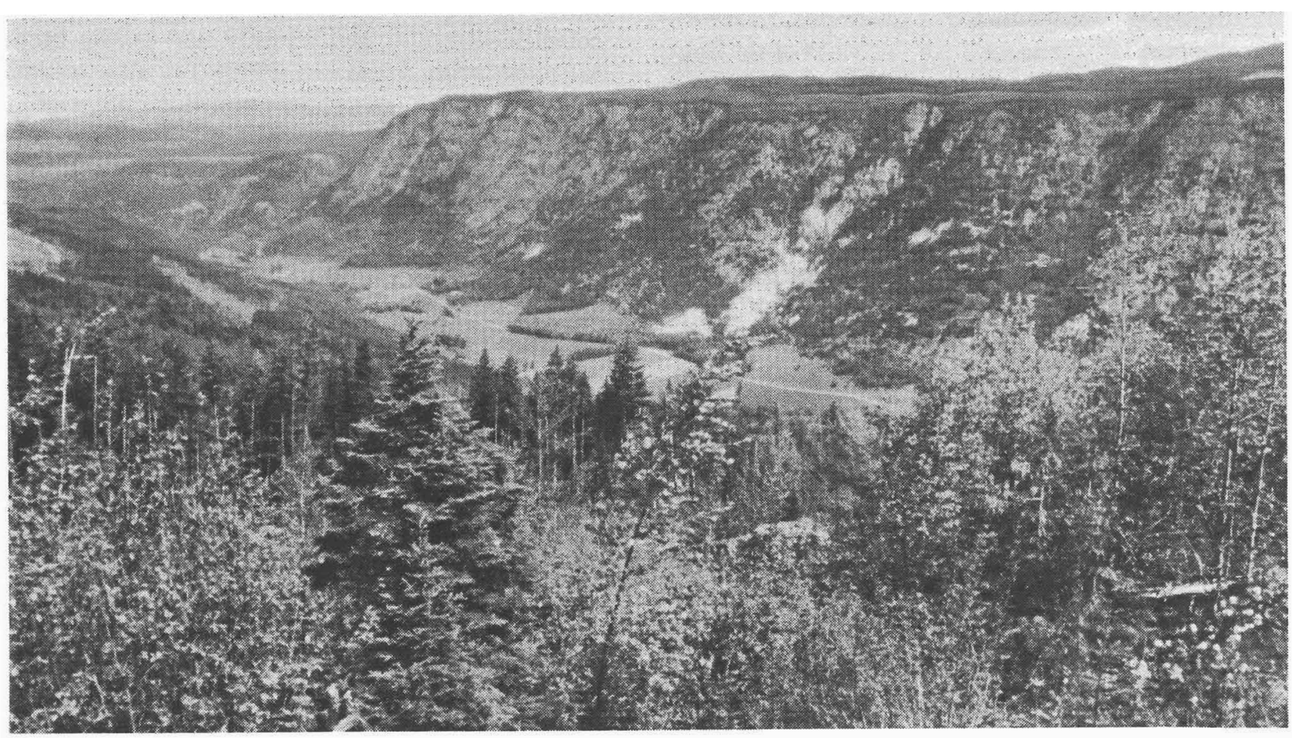

Figure 2. View to northeast along Sinmax Creek, with Homestake in centre of photo. Note high relief, plateau topography.

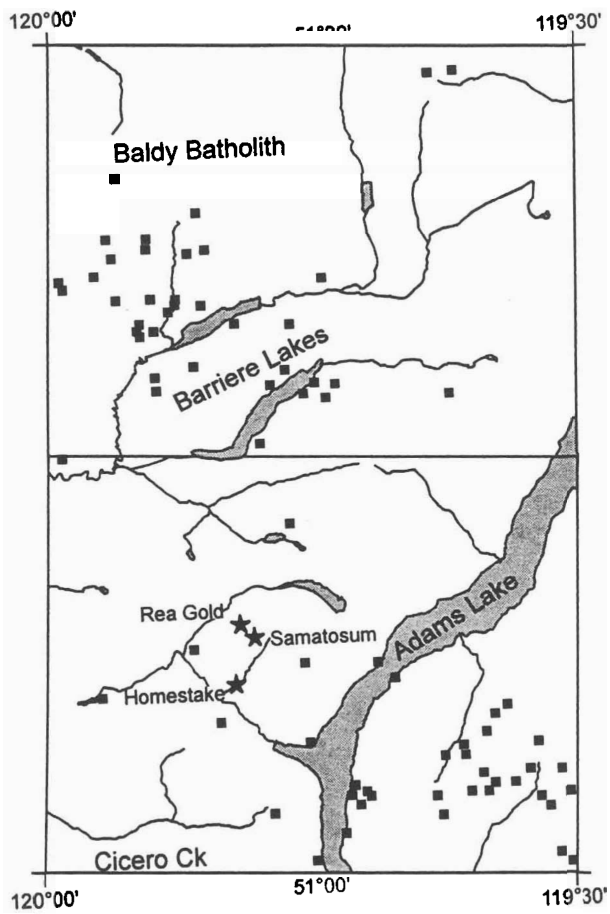

Figure 3. Mineral occurrence locations for NTS 82M/4 and 5 from MINFILE database.

(Sibbick *et al.*, 1997). Preliminary Quaternary geology results have been summarized in two papers (Bobrowsky *et al.*, 1997a, Dixon-Warren *et al.*, 1997a) and two 1:50 000 scale Open File terrain maps (Dixon-Warren *et al.*, 1997b; Leboe *et al.*, 1997).

Open File 1997-9 provides the final summation of the till geochemical data collected in the two map sheets during 1996. All samples considered reliable and useful for further exploration research are included in this report. This consists of ICP, INAA and whole rock analytical results on some 500 basal till, ablation till and colluviated till samples. An important part of this report is the information provided regarding the regional Quaternary geologic history. Finally, the reader will benefit from the discussion regarding the distribution of anomalous values for several elements (Ag, Au, Cu, Cd, Zn, Pb and As) in this area, since it draws on the relevance of sample media, deposit genesis and probable mineral prospects.

OPEN FILE FORMAT

Open File 1997-9 consists of the following sections:

- Introduction
- Description of the survey area
- Survey methodology
- Quality control
- Data interpretation and discussion
- Summary and Recommendations
- References
- Guide to field observations (Appendix A)
- Analytical data for ICP Analysis (Appendix B)
- Analytical data for INAA Analysis (Appendix C)
- Analytical data for Whole Rock Analysis (Appendix D)
- Summary statistics and element maps for ICP data (Appendix D)
- Summary statistics and element maps for INAA data (Appendix F)
- Summary statistics and major oxide maps for Whole Rock data (Appendix G)
- Analytical duplicate data for ICP, INAA and Whole Rock Analysis (Appendix H)
- Station Location Map (Appendix I)
- Analytical and field data as an ASCII file on a 3.5-inch high density diskette in the back pocket.

DESCRIPTION OF THE SURVEY AREA

PHYSIOGRAPHY AND GEOLOGIC SETTING

The Adams Plateau and North Barriere Lake map areas are located in south-central British Columbia, approximately eighty kilometres north-northeast of Kamloops (Figure 1). The study area lies within the Shuswap Highland, a region of broad forested mountains of moderate to high relief (Figure 2). Elevations in the two map areas range from about 450 m above sea level along the shores of Adams Lake in the south, to about 2630 m above sea level at Dunn Peak in the northwest. Topography is variable: in the north, several peaks which rise over 600 metres above tree-line punctuate the landscape, in contrast to the area in the southwest, where the Adams Plateau is a high (1680 m a.s.l.), flat and expansive topographic feature. Throughout the two map areas, several prominent valleys trending mainly southeast to southwest occur in the area, the largest represented by the Barriere River valley.

Vegetation

Vegetation is of the Southern Columbia and Interior Subalpine forest regions (Rowe, 1972). Valley bottoms are vegetated with black cottonwood and have been cleared and planted to suit agricultural purposes. Hillsides and plateaus between valley bottoms (at elevations of approximately 1220 m) support a dense vegetation cover of western hemlock, red cedar and Douglas fir. Upper valley slopes up to tree-line support a community of western white and Englemann spruce, and alpine fir. Above tree-line, slopes are either devoid of plant cover or sparsely vegetated with low-lying hardy shrubs. Alder and lodgepole pine are abundant in many disturbed areas.

Hydrologic system

Lakes are a conspicuous feature of the landscape. Excluding Adams Lake in the southwest, other moderately-sized water bodies include North, South and East Barriere lakes all located near the border of the two map sheets, Johnson Lake near the centre of 82 M/4 and Saskum Lake near the centre of 82 M/5. Sinmax Creek, and numerous minor creeks, drain southeastward into Adams Lake, whereas Harper, Fennel, Fadear and Haggard creeks drain via the Barriere River westward into the Thompson River.

Geologic Setting

In terms of the bedrock geology, the area lies within the Kootenay Terrane, supporting economically attractive suites including Paleozoic metasedimentary and metavolcanic rocks of the Eagle Bay Assemblage and Fennell Formation. As mapped in detail by the B.C. Geological Survey Branch (Schiarizza and Preto, 1987), both the Eagle Bay and Fennell transect significant parts of both map sheets. Schiarizza and Preto (1987) assigned ages of Early Cambrian to Late Mississippian to rocks of the Eagle Bay Assemblage. These consisted of quartzites, quartzose schists, and limestones overlain by calcareous phyllite, calc-silicate schist and skarn or mafic metavolcanics, which in turn are overlain by felsic metavolcanic rocks, intermediate locally alkalic metavolcanics and clastic metasediments. The Fennell Formation comprises oceanic rocks consisting of bedded cherts, gabbro, diabase, pillow basalt, sandstone, quartz-feldspar-porphyry and conglomerate. Rocks of the Intermontane Belt border the west, whereas high-grade metamorphic rocks of the Shuswap Complex lie to the east. In the north, much of 82M/5 is underlain by a mid-Cretaceous granodiorite and quartz monzonite intrusion (Baldy Batholith).

The Devono-Mississippian felsic to intermediate metavolcanic rocks of the Eagle Bay Assemblage host polymetallic precious and base metal massive sulphide occurrences; most notably Rea Gold, Samatosum (MINFILE 082M 244) and Homestake mines (Figure 3). Massive sulphide deposits include SEDEX Pb-Zn-Ag and BESSHI Cu-Zn-Ag deposits, as well as polymetallic Cu-Pb-Zn deposits. There are 79 mineral occurrences in total: 42 of them are on NTS 82M/4 and 37 of them on NTS 82M/5. All "past producer" occurrences (6) and "developed prospects" (3) include Pb, Zn, Ag, and Cu. Seven of these occurrences include Au.

SURFICIAL GEOLOGY

The surficial geology component of the Quaternary geology program consisted of terrain mapping at a scale of 1:50 000 and Terrain Survey Intensity Level B (Resources Inventory Committee, 1996). Work first consisted of compiling and evaluating all existing terrain information available for the area. Soil and landscape maps produced by the Resource Analysis Branch of the British Columbia Ministry of Environment in 1975 provided background data on the type of materials likely to be encountered (Kowall, 1975a and b). Regional Quaternary mapping studies by the Geological Survey of Canada (*e.g.* Fulton *et al.*, 1986) contributed additional information on the types and distribution of sediments.

Air photographic interpretation and 'pretyping' followed the methodology of RIC (1996) and the terrain classification system of Howes and Kenk (1988). Air photos at a scale of 1:40 000 (approx.) (flight lines 15BCC-95014 and 15BCC-95009) were used in the map generation. Preliminary polygon interpretations were then verified through ground-truthing.

Seven main types of deposits were observed including: basal till, ablation till, glaciofluvial, glaciolacustrine, fluvial, organic, and colluvial. The relative abundance and distribution of each, a reflection of preservation potential, is largely controlled by immediate topography and postglacial erosional processes. As a general observation, the plateaus and hills are mainly covered by combinations of till, colluvium, and glaciofluvial deposits, whereas fluvial, glaciofluvial and glaciolacustrine sediments are more common in valley settings. Colluvial deposits predominate on steeper slopes, whereas till and glaciofluvial sediments are more abundant on gentler slopes. Organic deposits occur locally in all types of terrain. The following discussion centres only on relevant sampled media: basal till, ablation till and colluviated till.

Throughout much of the region, bedrock is mantled by variable amounts of massive, very poorly sorted, matrix-supported diamicton (Figure 4). Attributes of these diamictons suggest that they are most likely basal till accumulations (*cf.* Dreimanis 1988). Deposits of diamicton ranged in thickness from less than one metre (veneer) on steeper slopes and upland areas to several tens of metres (blankets) on the low relief terrain and gentler slopes. The surface expression of these deposits ranges from gently rolling and hummocky to ridged and streamlined.

Two types of basal till were identified, essentially reflecting the type of bedrock from which they were derived. In the south, basal till deposits are primarily massive to poorly stratified with a sandy silt to silty clay texture, and a fissile matrix. Deposits are dense, compact, cohesive with irregular jointing patterns. Clast content ranges from 10-30%, usually averaging about 25%, and clasts range in size from granules to boulders, averaging some 1-5 cm (small to medium pebble size). They are mainly subrounded to subangular in shape and consist of both local and distantly derived lithologies. A number of clasts (mainly prolate in shape) have striated, faceted surfaces. Apparent pebble fabrics are interpreted to be well-defined and appear to be aligned parallel to paleo-ice flow. Colour is variable, and is often reflective of the underlying bedrock. The presence of gossan flecks within till matrix was noted on a number of occasions.

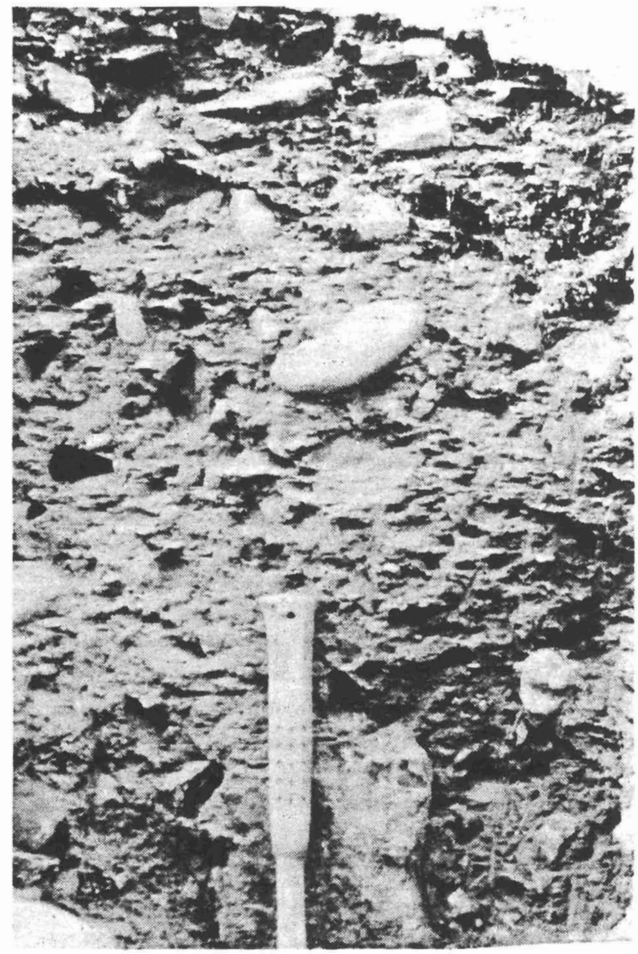

Figure 4. Example of basal till deposit representative of commonly sampled materials during Eagle Bay drift exploration project.

To the north, basal till in the vicinity of the Baldy Batholith is characteristically sandier in texture. In these areas, the till accumulations are highly consolidated, light to medium grey in colour, with a clayey sand matrix. All of these attributes are indicative of the granitic and granodioritic bedrock source. The modal grain size of the fine fraction is about 0.25 to 0.50 cm (coincident with the size of crystals within granodiorite outcrops), but clasts range from granule to boulder in size. Clast content ranges from 5-30% and averages about 15%.

Boulder fields and massive clast-supported diamicton mantle both bedrock and basal till deposits at several locations in the high plateaus in the central and northern parts (Figure 5). In contrast to the basal tills, these diamictons are generally less compact, dense and cohesive. The sandy matrix is poorly consolidated and

Figure 5. Ablation till. Photo shows boulder field of granitic rocks. Typically observed on plateaus within the central and norther parts of the study area.

usually deficient in silt and clay. Clast content is higher, ranging from 20-45%. As with the basal tills, the sediments are very poorly-sorted with clast size ranging from granule to boulder (latter often abundant), but mean clast size is generally larger (about 4 cm). Clast provenance is sometimes variable, but often deposits are almost entirely monolithologic in character (Baldy Batholith origin). However, mixed lithologies, including Eagle Bay Assemblage rocks, increase in abundance gradually to the south. These diamictons are interpreted as supraglacial or ablation till deposits, resulting from deposition by stagnating glacier ice (*cf.* Dreimanis, 1988).

QUATERNARY GEOLOGIC HISTORY

A well-defined knowledge of the Quaternary geologic history is critical for ensuring success in areas targeted for mineral investigation based on drift exploration. According to Fulton and others (Fulton and Smith, 1978; Ryder *et al.* 1991), the present-day landscape of south-central British Columbia is the result of two cycles of glaciation, one interglacial and intensive early Holocene erosion and sedimentation. Although not necessarily present in the study area, the following lithologic units and their correlative geologic climate units have been identified in south-central British Columbia. The oldest deposits in the region, thus far identified at only two locations some 60 and 100 km to the south, are the interglacial Westwold Sediments. These deposits consist of cross-stratified gravely sand, capped by marl, sand, silt and clay all of which are equivalent in age to the Highbury Non-glacial Interval in the Fraser Lowland (Sangamonian).

Next in age are Okanagan Centre Drift deposits, consisting of coarse, poorly stratified gravel, laminated silt and till, presently recognized at Heffley Creek (20 km to the south of the study area) and elsewhere farther south. These sediments were deposited during the Okanagan Centre Glaciation, equivalent to the Semiahmoo Glaciation in the Fraser Lowland (Early Wisconsinan).

Middle Wisconsinan, Olympia Non-Glacial Interval Bessette Sediments overlie the Okanagan Drift deposits. They consist of nonglacial silt, sand and gravel with some organic material and in some cases up to two tephras.

The Kamloops Lake Drift overlies the Bessette Sediments, and underlies the present-day surface cover of postglacial deposits. This unit consists of silt, sand, gravel and till deposited during the Fraser Glaciation (Late Wisconsinan).

The surface and near-surface sediments mapped in the Adams Plateau and Barriere Lakes areas directly result from the last cycle of glaciation and deglaciation (Fraser Glaciation), and ensuing postglacial activity. Regional ice flow, as determined from Fulton *et al.* (1986) ranges from south to southeast. This regional flow direction was observed in several locations in both map areas. Ice flow was also diverted locally in several of the valleys. For example, along the Barriere River valley at the boundary of NTS maps 82 M/4 and 82 M/5, striations on a bullet shaped boulder embedded in till indicate that ice flowed to the east, parallel to the valley orientation. Similar down-valley deflection of ice flow is recorded on bullet-shaped boulders within the Fadear Creek valley and western Sinmax valley, where regional southeast flow was deflected eastward (Figure 6).

Existing radiocarbon dates provide a tentative chronology for glaciation and deglaciation of the Adams Plateau region. Late Wisconsinan ice first covered the area sometime after 20230 ± 270 years BP. Dates of 11.3 ka and 10.1 ka indicate that deglaciation began shortly before this time in the lowland areas of this region (Dyck *et al.*, 1965).

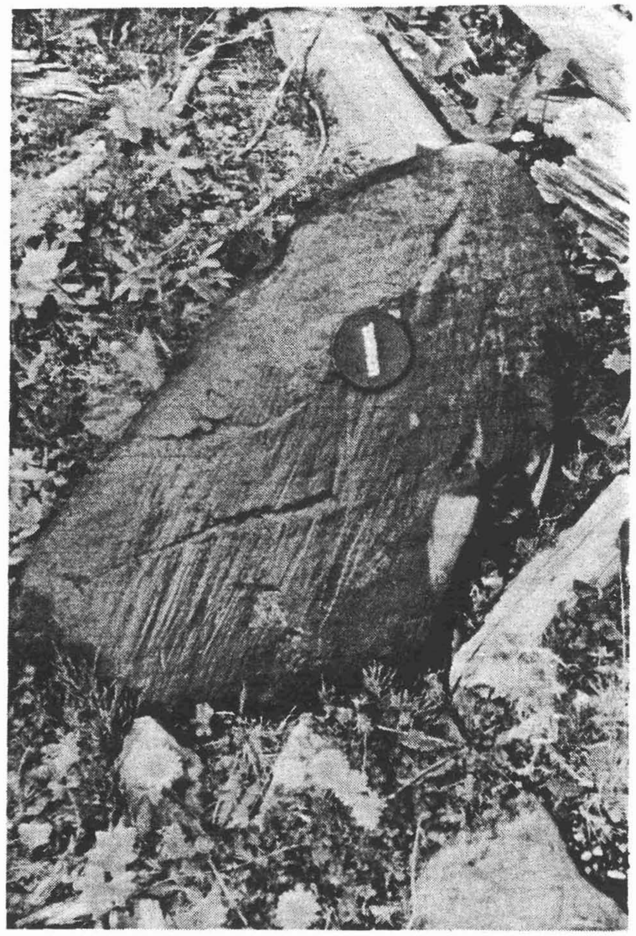

Figure 6. Example of striated bullet-shaped boulder lying on till surface.

SURVEY METHODOLOGY

SAMPLE COLLECTION

Fieldwork was based out of two camps: one near Tod Mountain for work in NTS 82M/4 and a second at the west end of East Barriere Lake for work in NTS 82M/5. Access to the lower two-thirds of the area is excellent. An extensive network of logging roads intersects most moderate slopes and all plateaus. There is, however, a lack of road access to the very steep slopes on the eastern shore of Adams Lake adjacent to the Adams Plateau and the extreme southwestern margin of the Adams Plateau map area. The northern reaches of the study area are at increasingly higher elevation and close to treeline; consequently, logging roads are infrequent and access is restricted, especially in the northwest corner near Dunn Peak and Harp Mountain.

The majority of fieldwork was conducted with a 4-wheel drive vehicle along secondary roads and trails of varying condition. Where road or 4-wheel drive track access was blocked or non-existent, traverses were completed on foot.

Initial work consisted of compiling and evaluating all existing terrain information available for the area. Soil and landscape maps produced by the Resource Analysis Branch of the British Columbia Ministry of Environment (Kowall, 1975a, 1975b) provided background data on the type of materials likely to be encountered. Regional Quaternary mapping studies completed by the Geological Survey of Canada (*e.g.* Fulton *et al.*, 1986) contributed further information on the types and distribution of sediments which may occur in the region. Regional ice flow was determined from Fulton *et al.* (1986) using their 1:250 000 surficial geology map of the Seymour Arm. Airphoto analysis contributed to paleo-ice-flow determinations from the identification of rare drumlinoid features and lineations on plateaus. Detailed local ice-flow directions were obtained by measuring the orientation of striations or grooves on bedrock surfaces, and apparent till fabric was determined from the orientation of bullet-shaped boulders (Figure 6).

Air photographic interpretation and 'pretyping' followed the methodology of RIC (1996) and the terrain classification system of Howes and Kenk (1988). Air photos at a scale of 1:40 000 (approx.) (flight lines 15BCC-95009, 95014 and 95017) were used in the map generation. Final terrain maps were produced at a scale of 1:50 000. Preliminary polygon interpretations were verified through ground-truthing. About half of the polygons were evaluated on the ground, thereby corresponding to a Terrain Survey Intensity Level B (Resources Inventory Committee, 1996).

At each ground-truthing field station some or all of the following observations were made: GPS-verified UTM location, identifying geographic features (*i.e.* creek, cliff, ridge), type of bedrock exposure if present, unconsolidated surface material and expression (terrain polygon unit), general slope, and orientation of striations/ grooves on bedrock or of bullet-shaped boulders.

Bulk sediment samples (1-5 kg in size) were collected for geochemical analysis over much of the study area. Emphasis was placed on collecting basal till deposits (first derivative products according to Shilts, 1993), although ablation till, colluviated till and colluvium was also collected under certain circumstances. Natural exposures and hand excavation were used to obtain samples from undisturbed, unweathered C horizon (parent material) deposits. At each sample site, the following information was recorded: type of exposure (gully, roadcut, etc.), depth to sample from top of soil, thickness of A and B soil horizons, clast percentage, matrix or clast-supported diamicton, consolidation, matrix texture, presence or absence of structures, bedding, clast angularity (average and range), clast size (average and range), clast lithologies and colour. The sample was evaluated as being derived from one of five categories: basal till derived from the Eagle Bay Assemblage, basal till derived from the Baldy Batholith, colluviated/ reworked basal till, ablation till, or colluvium.

Pebble samples were collected at a number of till sample stations for lithologic provenance studies. Between 105 and 110 clasts were collected at each station from within the trench dug for diamicton sampling. (A higher number than 100 clasts was collected to anticipate miscounts, non-identification and specimen destruction). Pebbles were returned to camp daily, split and are now stored in the Department of Earth Sciences, Simon Fraser University pending future identification. Sampling focused on the Adams Plateau map area and the southern margin of the North Barriere Lake map, in order to limit data collected to tills representative of the Eagle Bay Assemblage.

SAMPLE PREPARATION AND ANALYSIS

Sediment samples were submitted to Eco Tech Laboratories in Kamloops for processing. This involved air drying, splitting, and sieving to <63 μm. The pulps, <63 μm sample and unsieved split were subsequently returned to the BCGS sample preparation laboratory in Victoria, British Columbia. The <63 µm fraction of each sample was further divided into 10 and 30 gram portions. The smaller portion was sent to Acme Analytical Laboratory, Vancouver, where samples were subjected to aqua regia digestion and analysis for 30 elements by ICP-AES (inductively coupled plasma emission spectroscopy) and for major oxides by $LiBO_2$ (lithium borate) fusion - ICP (11 oxides, loss on ignition and 7 minor elements). The larger portion was sent to Activation Laboratories, Ancaster, Ontario, for INAA (instrumental thermal neutron activation analysis) analysis for 35 elements (Table 1).

Analytical results are provided as Appendix B (ICP), Appendix C (INAA) and Appendix D (Whole Rock). Data for 31 of the 35 INAA elements and 27 of the 30 ICP elements are presented. Elements excluded from the database are those that contained an excessive number of values at or below the detection limit. For the INAA analysis the excluded elements are Ag, Hg, Ir and Sn. Elements excluded from the ICP results are Au, Sb and U. Detection limits for the included elements for all methods of analysis are shown in Table 1. Summary statistics are included with the element maps.

TABLE 1
DETECTION LIMITS FOR INAA, ICP AND WHOLE ROCK ANALYSIS FOR EAGLE BAY ASSEMBLAGE SAMPLES

	INA	ICP			INAA	ICP		Whole-rock
Sb	0.1 ppm			Mn		1 ppm		SiO2 0.01%
Al		0.01 %		Mo	1 ppm	1 ppm		Al2O3 0.01%
As	0.5 ppm	2 ppm		Nd	5 ppm			Fe2O3 0.01%
Ba	50 ppm	2 ppm		Ni		1 ppm		MgO 0.01%
Bi		2 ppm		P		0.001 %		CaO 0.01%
B		2 ppm		K		0.01 %		Na2O 0.01%
Br	0.5 ppm			Rb	5 ppm			K2O 0.01%
Cd		0.2 ppm		Sm	0.1 ppm			TiO2 0.01%
Ca	1 %	0.01 %		Sc	0.1 ppm			P2O5 0.01%
Ce	3 ppm			Ag		0.1 ppm		MnO 0.01%
Cr	5 ppm	1 ppm		Na	0.01%	0.01 %		Cr2O3 0.001%
Co	1 ppm	1 ppm		Sr		1 ppm		LOI 0.01%
Cu		1 ppm		Ta	0.5 ppm			
Eu	0.2 ppm			Tb	0.5 ppm			
Fe	0.01 %	0.01 %		Th	0.2 ppm			
Au	2 ppb			Ti		0.01 %		
Hf	1 ppm			U	0.5 ppm			
La	0.5 ppm			W	1 ppm			
Pb		2 ppm		V		2 ppm		
Lu	0.05 ppm			Yb	0.2 ppm			
Mg		0.01 %		Zn		1 ppm		

QUALITY CONTROL

METHODOLOGY

Distinguishing geochemical trends resulting from geological features versus those resulting from anthropogenic influences, spurious sampling or analytical errors is an important part of a regional till geochemical survey. In order to adequately evaluate sampling and analytical variability, this project adopted a routine methodology developed by the BCGS for quality control which involves using field and laboratory duplicate samples and reference standards integrated into the sample suites submitted for commercial laboratory analysis. Field duplicates were collected from arbitrarily selected sample sites and subjected to the same laboratory preparation and analytical procedures as the replicate pair. Analytical duplicates consist of representative splits taken from samples following the sample preparation process but preceding geochemical analysis. Control reference standards consist of three different 'prepared' sediments of known element concentration. In total, the quality control consisted of 29-30 pairs of field duplicates and analytical duplicates (Appendix H). It is common to observe greater variability in the field duplicate pairs as compared to the analytical duplicates. The reason for this difference is that the former represents two different but 'adjacent' samples (= field sampling + preparation + analytical variability), whereas the latter represents two parts of the same sample (= analytical variability).

Scatter plots of the analytical and duplicate pairs were generated to facilitate quality control evaluation (Figures 7 and 8). The field duplicate data contained a greater number of outliers.

In general, the results shows good correlation for most field duplicate pairs with correlation coefficients ranging from 0.352 to 0.992. The presence of individual, anomalous samples would have significantly reduced the overall correlation coefficients for each analysis. Analytical duplicate pairs show a much higher degree of correlation with r values between 0.515 and 1.000.

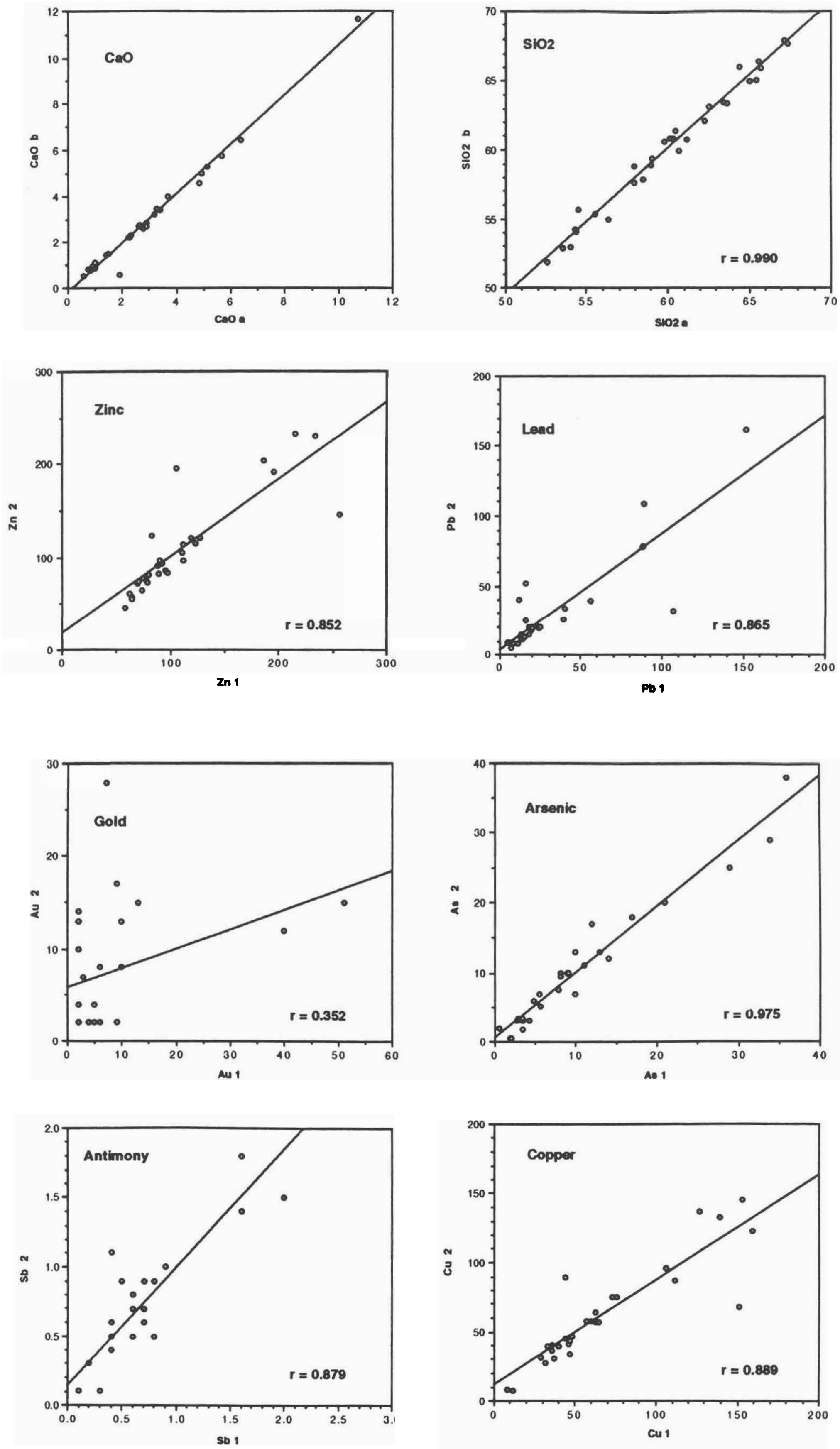

Figure 7. Bivariate scatter plots of field duplicate pairs for the Eagle Bay study. Note sample sizes.

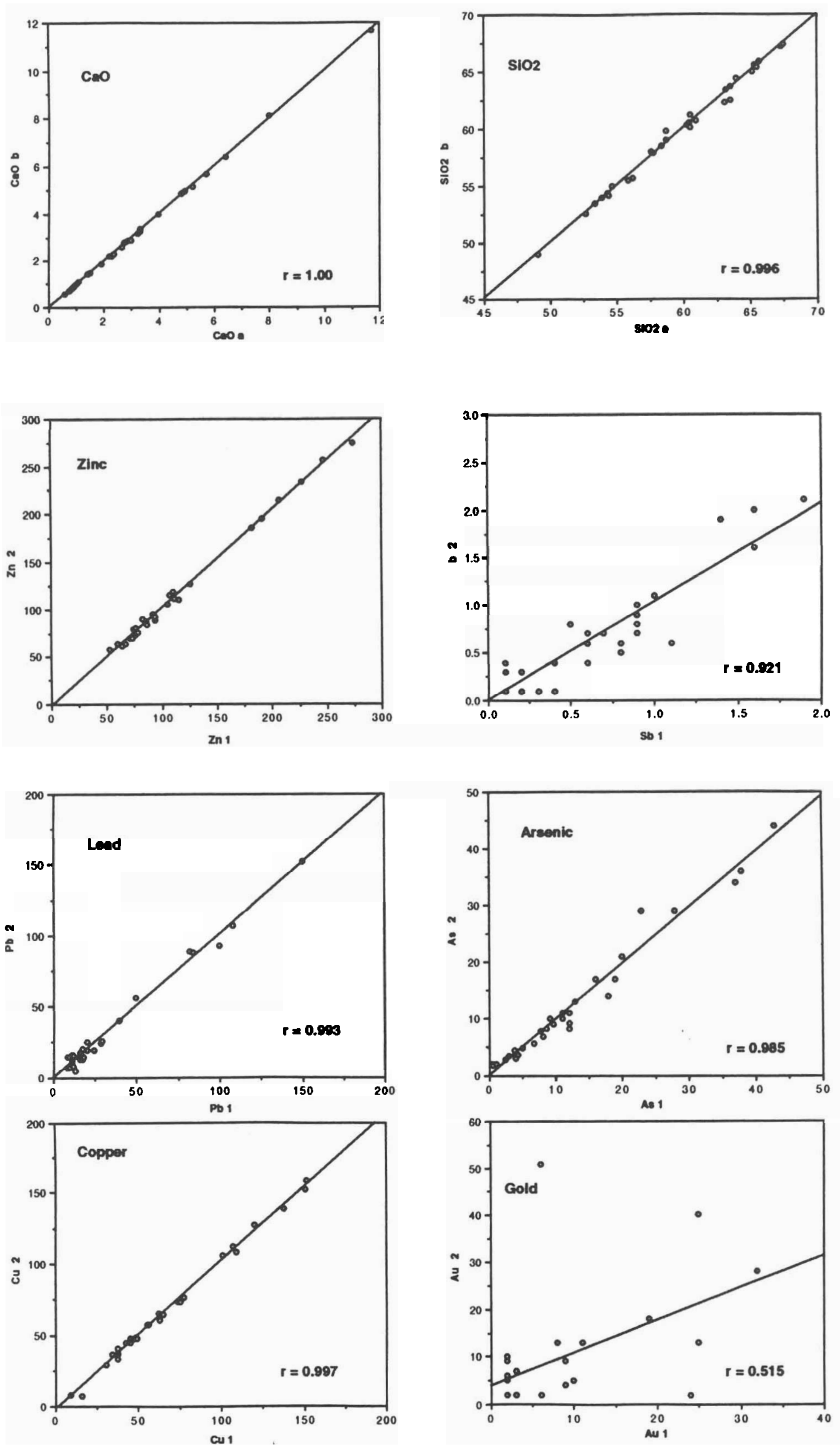

Figure 8. Bivariate scatter plots of analytical duplicate pairs for the Eagle Bay study. Note sample sizes.

DATA INTERPRETATION

The results of the till geochemical survey program at 'Eagle Bay' provide a reconnaissance level guide to geochemical patterns established in the two map sheets. From an exploration perspective the relation between "anomalous" values of certain elements such as copper, gold, silver, lead, zinc, arsenic and cadmium and the surficial geologic history warrants further discussion to ensure that follow-up studies are executed with a good knowledge of probable source areas and higher likelihood of discovering those source areas.

As noted previously, analytical results for 27 of the 30 ICP elements (Appendix B) and 31 of the 35 INAA elements (Appendix C) are presented in this report. The whole rock analysis data provides results of analysis for 11 major oxides, 7 minor elements as well as Loss-On-Ignition (LOI) values (Appendix D). The ICP data in Appendix B consists of a map identification column (MAP), station identification label (ID), UTM zone (UTMZ), easting and northing (UTME and UTMN, respectively), field duplicate identification (Rep), and sample media (Med - C for colluviated till and M for till). The individual elements are listed along the top of the x-axis under which a unit of measurement (*e.g.* ppm or %) is provided, followed in each case by the level of detection. In Appendix C, the INAA analytical data consists of the same first seven columns as the ICP data. Under each of the elements detailed for the INAA data, units of measurement include ppb, ppm and %, which in turn are underlain by levels of detection. Finally, the whole rock analysis data provided in Appendix D consist of the same first seven columns as in the ICP data, as well as data for major oxides and LOI concentrations presented as a percentage of total; the final column gives the analytical summed value for each sample.

Appendix E provides graphical plots of the 27 elements analyzed by ICP. Each illustration provided consists of an element specific map covering the full sample area (all of NTS 82M/4 and 5), geographical reference points (*e.g.* towns, villages, and river names), geographical coordinates (UTM and latitude and longitude), as well as a symbol legend. The symbol legend describes the distribution of values for eight percentile categories, minimum and maximum values within each percentile category and a graphic representation of the symbol size used to denote the particular percentile category. The facing page of each element map provides a frequency histogram of the specific distribution, as well as a normal cumulative probability curve. Analytical summary data presented includes the fraction analyzed, the analytical method and the detection limit. Summary statistics for each element consist of the number of samples, minimum and maximum values, mean, mode, median, lower and upper quartiles, standard deviation and a coefficient of variation.

The graphical representation, analytical summary and statistical summary is duplicated for the 31 elements analyzed by INAA and for the 11 major oxides. These results are provided as Appendix F and G, respectively. To assist in station identification, a mylar overlay map with all station locations and identification labels is included as Appendix I. Lastly, a digital version of the geochemical data is provided in ASCII format on the 3.5" diskette included in the back cover insert.

The elements presented here are those for which analytical results appear to be both minimally biased and well above detection limits. Moreover, the data presented include results for comparable media (tills and colluviated till). Hence, the integrity of the data is interpreted to be exceptionally high in comparison to any discussion centred on mixed media samples (*e.g.* till, colluvium, soils, outwash, etc.). Given the nature of the surficial sediments in the Eagle Bay area, the media sampled and presented here reflect 'parent' materials or proximal sources which are 'local' in origin; that is, where transport distances are on the order of tens of metres to a few kilometres from source area, rather than tens or hundreds of kilometres as is the case in other regions.

In the following discussion, several of the more important elements associated with (gold, copper, lead, silver, zinc, cadmium and arsenic) are reviewed.

SILVER

The 496 till samples collected and analyzed by ICP provided silver concentrations ranging from less than 0.3 ppm to 1.9 ppm. The samples generated a mean concentration of 0.20 ppm; mode and median values were below detection limit. Most of the sample results occurred in the lower 85th percentile (420 samples) with only 5 samples having concentrations of > 0.7 ppm. The highest five samples are discussed in this report.

A basal till sample at station 969145 which was originally derived from the Eagle Bay Assemblage, located south of Samatosum Mountain and east of Homestake Creek provides the highest concentration of silver recorded (1.9 ppm). Positioned directly down-ice of Samatosum in a southeasterly direction, it is most likely representative of this known mineral occurrence. The sample was retrieved from basal till in an area of thick deposition which accounts for the significant transport distance for this type of local terrain.

A colluviated till sample from thin overburden collected at station 969062 provided the second highest silver concentration in the area (1.3 ppm). Located on the north side of Fadear Creek in the southwest corner of NTS 82M/4, the sample is unique in that it is located in an area where there are no known mineral occurrences. Locally associated with EBP rocks, the most probable source for this sample is 100 to a few 1000 m to the northwest along the strike of the valley occupied by Fadear Creek.

Two other significant samples were retrieved on map sheet NTS 82M/4, but on the east side of Adams Lake. Station 969095 provided a silver concentration of 0.9 ppm. The sample was removed from a thin veneer of colluviated till in a natural gully southwest of Pisima Mountain near the edge of the plateau itself. Given the proximity of this location to two known mineral occurrences to the northwest, it is highly probable that either Speedwell or Donnamore showings contributed to the silver concentration observed at 969095.

A sample at station 969555 was taken at 2 m depth in thick basal till derived from the Eagle Bay Assemblage and provided a silver concentration of 0.8 ppm. The site is located east of Nikwikwaia Creek in the southeast part of NTS 82M/4. Locally associated with EBGs rocks, the sample is in close proximity to a number of up-ice and known mineral occurrences hosting silver as a commodity including Big Ben 2, Lucky Coon and Axl 1. Any or all of these three occurrences may have contributed parent material to the till sample at station 969555.

The final sample under discussion for silver was obtained from a station located about 2.5 kilometres north of the western end of East Barriere Lake. Station 969540 provided a silver concentration of 0.8 ppm. The sample was taken from a thick blanket of basal till derived from the Eagle Bay Assemblage. The source area is presently unknown, but the most likely area contributing to this sample lies somewhere in a location west to north (northwest is the strongest candidate) of this station. Given the nature of the sample (thick basal till), the source area could be as far as 5 kilometres up-ice.

COPPER

Concentrations of copper analyzed by ICP ranged from 1 ppm to 3653 ppm. Moderately high mean and median values of 74 ppm and 50 ppm Cu, respectively, are present. Some 123 samples occur in the upper tenth percentile distribution, with values exceeding 86 ppm. Of the 496 samples analyzed, the top five values ranged between 325 and 3653 ppm and an additional five had values between 234 and 311 ppm. A significant number of the highest copper concentrations were clustered along an east - southeast axis south of the Baldy Batholith in the centre of NTS 82M/5. Several of the high copper concentrations can be tentatively associated with known mineral occurrences, but at least two samples have no known or obvious bedrock source.

A copper value of 3653 ppm was obtained from a deep basal till sample at station 969386. Here thick basal till is associated locally with EBA rocks. In this instance, the most likely bedrock source area is to the north, perhaps as far north as two known mineral occurrences (Kunigunde and Mafalda). However, since we did not sample north of this station and have no indication of copper concentrations directly up-ice, it is equally likely that a closer bedrock source, located south of the two known occurrences, actually contributed to the copper concentration recorded at station 969386.

The next three highest values of copper were obtained from samples aligned in a southeast trend starting at the south shore of North Barriere Lake and extending almost to the north shore of East Barriere Lake. Stations 969529, 969511 and 969524 provided till sample copper values of 463, 365 and 325 ppm, respectively. The northernmost sample (969524) was obtained from a thin basal till, whereas the remaining two southern samples were taken from thick blanket deposits of till. All three samples are associated with the Eagle Bay Assemblage but are locally associated with EBG, NM and EBQ rocks. A copper showing at the B & B most likely contributed to the sample obtained at station 969524. Sediment at station 969529 may be representative of much greater transport distances from the west or even north such as the EBL prospect. However, the latter is very unlikely. The sample from station 969511 cannot be readily associated with any known mineral occurrence. The most likely source area for this copper concentration lies to the north in an area situated between the B & B and EBL occurrences.

At station 969014, directly south of Skwaam Bay on the steep west shore of Adams Lake (NTS 82M/4), a copper concentration of 325 ppm was obtained from a thick basal till sample. Locally associated with EBAgn rocks, the 969014 station is the end member for three (includes 969013 and 969017) moderate to high values aligned parallel to ice-flow southeast along Sinmax Creek. However, the two up-ice values are lower (both 210 ppm) than that at 969014 and may indicate the "proximal rise" associated with classic dispersion plumes. The 325 ppm copper value would then represent the "peak concentration" in the distribution curve. As there are no known mineral occurrences in the immediate vicinity, the bedrock source must lie within the two end members of the copper "train", namely stations 969017 and 969014. The sample from station 969014 also has high lead and zinc values (see discussion below).

GOLD

The mean and median concentrations of gold (INAA) are 7.2 ppb and 4 ppb, respectively. Values ranged from <2 to 215 ppb for the 500 samples of till and colluviated till analyzed. There are 10 samples in the upper 1.0 percentile, five with gold concentrations between 35 ppb and 43 ppb and 5 with gold values greater than 43 ppb. A few of the top five concentrations of gold are not presently associated with known mineral occurrences.

The highest gold value was obtained from an ablation till sample (969292 - 215 ppb) located on the steep, west shore of Adams Lake near the border of NTS 82M/4 and 5. A second elevated but much lower gold value occurs directly southeast of this 'high' suggesting the presence of a partial dispersion train in this direction. Several other sample sites are present in the region, but none show elevated concentrations of gold. This pattern suggests that the most likely bedrock source for this incomplete train is within about 2 kilometres to the northwest (within the range of 270-360) of the 969292 locality.

A value of 84 ppb gold was obtained from thick basal till at station 969540 (NTS 82M/5). Attributed to till from the Eagle Bay Assemblage, the sample is locally associated with EBG rocks. Located some 4 km northwest of the outlet at East Barriere Lake, the site almost certainly reflects the influence of one of two known mineral occurrences recorded farther to northwest: White Rock and Silver Mineral both record Au as a commodity in their MINFILE summaries.

At station 969318 (NTS 82M/5), about 2 km west of the Barriere River and 1 km east of Chip Creek, a thick basal till sample yielded a gold value of 52 ppb. Several other samples in the vicinity did not provide elevated gold values. There are no known mineral occurrences recorded for the area which can be considered as possible source candidates for this gold concentration. Local bedrock is NM. Given local ice flow directions it is proposed that the bedrock source for this station is located within a few kilometres to the northwest in the direction of Sprague Creek.

Another location with a high gold concentration which also cannot be readily attributed to any known mineral occurrence is present at station 969188. A gold value of 44 ppb was obtained from thick basal till at a site located about 2 km north of Dixon Lake in the northeast part of NTS 82M/4. Two other till geochemistry sample sites occur within a kilometre of this station to the north and northwest and neither show elevated values of gold. There are no recorded mineral occurrences in the region.

The final location discussed here for gold is station 969359 where a value of 44 ppb was determined. The sample was collected from thick basal till attributed to the Eagle Bay Assemblage; local rocks are EBP. The site is situated about 5 km northwest of the outlet from North Barriere Lake. Gold concentrations at this location are almost certainly a result of source input from a past producing operation, Energite, located directly west of the sample station.

LEAD

Mean and median concentrations of lead (ICP) are 26.3 ppm and 17.5 ppm, respectively. Lead concentrations ranged from a minimum of <3 ppm to a maximum of 279 ppm. Of the 496 samples analyzed, the top five had values > 190 ppm and the top ten had values > 128 ppm.

Lead values at or above the mean were distributed in discrete clusters in the southeast corner and centre part of NTS 82M/4, and in a broad band extending from North Barriere to East Barriere lakes. The highest concentration of lead was recorded at station 969410 (279 ppm) on the southeast shore of East Barriere Lake. Here, a sample of basal till from a thin veneer of sediment was obtained over bedrock locally assigned to EBG. This lead sample coincides with the location of a known mineral occurrence: Kajun.

The second highest concentration of lead was obtained from station 969555 on Adams Plateau in the southeast corner of map sheet NTS 82M/4. The 261 ppm lead value obtained at this location can be compared to elevated concentrations of silver and cadmium in this sample. Locally, the station is associated with EBGs rocks. As noted earlier, there are several known mineral occurrences in the up-ice vicinity of this station and all are equal candidates as source areas contributing to the high value of lead observed; in particular, Big Ben 2, Lucky Coon and Axl 1.

A lead value of 233 ppm was obtained from a basal till sample at station 969116 which is directly up-ice from a second elevated lead sample at station 969145 where the concentration was 198 ppm. Locally associated with EGB rocks, the two stations are down-ice recipients of sediment derived from two known mineral occurrences and likely bedrock sources, namely, Rea Gold and Samatosum Mountain. The sample from 969116 also shows elevated concentrations of silver, arsenic and cadmium, whereas the latter site also displays a higher concentration of silver.

The final location discussed here with an elevated value of lead is from station 969014 (221 ppm) from the west side of Adams Lake, directly south of Skwaam Bay (NTS 82M/4). Locally associated with EGAgn rocks, the sample was collected from a thick basal till locality. As discussed earlier, a high copper concentration was also measured for this sample. There are no recorded mineral occurrences suitably situated to explain this anomalous lead concentration at station 969014. The most probable bedrock source is inferred to be located within a few kilometres of the sample station to the northwest along Sinmax Creek.

ZINC

Zinc concentrations (ICP) ranged from a minimum of 12 ppm to a maximum of 4168 ppm for the 496 samples included in this report. A mean value of 116.2 ppm and median value of 94 ppm result from this distribution. The highest ten values of zinc are all greater than 351 ppm. The upper tenth percentile distribution contains 51 samples with values exceeding 179 ppm. Of the top five high zinc values, two are not associated with any known mineral occurrence.

Three of the top five zinc samples lie in a northwest - southeast axis west of Adams Lake directly north of Sinmax Creek. Stations 969142, 969116 and 969145 yielded zinc concentrations of 4168 ppm, 549 ppm, and 488 ppm, respectively, illustrating a classic decrease in lead concentration along a dispersion plume which has its origin at Samatosum Mountain and/or Rea Gold and progressively diminishes in a down-ice direction to the southeast.

Although the three zinc concentrations discussed above owe their elevated values to known mineral occurrences in the area, two other stations have yet to be associated with any mineral occurrences. Station 969014 has a zinc value of 609 ppm. The sample was retrieved from thick basal till overlying EBAgn rocks. As discussed earlier, high concentrations of Cu and Pb were also obtained from this sample. There are no known mineral occurrences suitably situated to explain this elevated concentration of zinc. The most probable source for this zinc value lies in an area within a distance of about 2 km to the northwest.

The final zinc concentration discussed here is from station 969347. The basal till sample retrieved at this site resulted in a zinc value of 481 ppm. Locally underlain with Kg rocks, the station is located in an area where there are no known mineral occurrences. Given the local bedrock geology of this area, it is difficult to explain the high zinc concentration.

ARSENIC

Concentrations of arsenic determined for the 496 samples reported here ranged in value from <2 ppm to a maximum of 83 ppm. The frequency distribution for arsenic is fairly uniform, with 125 samples in the upper 90th percentile. The highest five arsenic values were all greater than 56 ppm. Two of the samples are clearly not associated with known mineral occurrences, and a third is most likely not associated with nearby known deposits. The final two samples are part of a well developed multi-element dispersion plume.

The highest arsenic concentration recorded in our 496 samples is derived from a thick basal till deposit at station 969540 (83 ppm). A high silver value was also obtained from this sample. Locally the area is underlain by EBG rocks. Situated northwest of the outlet from East Barriere Lake, the station is down-ice from two known mineral occurrences: Silver Mineral and White Rock (NTS 82M/5). However, low values of arsenic were obtained from sample stations positioned between the two known mineral occurrences and station 969540. As such, it is more likely that the bedrock source for this sediment is derived locally, perhaps within a few hundred metres northwest of station 969540.

The second highest recorded value of arsenic was obtained from thin deposit of basal till from a site located in the west part of NTS 82M/4 directly south of Sinmax Creek. Here at station 969024 an arsenic value of 81 ppm was obtained from the sample. Locally underlain by EBS rocks, there are no known mineral occurrences in the vicinity. The shallow nature of the deposit and ice-flow directions suggest that the most likely source area for this station is within several hundred metres to the northwest in the direction of Forest Lake.

The next two significant concentrations of arsenic were obtained from two stations which comprise part of the multi-element dispersion plume recorded to the southeast originating from Rea Gold and/or Samatosum Mountain. Station 969142 is the more proximal of the two and has an arsenic value of 80 ppm, whereas station 969116 is farther down ice from the source area and has an arsenic value of 62 ppm. Station 969142 also has elevated values of zinc and cadmium. Station 969116 has elevated values of silver, cadmium, lead and zinc.

The final arsenic sample discussed in this report is the 58 ppm value obtained from station 969076. The sample was taken from a thick accumulation of basal till in the southwestern corner of NTS 82M/4, west of Fadear Creek. An elevated concentration of cadmium was also recorded for this sample which locally overlies NM rocks. There are three known mineral occurrences up ice (northwest) of station 969076 including Fortuna, Plato and Skookum (NTS 92P/1). These three occurrences are the most probable source area for this sample.

CADMIUM

Cadmium concentrations ranged from a low of <0.2 ppm to a high of 21.6 ppm for the 496 samples examined in this report. A mean value of 0.39 ppm and median value of <0.2 ppm result from this distribution of data. There are 12 samples in the 98.8% and better with minimum values of 1.5 ppm. All of the elevated cadmium values can be tentatively associated with known mineral occurrences in the two map sheets.

The highest cadmium value obtained in this study comes from a basal till sample recovered at station 969142 (21.6 ppm) which is situated directly down ice of Samatosum Mountain and Rea Gold just west of Adams Lake. Farther down ice, stations 969116 (2.8 ppm cadmium) and 969185 (3.0 ppm) both appear to be part of the dispersion plume originating at one of the two, above mentioned properties. All stations locally overlie EBG rocks. Station 969186, located directly north of 969185 also shows an elevated cadmium concentration of 3.0 ppm. This latter colluviated basal till sample is most likely derived from the Twin Mountain prospect to the west.

The second highest concentration of cadmium was recorded at station 969076 in the southwest corner of map sheet NTS 82M/4. A cadmium value of 4.4 ppm resulted from the thick basal till sample which locally overlies NM rocks. High arsenic was also measured in this sample. As noted earlier, this station most likely reflects a bedrock source area originating in map sheet NTS 92P/1, where three known mineral occurrences are possible candidate contributors to the sediment content: Fortuna, Plato and Skookum.

The final station discussed for cadmium provided a value of 2.8 ppm (969464). Located in the northeast part of map sheet NTS 82M/5, the sample was derived from thick basal till which locally overlies Kg rocks. Only two mineral occurrences are present in the general vicinity of this station: Hilltop and Hilltop 9. These two copper commodity showings occur up ice of the station. It is difficult to propose the likely source for this cadmium concentration.

SUMMARY AND RECOMMENDATIONS

This report presents the results of a drift exploration program integrating surficial geology mapping and till geochemistry sampling northeast of Kamloops. Surficial geology data and Quaternary geologic history information relevant to explorationists are reviewed. The results of ICP, INAA and whole rock analyses for about 500 till and colluviated till samples are presented and discussed. Collectively, these data provide a good reconnaissance level study of the mineral potential of this glaciated and drift covered region.

Much of the area (NTS 82M/4 and 5) is covered by unconsolidated sediment of variable thickness ranging from less than one metre to several metres. The high relief area to the north and deeply incised valleys elsewhere support thin veneers of colluvium (1 m) over bedrock on steep slopes and higher elevations. Thicker blankets of colluvium (>1 m) over till occur on mid slope regions. At lower elevations and over much of the flat lying plateau areas, morainal deposits in the form of ablation and basal till can be found. Ablation till predominates in the north, whereas basal till is more common to the south. Till accumulations range in thickness from less than a metre to over several tens of metres depending on the relief of the underlying bedrock. Fluvial deposits are restricted to the lowest elevations within the various creek and valley bottoms. Sediments often occur within a few metres elevation above present day creeks, streams and rivers. Glaciofluvial and glaciolacustrine sediments occur throughout the study area, often as thin deposits overlying till, but their occurrence is proportionately minor in comparison to till. Glaciofluvial sediments are found in valley settings, but at higher elevations than the fluvial deposits. Glaciolacustrine sediments are found in the lowest areas to the west, essentially in association with thicker deposits in the North Thompson valley.

Quaternary geology plays an important role in mineral exploration studies in areas of glaciated terrain. The principles of drift exploration rely on an accurate understanding of the regional geological history, the distribution of various types of sediment, the genesis of individual deposits and the relationship of sediment cover to bedrock lithology (Liverman, 1992). Terrain and surficial geology mapping provides the first step towards attaining this understanding, whereas ground-truthing, including stratigraphic and sedimentologic descriptions, further the process. Sampling for till geochemistry and clast lithologies provides two mechanisms to recognize glacial dispersal trains and consequently infer potential mineral occurrences covered by drift. But the successful integration of these data with the surficial geology studies is the key for determining their location. Terrain geology maps for NTS 82M/4 and 5 are available for use as discussed in earlier sections of this report. They should be consulted as part of the continuance of detailed exploration work resulting from this reconnaissance project.

It is recommended that terrain and surficial geology mapping precede the complementary aspects of drift exploration studies which rely on till geochemistry and pebble lithology analysis. Such mapping not only identifies where preferred sediments for sampling occur, but also provides information regarding drift thickness and paleo-ice-flow direction. Unique deposit types must be identified and consistency in sampling such deposits must be maintained to ensure comparability of the results. For example, one recent study of glacial dispersal of till constituents clearly illustrated how both flow-paths and transport distances differed between various types of morainic landforms, furthering emphasizing the need for good associated surficial mapping (Aario and Paeuraniemi, 1992).

A total of 535 bulk sediment samples (including duplicates) were initially collected for the till geochemistry study. Of these, 526 samples were considered acceptable for the objectives of this survey and the results are presented here. Samples were collected at an average depth of 1.9 m below soil surface. Till sample density averaged one per 3.8 km^2 for the total survey area. Excluding inaccessible regions, sampling density averages one per 2.6 km^2. Assuming average transport lengths of 1.0 kilometre for geochemical anomalies (*cf.* Salminen and Hartikainen, 1985) this level of sampling provides a high level of reconnaissance information for the region.

Most of the samples taken for geochemical analysis were representative of basal till, most likely lodgement till. Of the 526 samples, 413 or 79% represented this sediment type. Two types of basal till were recognized, one reflecting an origin predominantly seated in Eagle Bay Assemblage rocks (M1), and the other derived from Baldy Batholith rocks (M3). Basal till which has undergone slight downslope movement was classed as colluviated till (CM). Samples taken from this type of deposit accounted for 76 or 14% of the total. Together, these three groups (93%) represent the highest quality media to sample for drift exploration. Also valid, but more difficult to interpret were the remaining 37 or 7% of the samples which were collected from ablation till (M2) and colluvium (C). ICP and INAA totals do not necessarily match the 526 depending on quality control samples and duplicates which were not part of the tally.

Previous geochemical studies provide an indication as to the style of mineralization, configuration of anomaly plumes and regional dispersal patterns one can expect for a particular area. Three examples of property scale geochemical sampling from two separate occurrences are presented here as analogues to the expected regional dispersal patterns.

At the Silver 1 property, located directly south of the confluence of Homestake and Sinmax creeks, B Horizon soil samples illustrate two forms of geochemical anomaly patterns (Richards, 1989). The cobalt plume shows a fan-shaped down-ice dispersal pattern with a sharp apex and broader fan tail extending about 500 m in length from the northwest to the southeast. The direction of this anomaly parallels the regional ice flow pattern and reflects strong clastic dispersion in the basal till media (Figure 9). At the same property, arsenic displays a less distinct dispersal pattern. In this case, although the long axis of the plume parallels regional ice flow from northwest to southeast and thus reflects typical clastic dispersal, a secondary downslope northeasterly component has been overprinted on the initial shape. Here, hydromorphic dispersion may have modified the original shape creating an anomaly over one km long and 500 m wide (Figure 10). Cobalt illustrates a single vector (ice-parallel) configuration, whereas arsenic illustrates a compound two-vector configuration consisting of ice-parallel plus downslope directions.

At the Kamad 3 property, also near the confluence of Homestake and Sinmax creeks, but about two kilometres north of Silver 1, a zinc anomaly shows a classic cigar-shaped dispersal plume (Marr, 1989). As in the previous cases, the form parallels regional ice flow to the southeast (Figure 11). This particular anomaly is about one kilometre long and 200 m wide. Although the anomaly crosses a slope and follows the contours of the land, there is no secondary downslope dispersion as in the case of arsenic in the previous example. A possible minor hydromorphic extension to the dispersal plume may be present at the head of the anomaly where it crosses a small creek.

The distribution of high concentrations of several elements were discussed in detail earlier in this report. Here we summarize the elements and sample locations to further emphasize which locations warrant additional attention. Table 2 lists the 5 or 6 till sample numbers whose concentrations were high for each of seven key elements. As evident in this table, a number of sample locations occur repeatedly, indicating that high multi-element concentrations were determined for the respective samples. Those samples which could not be readily associated with a known mineral occurrence are italicized in this table. These few sites should be the focus of additional exploration attention as detailed under the individual element discussions. Future reconnaissance level till geochemistry and surficial mapping should be pursued in the region given the high mineral potential that this area displays.

TABLE 2

SUMMARY OF HIGHEST CONCENTRATION TILL SAMPLES FOR KEY ELEMENTS

ELEMENT	SAMPLE NUMBERS
SILVER	969145, *969062*, 969095, 969555, *969540*
COPPER	*969386*, 969529, *969511*, 969524, *969014*
GOLD	*969292*, 969540, *969318*, *969188*, 969359
ARSENIC	*969540*, *969024*, 969142, 969116, 969076
LEAD	969410, 969555, 969116, 969145, *969014*
CADMIUM	969142, 969116, 969185, 969186, 969076, *969464*
ZINC	969142, 969116, 969145, *969014*, *969347*

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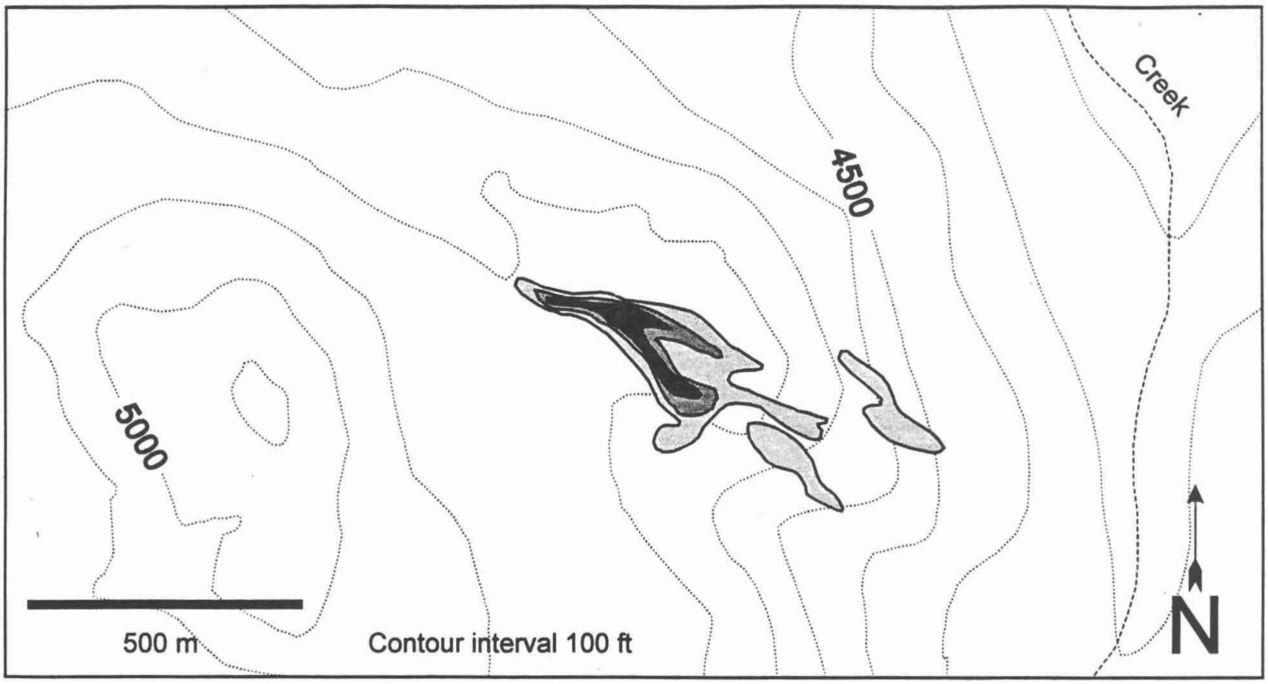
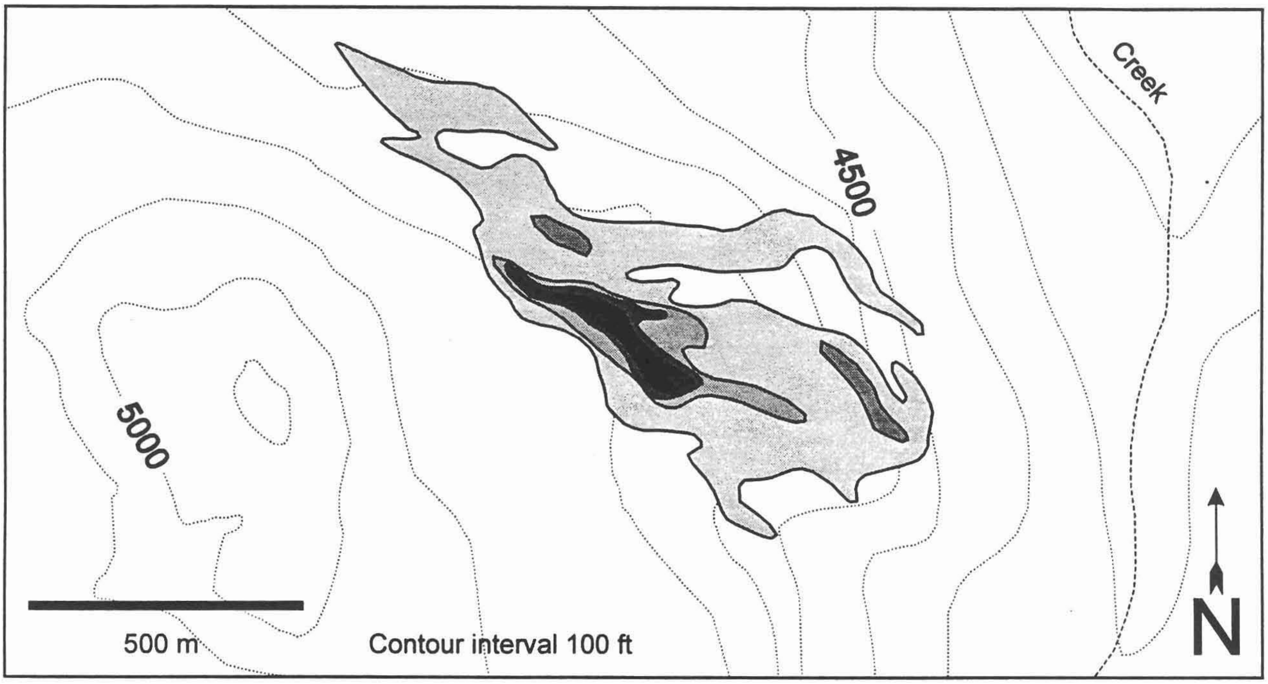


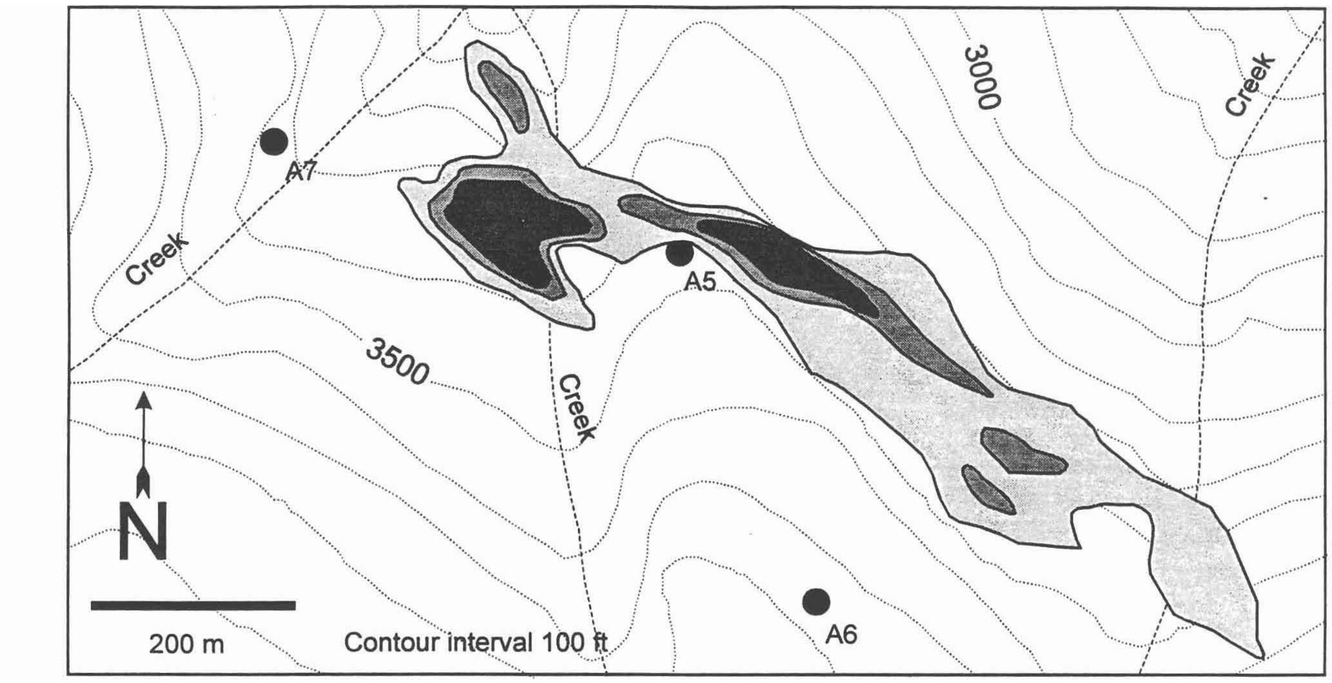
Weakly anomalous Co; 21-30 ppm.
Moderately anomalous Co; 31-40 ppm.
Highly anomalous Co; >40 ppm.

Figure 9. Cobalt soil anomaly for the Silver 1 property. Modified after Richards (1986).



Weakly anomalous As; 16-70 ppm.
Moderately anomalous As; 70-125 ppm.
Highly anomalous As; 126-180 ppm.
Extremely anomalous As; >180 ppm.

Figure 10. Arsenic soil anomaly for the Silver 1 property. Modified after Richards (1986).



Weakly anomalous Zn; 202-300 ppm.

Moderately anomalous Zn; 301-400 ppm.

Highly anomalous Zn; >400 ppm.

A6 Mineral occurence. Sulphidic veins or sulphide-bearing quartz

Figure 11. Zinc soil anomaly for the Kamad 3 property. Modified after Marr (1989).

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