SURFICIAL DEPOSITS IN THE LOUIS CREEK AND CHU CHUA CREEK AREA

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INTRODUCTION

Surficial geological mapping and drift exploration studies were undertaken in the summer of 1997 north of Kamloops in NTS map sheets 92P/1 (Louis Creek) and 92P/8 (Chu Chua Creek), as a continuation of the Eagle Bay Project initiated in the previous year (Bobrowsky *et al.*, 1997; Dixon-Warren *et al.*, 1997). The surficial component is part of an integrated regional study centred on Devono-Mississippian rocks of the Eagle Bay Assemblage and Permian to Devonian rocks of the Fennell Formation. Massive sulphide deposits hosted in stratiform volcanogenic assemblages of the Fennell Formation at Chu Chua (MINFILE 092P 140) and syngenetic sedimentary rocks of the Eagle Bay Assemblage at Mount Armour (MINFILE 092P 051) suggest the region has considerable mineral potential. Polymetallic gold-bearing veins hosted in volcanic and volcanogenic rocks of the Fennel Formation at Windpass (MINFILE 092P 039) also suggest a high potential for gold in the area. Several placer occurrences of Au have also been recorded in the region.

Recent exploration and successful mineral discoveries in the Yukon (*i.e.* Kudz Ze Kayah and Wolverine) in correlative rocks to the Eagle Bay Assemblage provided the impetus for a Geological Survey Branch integrated project in the Kamloops district. This exploration project includes, mineral deposit studies (Höy and Ferri, 1998), detailed ice-flow dispersal studies (Lett *et al.*, 1998), till geochemistry sampling, and 1:50 000 scale surficial geology mapping. The latter two components provide vital information for mineral exploration in regions where unconsolidated sediments of variable thickness mask the underlying bedrock (Bobrowsky *et al.*, 1995).

The purpose of the drift exploration program was to map the surficial geology of the area and to document results of a reconnaissance level till geochemistry sampling survey. The goal of the surficial geology research was to map approximately 1000 square kilometres of rugged, high relief, glaciated terrain, by documenting the type and distribution of Quaternary sediments present. The surficial maps for both 92 P/1E and 92P/8E are available at a 1:50000 scale as separate Open Files (Paulen *et al.*, 1998a; Paulen *et al.*, 1998b).

The objectives of the project were:

- to stimulate new exploration and economic activity in the area;
- to define new anomalies which may be used in the discovery of mineralization;
- to document ice-flow indicators and both local and regional ice-flow patterns which will aid drift prospecting in the area;
- to provide information that will be of use in other areas where mineral exploration has been hampered by thick glacial drift cover.

This paper describes the surficial mapping methods and preliminary results focusing on the types, distribution and character of Quaternary deposits. We also summarize the 1997 till geochemistry activities. Discussion of the ice-flow history and the Quaternary stratigraphy are provided to supplement the analytical results of the survey which will be released as a separate Open File with digital data on disc in 1998.

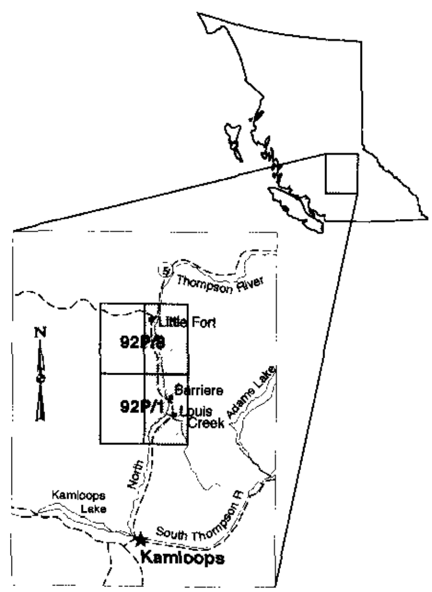

Figure 16-1. Location of the Eagle Bay drift exploration project (1997) study area in south-central British Columbia.

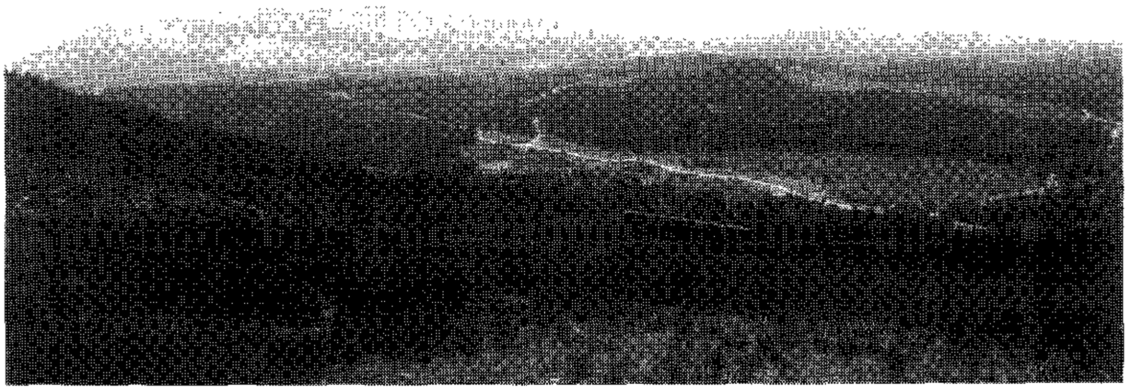

Photo 16-1. General view of topography and terrain in the Eagle Bay area. Till blanket/veneer covers prominent hills and ridges in background of photograph.

BACKGROUND AND SETTING

Located in south-central British Columbia, the Louis Creek and Chu Chua map area (Figure 16-1) lies in the southwestern part of the Shuswap Highland and the northeastern part of the Thompson Plateau within the Interior Plateau (Holland, 1976). This region is characterized by moderate to high relief, glaciated, and fluvially dissected topography (Photo 16-1). Elevations range from 360 metres above sea level in the North Thompson River Valley in the west to about 2290 metres above sea level at Baldy Mountain in the northeast. Topography is variable with many flat areas interspersed with low to high relief. There is a relatively large plateau approximately 1300 metres above sea level which is heavily dissected by numerous prominent valleys. The largest valley, the North Thompson River occurs along the Louis Creek Fault and is the boundary between the Adams Plateau to the east and the Bonapart Hills to the west.

All streams and minor creeks drain into the North Thompson River which is characterized by a broad, braided fluvial plain. The river flows southward and joins the Thompson River at Kamloops which is a major tributary to the Fraser River system. Dunn Lake is the only other notable body of water in the study area.

Most of the area is covered by drift of mixed genesis and of variable thickness. Ground moraine (of various facies) dominates the landscape, followed in turn by colluvial, glaciofluvial, fluvial and glaciolacustrine sediments which collectively make the area extremely favorable for a till geochemistry sampling survey.

Bedrock Geology

The area lies within a belt of structurally complex low-grade metamorphic rocks which lies along the western margin of the Omineca Belt. This belt is flanked by high grade metamorphic rocks of the Shuswap Complex to the east and by rocks of the Intermontane Belt to the west (Schiarrizza and Preto, 1987). Lower Paleozoic to Mississippian rocks of the Eagle Bay Assemblage (Kootenay Terrane) underlie a significant part of the area. The rocks consist of calcareous phyllite, calc-silicate schist and skarn, or mafic metavolcanics overlain by felsic metavolcanic rocks, intermediate metavolcanics and clastic metasediments. To the north, the Permian to Devonian rocks of the Fennell Formation comprise imbricated oceanic rocks of the Slide Mountain Terrane. These consist of bedded cherts, gabbro, diabase, pillowed basalt and volcanogenic metasediments. To the northeast and northwest, mid-Cretaceous granodiorite and quartz monzonite intrusions of the Baldy Batholith and the late Triassic - early Jurassic monzo-granite and granodiorite of Thuya Batholith (Campbell and Tipper, 1971) underlie the area, respectively. The far northwestern margin of the map area is underlain by Upper Triassic Nicola Group (Quesnel Terrane) andesite, tuff, argillite, greywacke and limestone, generally in faulted contact with the rocks of the Fennel Formation.

A major north-trending fault within the North Thompson River valley separates the Kootenay and Slide Mountain terranes from the younger Quesnel terrane to the west. Eocene breccias occur sporadically along the western edge of the Thompson River valley and also at Skull Hill.

Polymetallic precious and base metal massive sulphides occurrences are hosted by Devono-Mississippian felsic to intermediate metavolcanic rocks of the Eagle Bay Assemblage. Massive sulphides are hosted in oceanic basalts of the Fennell Formation; skarn mineralization and silver-lead-zinc vein mineralization occur as numerous deposits within the Fennell Formation near the Cretaceous granitic intrusions. There are a total of 19 mineral occurrences in the study area (Figure 16-2), seven occur in the Eagle Bay Assemblage and eight occur in the Fennel Formation. There are four occurrences within the Baldy and Thuya batholiths containing Mo and Mo-Cu-Ni. In total, there are 11 gold occurrences, of which two are placer deposits.

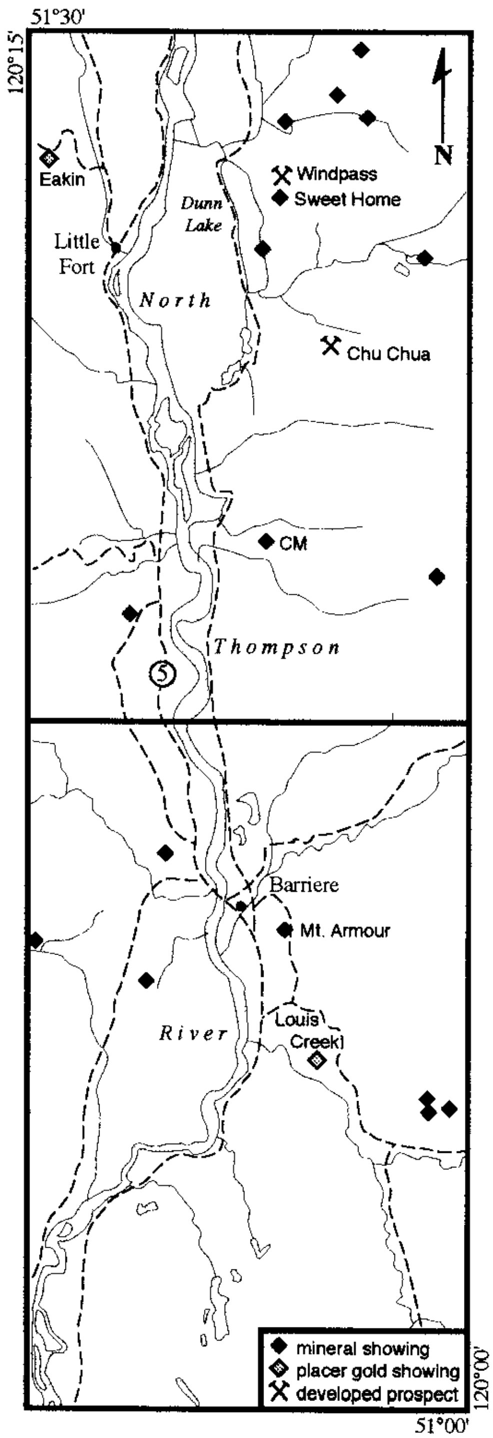

Figure 16-2. Mineral occurrence locations for NTS 92P/1E and 92P/8E from the MINFILE database.

METHODS

Fieldwork was based from one camp at Tod Mountain. Access to the map area is excellent with Yellowhead Highway #5 bisecting both the study area. There is an extensive network of logging roads except for the steeper slopes. Only in the northeast in the higher alpine areas of Baldy and Chu Chua mountains are roads infrequent and access poor.

Fieldwork was conducted with 4-wheel drive vehicles along all major and secondary roads and trails of varying condition. In some cases, traverses were completed on foot where access was blocked or non-existent. One helicopter traverse was conducted to examine large-scale features, as well as to evaluate terrain polygons that were inaccessible otherwise.

Initial work consisted of compiling and evaluating all existing terrain information available for the area. Regional Quaternary mapping completed by the Geological Survey of Canada (Tipper, 1971) and soil and landscape maps produced by the Resource Analysis Branch of the B.C. Ministry of Environment (Gough, 1987a, 1987b) provided preliminary information on the types and distribution of the surficial sediments. Air photographic analysis contributed to the regional ice-flow history through the identification of lineations and drumlinoid forms on the plateaus. Detailed local ice-flow directions were obtained by measuring and determining the directions of striations, grooves and local roche moutonnées.

Air photographic interpretation and 'pretyping' followed the methodology of the Resources Inventory Committee (1996) and the terrain classification system of Howes and Kenk (1997). Air photographs at a scale of 1:30 000 (approx.) (flight lines 15BCC-95009, 95014, 95017) were used in the map generation. Final terrain maps were produced at a scale of 1:50 000. Preliminary terrain polygon interpretations were verified through ground-truthing. Approximately seventy-five percent 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, geographic features (*i.e.* creek, cliff, ridge, plateau, etc.), type of bedrock exposure, if present, unconsolidated surface material and expression (terrain polygon unit), general slope, orientation of striations/grooves on bedrock or of bullet-shaped boulders, large scale features of streamlined landforms, elevations of post-glacial deposits (glaciofluvial and glaciolacustrine) and active geological processes.

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 colluviated till 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 and so on), depth to sample from top of soil, thickness of A and B soil horizons, total exposed thickness of the surficial unit, stratigraphy of the exposure, 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 the four categories; basal till, ablation till, basal/ablation till derived from the Baldy Batholith, or colluviated/reworked basal till. Sediment samples were sent 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. The <63 µm fraction of each sample was further divided into 10 and 30 gm 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 (inductively coupled plasma emission spectroscopy) and for major oxides by $LiBO_2$ fusion - ICP (11 oxides, loss on ignition and 7 minor elements). The larger portion was sent to Activation Laboratories, Ancaster, Ontario for INA (thermal neutron activation analysis) for 35 elements (Table 16-1).

TABLE 16-1: ANALYTICAL METHODS EMPLOYED AND ELEMENTS ANALYZED FOR TILL GEOCHEMISTRY SURVEY.

ANALYSIS	ELEMENTS
Whole Rock	SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O, K_2O, MnO, TiO_2, P_2O_5, Cr_2O_3, LOI, Ba, C, Ni, Nb, S, Sr, Sc, Y, Zr
INA	Au, Ag, As, Ba, Br, Ca, Co, Cr, Cs, Fe, Hf, Hg, Ir, Mo, Na, Ni, Rb, Sb, Sc, Se, Sn, Sr, Ta, Th, U, W, Zn, La, Ce, Nd, Sm, Eu, Tb, Yb, Lu
ICP	Mo, Cu, Pb, Zn, Ag, Ni, Co, Mn, Fe, As, U, Au, Th, Sr, Cd, Sb, Bi, V, Ca, P, La, Cr, Mg, Ba, Ti, B, Al, Na, K, W, Tl, Hg, Se, Te, Ga

RESULTS

A total of 530 field stations were examined for ground truthing during the survey. The density of the stations for the total map area is approximately one station per 1.8 km^2. A total of 352 bulk sediment samples were collected for the till geochemistry study (Figure 16-3). Samples were collected at an average depth of 1.7 metres below the soil surface. Till sample density averaged one per 2.8 km^2 for the total survey. This level of survey and sampling provides a high level of reconnaissance information for the region.

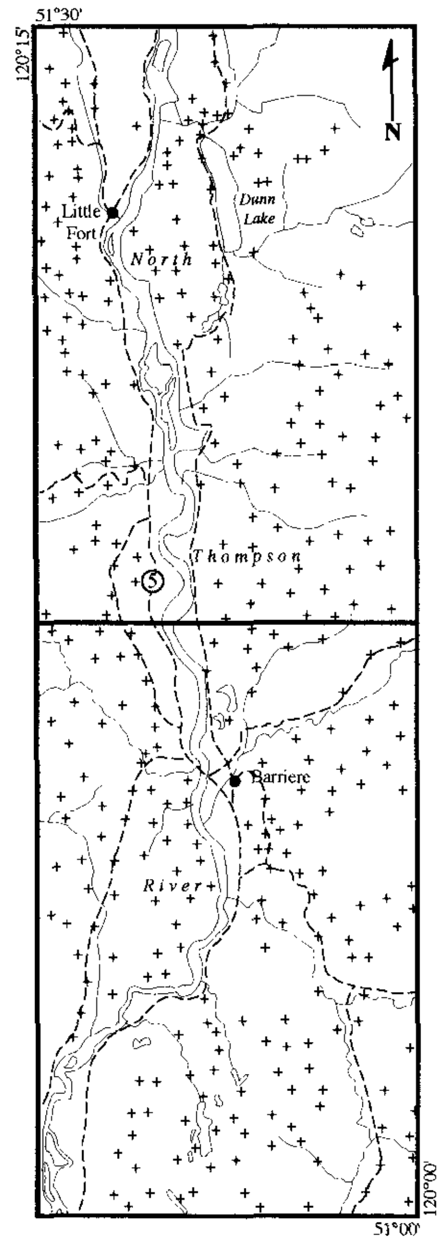

Figure 16-3. Till geochemistry 1997 survey sample sites.

Most of the samples taken for geochemical analysis were representative of basal till (M1), most likely lodgement till (Photo 16-2). Of the 352 samples, 255 or 72% represented this sediment type (Table 16-2). Ablation and basal till derived from the Baldy Batholith rocks (M3) only accounted for 2 samples or <1% of the total. Basal till which has undergone slight downslope movement was identified as colluviated till (CM). Samples of this material accounted for 9 or 3% of the total. Together these groups (76%) represent the best media to sample for drift exploration. The remaining 86 or 24% of the samples which were collected from ablation till (M2) are also valid, but more difficult to interpret. Results and interpretation of the till geochemistry survey for this study will be released elsewhere.

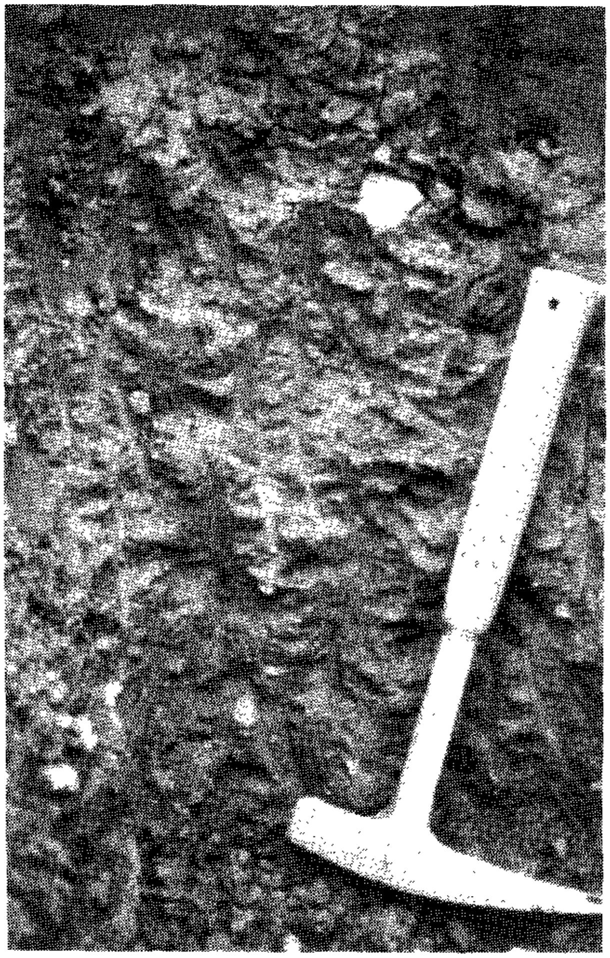

Photo 16-2. Close-up view of typical basal lodgement till commonly sampled during drift prospecting.

Previous geochemical studies in the area provide an early indication as to the style of mineralization, configuration of the anomaly plumes and regional dispersal patterns one can expect for this region. Two examples of property scale geochemical sampling from two separate occurrences, are presented here as precursors to the expected regional dispersal patterns.

At the Cedar I to VI mineral claims (MINFILE 92P 055), located eight km northwest of Little Fort and directly above Eakin Creek, soil samples taken from the C horizon illustrates two forms of geochemical dispersal patterns (Yorston and Ikona, 1985). The gold dispersal pattern shows a small, fan-shaped, down-ice dispersal pattern on the higher ground with the axis of symmetry paralleling the regional ice-flow from northwest to southeast and thus reflects a typical clastic dispersal (DiLabio, 1990). On the slopes above Eakin Creek, a secondary downslope dispersion has modified the original dispersal fan stretching the southern boundary of the anomaly. This is shown in Figure 16-4 where the gold illustrates a compound two vector configuration consisting of clastic plus hydromorphic dispersal.

TABLE 16-2. FREQUENCY DISTRIBUTION FOR DRIFT PROSPECTING SAMPLES ACCORDING TO PRIMARY GENETIC MATERIAL.

UNIT	DESCRIPTION	#	%
M1	Basal till derived from Kootenay, Slide Mountain and Quesnel terranes	255	72
M2	Ablation till derived from Kootenay, Slide Mountain Terranes and Cretaceous-Tertiary intrusions	86	24
M3	Lodgment and ablation till derived from Baldy Batholith	2	<1
CM	Colluviated/ reworked till	9	3
TOTAL		**352**	**100**

At the CM Property (MINFILE 92P 101), located 15 km north of Barriere and near the confluence of Cold and Newhykulston Creeks, soil geochemistry shows several ribbon anomalies of copper (Casselman, 1993). The dispersal pattern parallels the local ice-flow which was directed down the North Thompson River valley in the early and late stages of the Fraser Glaciation. There is little or no indication of regional dispersal to the southeast during the peak glacial period. As in the previous case, the anomaly shows secondary downslope dispersion due to hydromorphic extension (Figure 16-5).

GLACIAL HISTORY AND STRATIGRAPHY

According to Fulton and others (Fulton, 1975; Fulton and Smith, 1978; Ryder *et al.*, 1991), the present day landscape of south-central British Columbia is the result of two glacial cycles, one interglacial period and vigorous early-Holocene erosion and sedimentation. Only the latter glacial deposits and the post-glacial deposits are present in the study area. Although not necessarily present in the study area, the following lithological units and their correlative geological climate units have been identified in south-central British Columbia.

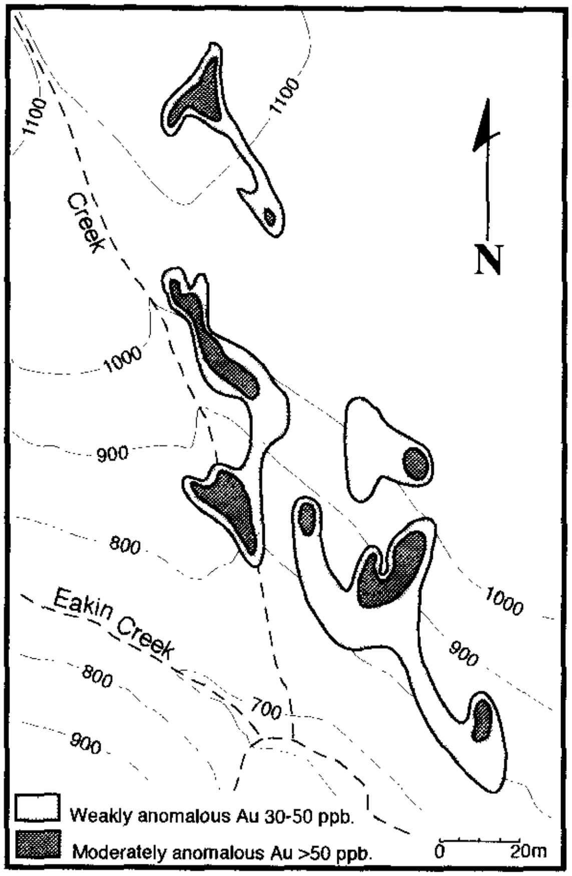

Figure 16-4. Gold soil anomaly for the Cedar I to VI mineral claims (Eakin Creek). Modified after Yortson and Ikona (1985).

Stratigraphically the oldest and identified only at two locations some 60 and 100 km to the south, are the interglacial Westwold Sediments. The deposits consist of cross-stratified gravely sand capped by marl, sand, silt, and clay, all of which are equivalent to the Highbury non-glacial interval in the Fraser Lowland (Sangamonian). Next youngest are Okanagan Centre Drift deposits, consisting of coarse, poorly stratified gravel, till and laminated silt, currently identified at Heffley Creek (20 km south of the map area), and elsewhere farther south. The sediments were deposited during the Okanagan Centre Glaciation, equivalent to the Semiahmoo Glaciation in the Fraser Lowland (early Wisconsinan). Middle Wisconsinan, Olympic Non-Glacial Bessette Sediments overlie the Okanagan Centre Drift. They consist of nonglacial silt, sand and gravel with some organic material and up to two tephras. The Kamloops Lake Drift (25.2 ka; Dyck and Fyles, 1963) 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).

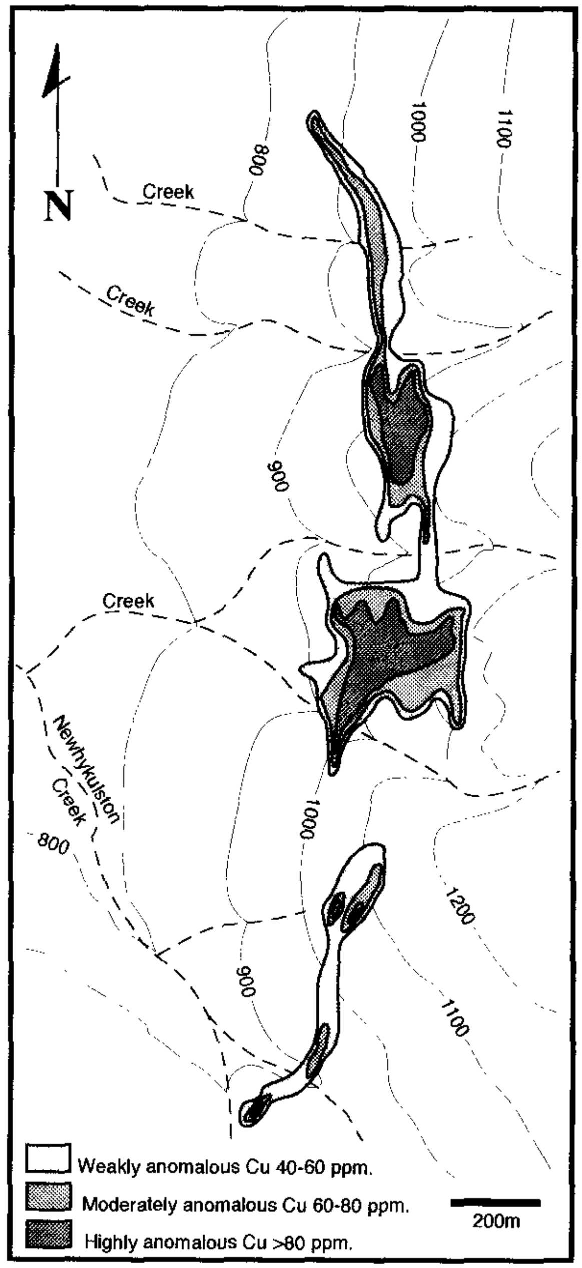

Figure 16-5. Copper soil anomaly for the CM Property (L.K.). Modified after Cassleman (1993).

An outlier of sculpted rock and erratics, possibly from the Penultimate glaciation, occurs 2500 metres above present day sea level near the northeastern margin of the map area. Rare, older striae preserved on bedrock surfaces suggest an early glacial advance from the northeast to the southwest, but there is no evidence of this in the surficial record. The surface and near-surface sediments mapped in the Louis Creek and Chu Chua Creek area directly result from the last cycle of glaciation and deglaciation (Fraser Glaciation), as well as ensuing post-glacial activity.

Fraser Glaciation

The onset of Fraser glaciation began in the Coast, Cariboo and Monashee Mountains. Valley glaciers descended to lower elevations to form piedmont lobes in the Interior Plateau and eventually coalesced to form a mountain ice sheet (Ryder *et al*., 1991). Ice sheet margins reached a maximum elevation between 2200 and 2400 metres along rimming mountains; the entire Shuswap Highland, except for perhaps Dunn Peak (2630 metres) and higher peaks to the north, was completely buried beneath an ice cap by approximately 19 ka. At Fraser Glaciation maximum, regional ice-flow was to the south-southeast, with deviations up to 45° (Fulton *et al*., 1986). Ice-flow was initially diverted down the North Thompson River valley and again diverted during deglaciation. Basal till deposits, which range widely in texture with the underlying bedrock, blanketed the land surface.

Deglaciation of the Interior Plateau was rapid; the equilibrium line rose considerably, reducing the area of accumulation for the Cordilleran ice sheet, and the ice mass decayed by down-wasting. Ablation till was deposited by stagnating ice in several high-elevation portions of the region. As uplands were deglaciated prior to low benches and valleys, meltwater was channeled to valley sides, resulting in kame terraces and ice-contact sediments that mainly occur below 540 metres elevation. Valleys clear of ice above the stagnating glaciers became areas of confinement for meltwater blocked from drainage, thereby resulting in local mantles of glaciolacustrine sediments. Observations show that these ice-dammed lakes attained a minimum elevation of 425 metres (above present day sea level). Radiocarbon dates of 11.3 ka to the north at McGillivary Creek (Clague, 1980), and 10.1 and 9.84 ka on Mount Fadear Plateau (Blake, 1986) in the southeast indicate that deglaciation began about 12 ka and that the modern drainage pattern was established by 9 ka. A minor re-advance of ice from local peaks and summits to the north occurred between 11 and 6.6 ka (Duford and Osborn, 1978).

Holocene Post-Glacial

Once ice-dammed lakes were released, melt-waters carrying heavy sediment loads deposited thick units of stratified sand and gravel in valleys. As sediment loads decreased, deposition was replaced by erosion, and water courses cut down through valley fills, leaving glaciofluvial terraces abandoned on valley sides. Following the complete deglaciation of the region, unstable and non-vegetated slopes were highly susceptible to erosion. Intense mass wasting of surface deposits on oversteepened valley slopes resulted in the deposition of colluvial fans and aprons along valley bottoms. Most post-glacial deposition occurred within the first few hundred years of deglaciation, and certainly before the eruption of Mt. Mazama, 6.6 ka, which deposited tephra near the present-day ground surface. Fluvial plain deposits and active talus slopes typify the modern sedimentation in the area.

SURFICIAL SEDIMENTS

Eight types of surficial deposit associations were defined and observed in the map area including: ground moraine (basal till), ground moraine (ablation till), colluvial, fluvial, glaciofluvial, glaciolacustrine, organic, and anthropogenic. General observations suggest the plateaus and hills are mainly covered by combinations of till, colluvium and minor glaciofluvial deposits, whereas glaciolacustrine, glaciofluvial and fluvial sediments occur mainly in the valleys. Bedrock outcrops account for less than 5% of the total map area, and these are predominately found in the northeast near Baldy and Chu Chua mountains. Anthropogenic deposits are not widespread and can be found only near developed prospects and the larger communities. Organic deposits occur locally, but in minor amounts in all types of terrain.

Basal Till

Throughout the region, the bedrock topography is mantled by variable amounts of massive, very poorly sorted matrix-supported diamicton (Photo 16-3). Deposits range in thickness from thin (<1 m) veneers to thick (>10 m) blankets. Characteristics of this diamicton suggest that it is most likely a lodgement depositional environment (Dreimanis, 1988). Basal till facies were variable with respect to the underlying bedrock, but not areally extensive enough to be subdivided into mappable units.

In general, basal till (lodgement till) deposits are primarily massive to poorly-stratified, light to dark olive grey, moderately to highly consolidated and derived from greenstone metavolcanics and metasediments of the Eagle Bay Assemblage and Fennell Formation. The matrix is fissile and has a clayey silt to a silty sand texture. Deposits are dense, compact, cohesive with irregular jointing patterns. Clast content ranges from 15-35%, usually averaging about 25%, and clasts range in size from granules to boulders (over 2 metres) averaging 1-2 centimetres. The clasts are mainly subrounded to subangular in shape and consist of various lithologies of local and exotic source. A number of clasts of have striated and faceted surfaces.

To the west and northwest, basal till in the vicinity of the Thuya River Batholith is characteristically sandier in texture and the clasts reflect the nature of the source material. Modal grain size is much higher than basal till derived from the finer-grained greenstone rocks of the Eagle Bay Assemblage and the Fennell Formation and is a result of the coarse crystals of the monzonite intrusion.

Photo 16-3. View of basal till overlying glaciolacustrine sediments.

Clast content ranges from 25-45%, usually averaging 35%, and clasts range in size from granules to very large boulders (over 4 metres) averaging 2-4 centimetres. The clasts are mainly rounded to subangular in shape and due to the nature of the source rock, are rarely striated or faceted.

Ablation Till

Massive to crudely stratified, clast-supported diamicton (Photo 16-4) occurs frequently throughout the study area. Most commonly, deposits of ablation till occur as a thin mantle overlying basal till and/or bedrock on the higher plateaus. Deposits also occur in areas of hummocky terrain where evidence of recessional ice and mass-wasting occurred during deglaciation. In contrast to the basal tills, these diamictons are light to medium grey, moderately compact and cohesive. The sandy matrix is poorly consolidated usually contains less than 5% silt and clay.

Clast content ranges from 30-60% and average clast size is 2-5 centimetres. Clast lithology is variable but often deposits are monolithologic, primarily granodiorites and monzonite derived from the Thuya River, Baldy and Raft Batholiths. Only till derived from the Baldy Batholith (M3) is considered areally extensive enough to be mapped as a separate till facies. This feature is common to the west and northeast but mixed lithologies increase in abundance gradually to the south. These diamictons are interpreted as supraglacial or ablation till deposits, resulting from deposition by stagnating glacier ice (Dreimanis, 1988).

Glaciofluvial Sediments

Deposits of massive to stratified sand, gravel and silt occur in upland valleys and as terraces in the North Thompson River valley. Deposit characteristics vary considerably from kame terraces to meltwater channels or large deltaic sequences in the lower valleys. The large glaciofluvial terraces in the North Thompson River valley primarily occur below 540 metres elevation and provide a near-maximum elevation for the northern extent of the glaciolacustrine lake that existed in the Kamloops area at the close of the Fraser Glaciation (Fulton, 1965). The coarse gravel beds range from open framework clast-supported beds to very well-stratified beds with normal, reverse or no grading exhibited. Pebble imbrication, cross-stratified beds, ripples and other structures provide evidence for paleo-stream flow. These are often interstratified with finer beds of silty sand, to coarse pebbly sand occasionally with cross-bedding. They likely represent ice-proximal to ice-distal facies deposited during deglaciation. In rare cases, eskers were observed directly east of the Bonapart Hills. These tend to be only a few metres in height and no more than 10 metres in width and trending southeasterly for a few hundred metres.

Glaciolacustrine Sediments

Along the North Thompson River, large sections of glaciolacustrine sediments form terraces above the modern day floodplain. The terraces occur below 425 metres above sea level, providing a minimum elevation of a large post-glacial lake in the valley. The exposures consist of rhythmically laminated, horizontal, tabular beds of massive to normally graded beds of fine sand, silt and clay. Ripple laminations, ball and pillow structures, and flame structures are common. Ice-rafted stones are common and the surrounding sediments exhibit penetrative structures. Individual rhythmites have sharp basal contacts and vary in thickness from a few millimetres to several tens of centimetres. Variations in deposit characteristics indicate differing proximity to the retreating ice front.

Photo 16-4. General view of coarse textured ablation till.

Fluvial Sediments

Intensive Holocene erosion has resulted in extensive fluvial deposits. Abandoned stream channels and large fluvial fans commonly occur at the edges of the North Thompson River valley. The islands and modern floodplain of this river valley comprise the majority of the fluvial deposits in the region. The entire community of Barriere is built upon a post-glacial fluvial fan. Deposits consist of clean, well-sorted and stratified sand and gravel. Clasts are well-rounded and reflect both local bedrock and older drift provenance. Fluvial deposits are mainly restricted to the lower elevations, occurring as terraced landforms or discontinuous sediment veneers over modern day floodplains.

Colluvium

The intense erosion of the Holocene and the high relief topography of the region has produced significant amounts of colluvial debris. Deposition and accumulation of colluvial sediments is a result of gravity-induced downslope movement of fractured bedrock and/or unconsolidated sediments. The source material contributing to the deposit strongly influences its character. As a result, colluvium varies from massive to crudely stratified, poorly-sorted to moderately-sorted, matrix to clast-supported, and monolithologic to polylithic. Deposits of colluvium in the region vary from a thin veneer to several metres thick and overlie all other types of surficial sediments and bedrock. Clast size ranges from granules to boulders and shape ranges from subrounded to angular, depending on source provenance. Deposits can occur as massive cones on bedrock slopes, to broad stratified fans, to a thin veneer on steep till slopes.

Organic Deposits

Organic deposits occur locally in areas of poor drainage. Deposits occur in the established islands and in abandoned oxbow channels in the North Thompson River. Organic deposits are also common around major meltwater channels, where modern day drainage is very poor. On the high plateaus, organic deposits are formed in-between the drumlinoid landforms and roche moutonnées where the bedrock topography traps surface water and forms small highland bogs (Photo 16-5).

Anthropogenic Deposits

Anthropogenic deposits consist of materials modified by human activities to the extent that their initial physical properties and surface expression are drastically altered. Such deposits occur in the mine dumps of the Windpass and Sweet Home developed prospects and within the town of Barriere as fill.

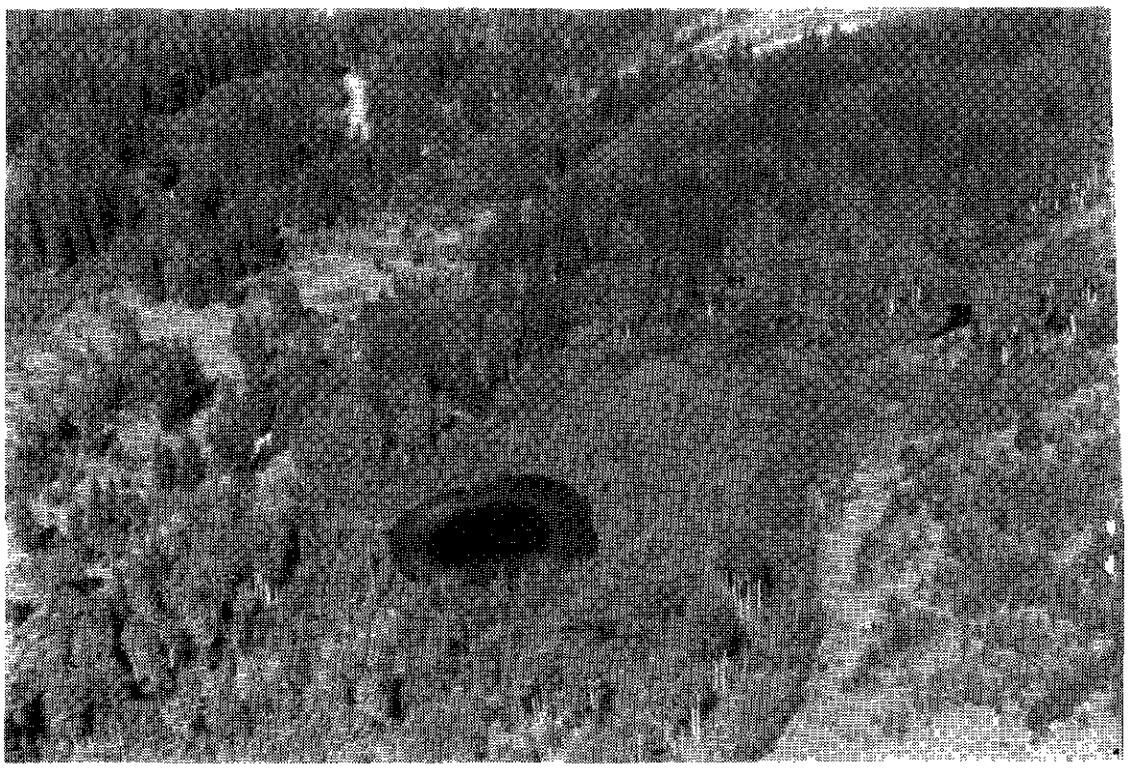

Photo 16-5. Oblique view of upland bog terrain found in lowlying areas between fluted ridges.

DRIFT EXPLORATION IMPLICATIONS

The thin drift mantling the upland plateaus and the defined valley systems provides an excellent landscape for drift prospecting. The lower-lying areas above the terraces of the North Thompson River valley have thin veneers of colluvium that are usually derived from local basal till. Basal tills in this region directly overlie the bedrock and are representative of the last glaciation to have affected the region. No sediments that predate this event were observed in the area. Thin deposits of basal tills, like that observed on the upland plateaus, usually reflect a more proximal source area for the sediments (Bobrowsky *et al.*, 1995). Basal tills are the dominate sediment type and this media has been recognized as the most ideal sampling media for drift prospecting (Shilts, 1993). If there are no complications related to multiple ice-flow directions, then a dispersal plume should reflect the last glacial event. Finally, the ice-flow direction is generally east-southeast to south-southeast over the plateau and may vary from south to southwest in the North Thompson River valley. Such characteristics provide ideal conditions for both reconnaissance and property scale drift prospecting.

Reported geochemical anomalies from known mineral occurrences indicate that the dispersal plumes conform to classic down-ice shapes, usually proximal to the source bedrock. It is expected that clastic dispersal patterns associated with any anomalous values detected from this reconnaissance survey will most likely parallel ice-flow, but may be imprinted with minor fluctuations from hydromorphic downslope dispersal. Given the nature of the sediment genesis and deposit characteristics, it is further expected that these anomalies will occur within a 100 metres from source rock. Particular care must be observed when working in the North Thompson River valley because evidence suggests ice-flow was locally diverted during the onset and retreat of the Fraser Glaciation.

CONCLUSION

A drift exploration program was initiated and completed during the summer of 1997 focusing on surficial geology mapping and till geochemistry over potentially polymetallic rocks of the Eagle Bay Assemblage and base metal and gold-bearing rocks of the Fennell Formation north of Kamloops. Two 1:50 000 scale terrain geology maps have been completed for the area, showing the type and distribution of surficial sediments present. A total of 352 samples were collected for the till geochemistry survey and subjected to ICP, INA and whole rock analysis. A total of 26 mineralized float and gossan samples were collected for analysis as well.

The landscape of the Louis Creek - Chu Chua Creek region is the product of a well-documented glacial and postglacial geological history. Although the region has experienced several glaciations, it is only the effects of the final glaciation during the Late Wisconsinan coupled with extensive modification during the Holocene that has had the most significant impact on the type and distribution of the surficial sediments in the area. Much of the area is covered by ground moraine, often veneers or thin blankets of basal till and veneers and hummocks of supraglacial till. Colluvium is the next most abundant and areally extensive surficial material. It most commonly occurs as a thin (<25 centimetres) veneer on moderate to steep till slopes and occasionally occurs as a thick colluvial fan deposit at the base of a slope and hanging valleys. Stratified outwash deposits are found in small valleys at higher elevations and as kame deltas and glaciofluvial deltas from paleo-streams that once flowed into an ice-dammed lake in the present Thompson River valley. These deltas now form terraces at a common elevation along the length of the North Thompson River and this could be useful for potential aggregate source material. Glaciolacustrine sediments are found in small areas of ponding in some of the smaller valleys and as thick deposits in the North Thompson River valley. Finally, in flat-lying areas of poor drainage, organic deposits are commonly found.

The type, character, thickness and distribution of the surficial sediments is an important element in any regional and local exploration program. The lack of bedrock exposure in some areas implies that the proper genetic interpretation of glacial overburden is essential in delimiting and understanding potential areas of mineralization. Knowledge of ice-flow history is very critical for a drift exploration program and known geochemical anomalies that exhibit classic down-ice dispersal patterns follow the regional ice flow patterns. This indicates that the local terrain is highly suitable for drift exploration studies. Local and regional ice flow patterns are readily determined in the field at the site level. The recorded showings of placer gold also warrant investigation of unknown source rock material. Integration of the surficial geology maps and this reconnaissance till survey should now be pursued at the property scale of exploration to locate potential sites of buried mineralized zones.

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