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NORTHGATE EXPLORATION LIMITED
YEAR-END REPORT 1988
GEOLOGICAL, GEOCHEMICAL SURVEYS
TIP # 1-5 Record Nos.2077-80, 2643
CLINTON M. D. B. C

BONAPARTE LAKE AREA
CARIBOO DISTRICT B. C.
CLINTON M. D.

PROJECT No.762

51 o 10 ', 120 o 45 '

NTS 92 P/2

REPORT BY:

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EXECUTIVE'S SUMMARY

The TIP-TOP property is an optioned gold prospect situated in a road accessible area in the Cariboo region of British Columbia.

The property straddles the northern and eastern margins of an apparent resurgent caldera of Upper Triassic age. An epithermal style mineralizing environment containing geochemically anomalous gold at 200 ppb has been identified in the caldera wallrock near the margin of the caldera. Geochemically anomalous gold is associated with vuggy and intensely silicified rhyolite and granitic crackle breccias of Tertiary age emplaced in a Cretaceous granodiorite cupola. The exposed mineralization is inferred on textural grounds to be structurally high in the system. The only exposure of the mineralized structure, measures 1.5 m by 4.5 m. There is a suggestion in a nearby outcrop that the zone could be up to 5 m wide. This structure was also reportedly encountered in an in-filled trench about 25 m to the NNE of the present exposure where it is said to have been wider. This structure trends sub-parallel to an inferred radial trend. About 250 m away, and approximately on strike, a soil sample is rated as PROBABLY ANOMALOUS at 60 ppb Au.

Systematic soil sampling generally of a reconnaissance nature has indicated 15 areas of elevated gold in the 1988 grid area. Anomalies are indicated variously on the caldera margin and over the caldera wallrock. Four of these are rated as ANOMALOUS with +84 ppb Au (values from 210 to 480 ppb Au) and 11 are rated as POSSIBLE ANOMALOUS with values from 25 to 70 ppb Au. There are geological reasons to consider values of 20 ppb as significant. Most of gold "hits" are one-point highs but they are considered significant in view of large line spacings, maximum 400 m.

A field program estimated to cost $100,000 is recommended. The objectives are: 1. To indicate drill targets in the principal showings area by means of back-hoe trenching, geological mapping and sampling, 2. To define targets for back-hoe trenching or geophysical surveys by means of detailed soil sampling elsewhere in the 1988 grid area, and 3. To indicate by reconnaissance soil sampling and mapping, areas of interest in the unsurveyed eastern caldera margin. To date, about 5 km of caldera margin has been mapped and reconnaissance sampled. This is about half of the indicated length of caldera margin in the property.

Epithermal precious metal environments are widely associated with the margins of collapsed and resurgent calderas such as those of the San Juan Volcanic field in Colorado. The mineralization is typically much younger than caldera volcanism and unrelated to it. The deposits usually occur as veins and breccias. These systems tend to concentrate in the caldera margins presumably because of ground preparation related to caldera collapse. The systems also occupy radial fractures which may extend many kilometers into the wall rock. An examples of the latter is the Red Mountain district of the Silverton caldera where a series of radial veins extend more than 10 km into the caldera walls. At Creede Ag-Au deposits are associated with faults in a complex graben which extend radially north-northwest of the Creede caldera. Rich gold deposits occur in the Cripple Creek camp, Colorado. The descriptions of these old producers suggest an affinity to the margin of a resurgent caldera involving syenitic rocks, among others. The Portland, the Vindicator and the Cresson Mines each produced over 2 million oz. of gold from gold telluride vein and collapse breccia deposits. Some of these deposits were characterized by small plan dimensions but had very large vertical extents. The Cresson Mine (Blowout), a breocia pipe, was mined to a depth of 2400 feet.

The results to date are very encouraging and the potential is regarded as high. The elements of an ore making system are definitely present and abundant space for ore exists. The dearth of outcrop makes finding ore challenging. Soil geochemistry is likely to be a key element in discovery. We are attempting to increase the penetration of our geochemical approach by using biogeochemistry with bark as a medium. This method has good potential and has been shown to work. The abundance of geochemical anomalies in the caldera margins indicates potential for several mineralizing zones. Radial trends extend up to 5 km into the wallrock of the indicated caldera. We have two strong soil anomalies (280 and 400 ppb) which are situated in the caldera wallrock well away from the margin near a radial trend. In addition, there is a 1 km wide by 4 km long strip of land in the northern parts of the property well away from the caldera margin on which potential for gold deposits in radial fractures exist. This area should be soil sampled at a later date after areas of known mineralization have been activated.

Key sections of report: Photographs p.19-24, Recommendations, Regional and Property Geology, Table 1 (p.32), Table 3.(p.36), Biogeochemistry (p.39,40: ROD ZONE) and Section 13.0

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1.0 INTRODUCTION

The purpose of this report is to describe and interpret geological and geochemical surveys conducted in 1988 on TIP # 1-5 mineral claims situated in southwestern British Columbia in the Bonaparte Lake area about 55 km northwesterly of the City of Kamloops. This property is in the preliminary exploration stage for gold deposits. The presently indicated potential is for epithermal deposits associated with granitic and rhyolite breccias probably of Tertiary age. The principal showings appear to be structurally high in the system.

Several features of the local geology and geophysics point to the possible existence in the property area of a resurgent caldera of Upper Triassic age. Proximity to a caldera margin is a favorable structural environment for epithermal mineral deposits. Deposits of this type are often controlled by radial and concentric fractures. The TIP-TOP property straddles the northern and eastern margins of the proposed caldera covering two segments totalling about 10 km out of an overall total of 27 km of caldera margin.

The property lies in the southern part of the physiographic region known as the Cariboo Plateau (GSC Map 1701 A). Access is by road from either the Cariboo Highway in the west by way of Loon Lake, a distance of about 60 km, or from the Trans Canada Highway in the south via Deadman River, a distance of about 65 km. Nearly half of the distance from the Cariboo Highway is paved and the other access is good gravel road with minor pavement.

TIP #1-6 and TOP #1-6 are contiguous 4 Post Claims totalling 181 Units. The largely drift covered property area was probably first prospected for gold in the 1930's. The Vidette Mine (Cockfield, 1935), situated about 7 km to the west of the TIP claims was found and developed at that time. The little known Telluric Mine (Stevenson, 1936) indicated by a shaft about 1 km south of TIP #4 mineral claim (Plate 4b) was also found at this time. The Vidette Mine produced 29,869 oz. Au and 46,573 oz. Ag from 53,900 tons of ore (MEMPR Prelim. Map 64. Tabulation). Gold production in the Vidette came from narrow quartz veins. Vidette closed in 1940. The Telluric had supplied an unknown, but probably small, amount of hand-cobbed ore to its owner Vidette Lake Gold Mines Ltd. (Mike Dickens, pers. comm.).

During the course of the construction of the so-called 3800 Road by Ainsworth Lumber in 1986, large blocks of vuggy, silica healed, crackle breccia were dislodged from shallow bedrock in a road cut. Michael Dickens found this material while the roadwork was in progress. He recognized its epithermal character and staked the ground. Northgate examined the prospect in the spring of 1988

PLATE 1

LOCATION MAP

*   TIP-TOP PROPERTY

(Bruaset, 1988). The intensity of silica alteration, trace element geochemistry, and brecciation indicated potential for epithermal gold deposits. The TIP grid covers an area of about 10 square kms and contains about 47 kms of lines. TIP #1- 5 were mapped geologically to the scale of 1:5000 (PLATES 4a, 4b), with 1:500 coverage in the showings area (PLATE 5). About 500 soil samples, with additional rocks and biogeochemical samples were collected (PLATES 5, 6a, and 6b).

The need for ongoing exploration on the TIP -TOP claims is clearly indicated by the results to date. Back-hoe trenching in the main showings is expected to develop drill targets and detailed soil sampling should be done to define existing anomalies more closely. The TOP claim group requires systematic soil sampling and mapping to explore indicated targets (Plate 8, Section 13.0).

2.0 SUMMARY

Geological mapping indicates at least three, and possibly four igneous events between Upper Triassic and Tertiary time in the TIP claim area. The magmatic rocks include Upper Triassic augite andesite and monzodiorite, diorite and quartz diorite. The Upper Triassic rocks exposed generally exhibit a penetrative fabric which includes mylonitization. This fabric trends easterly to northeasterly. The Upper Triassic rocks have undergone uppermost greenschist or amphibolite facies metamorphism. The metamorphic grades indicated attest to the once deep burial of these rocks. Their current crustal level was probably achieved either through thrust or block faulting or both.

Soil geochemical sampling has indicated several one point highs in gold ranging from 210 to 480 ppb as well as a large number of lesser elevated values in the range 20-70 ppb. These require detailed sampling for more precise definition. At present, several of the gold highs are indicated at 50 and 100 m sample spacings on lines spaced at 200 and 400m (PLATES 6a, 6b).

Geochemically anomalous gold in rock up to 200 ppb occurs in association with a northnortheasterly trending siliceous monolithic granitic breccia of probable Tertiary age. Associated alteration and textures are indicative of a high structural level in an epithermal system (PLATE 5, APPENDIX 1 and photographic views).

A number of precious metal showings are reported from the TOP claims. These variously contain anomalous precious metals, indicator elements and structures generally exposed in pits dating back to the 1930's. In one instance, an occurrence of 0.3 oz./ton gold is reported in a soil sample collected in a recent program on a adjacent property near the southwestern corner of TOP #1 (Section 13.0).

3.0 RECOMMENDATIONS

COMPILATION :

Extensive data from adjoining areas is available in assessment reports. Compilation of this and other data may indicate new areas of interest and firm up the exploration model. The caldera model provides a framework for such a compilation and presently gives Northgate a competitive advantage.
Estimated cost: $6000.

FIELD:

A program of back-hoe trenching, follow-up soil sampling, reconnaissance soil sampling, ground magnetics and geological mapping is recommended as follows at a total estimated cost of $ 100,000.

1. Back-hoe trenching, sampling and mapping in the showings area as per PLATE 5. with the objective of defining drill targets.

2. Fill-in soil sampling of the 1988 grid to better define area of elevated gold in soil in the ANOMALOUS and PROBABLY ANOMALOUS categories (PLATES 7a, 7b). The objective would be to define targets for back-hoe trenching or geophysical follow-up. Prior to embarking on the proposed sampling program which is indicated by dashed lines on PLATES 7a and 7b, sufficient detailed sampling should be done on short east-west oriented grid lines to determine if caldera-relative radial geochemical trends are present in the area of the four ANOMALOUS sample sites. If such trends are in fact dominant, than the north- south oriented follow-up grid on these plates should be changed to east-west lines. The solid east-west sample lines (situated 50 m north and 50 m south of ANOMALOUS sites) should be sampled every 10 m. The same sample density should be obtained for 50 m north and 50 m south of the existing ANOMALOUS sites.

3. Systematic sampling at 100 m on 400 m spaced lines as shown on PLATE 8 with the orientation of sample lines on TIP #5 and 6 contingent on the trends indicated in section 2. above.

4. In addition to the foregoing, it is recommended that the 150 m by 1700 m strip of open ground situated between TULERIC and TOP #3 and 4 be located. This area lies on the margin of the inferred collapsed caldera.

4.0 PROPERTY

The TIP-TOP Property consists of a total of 12 contiguous 4 Post Claims which are registered in the name of Michael Dickens, resident of Savona B.C. Relevant claim information is listed below (PLATES 2, 8). PLATE 9 shows the GNOME and YARD claims. Inco is exploring these under the terms of a 1988 option agreement with Chevron and Mike Dickens. As advised earlier, YARD 4-6 were located recently, probably for Inco's protective purposes. It is understood that the ground between TIP # 5 and 6 and YARD 4 and 5 is still open.

CLAIM NAME	RECORD NUMBER	DATE RECORDED	UNITS
TIP #1	2077	20 Oct. 1986	16
TIP #2	2078	"	18
TIP #3	2079	"	16
TIP #4	2080	"	12
TIP #5	2643	18 Jul. 1988	12
TIP #6	2644	"	8
TOP #1	2637	"	20
TOP #2	2638	"	15
TOP #3	2639	"	20
TOP #4	2640	"	12
TOP #5	2641	"	20
TOP #6	2642	"	12

			181

Note 1: A 150 m by 1700 m strip of land occurring between TULERIC M. C. and TOP # 3 and 4 should be staked. This ground is open by virtue of non-recording of FLY whose staking commenced July 7, 1988 and was completed on July 8, 1988. We do not know why this ground was not recorded. Most of the area that would otherwise have been staked as FLY was located as TULERIC (owner M. Dickens). The latter was staked on July 9, 1988. TULERIC succeeds FLY under the Mineral Act in existence prior to August 15, 1988. Dickens has held the Telluric prospect previously under the claim name TUL located 27 May 1986.

Note 2. Gail # 1-8 M.C. were in good standing at the time of the commencement of the location of TOP # 3 and 4 but had forfeited prior to the completion of the latter claim. Under the Mineral Act then in existence, the TOP claims assume portions of the former claims.

5.0 LOCATION, ACCESS AND PHYSIOGRAPHY

The TIP-TOP Property is shown on Plate 1 in relation to major population centers in B.C. A good access route to the property is by Loon Lake road which is paved to the east end of that Lake. From Loon Lake to the property is about 40 kms. by way of Loon Lake Road, the 3400, 3200 and 3800 Roads of Ainsworth Lumber. An alternate access to Kamloops may exist from the south end 3800 road through the head-waters of Deadman River. A portable bridge was used by Ainsworth Lumber while logging south of Deadman River (PLATE 2). The Forestry had apparently required that the Ainsworth bridge be removed on completion of logging to discourage through traffic from Kamloops to the Cariboo. It is reported that a series of logging roads built by the Kamloops area sawmills were close to linking up with the 3800 Road which serves the Clinton mill.

The terrain in the TIP-TOP property area is flat to gently rolling with elevations ranging from 1158 m (3800 ft.) to about 1433m (4700 ft.) PLATE 2.

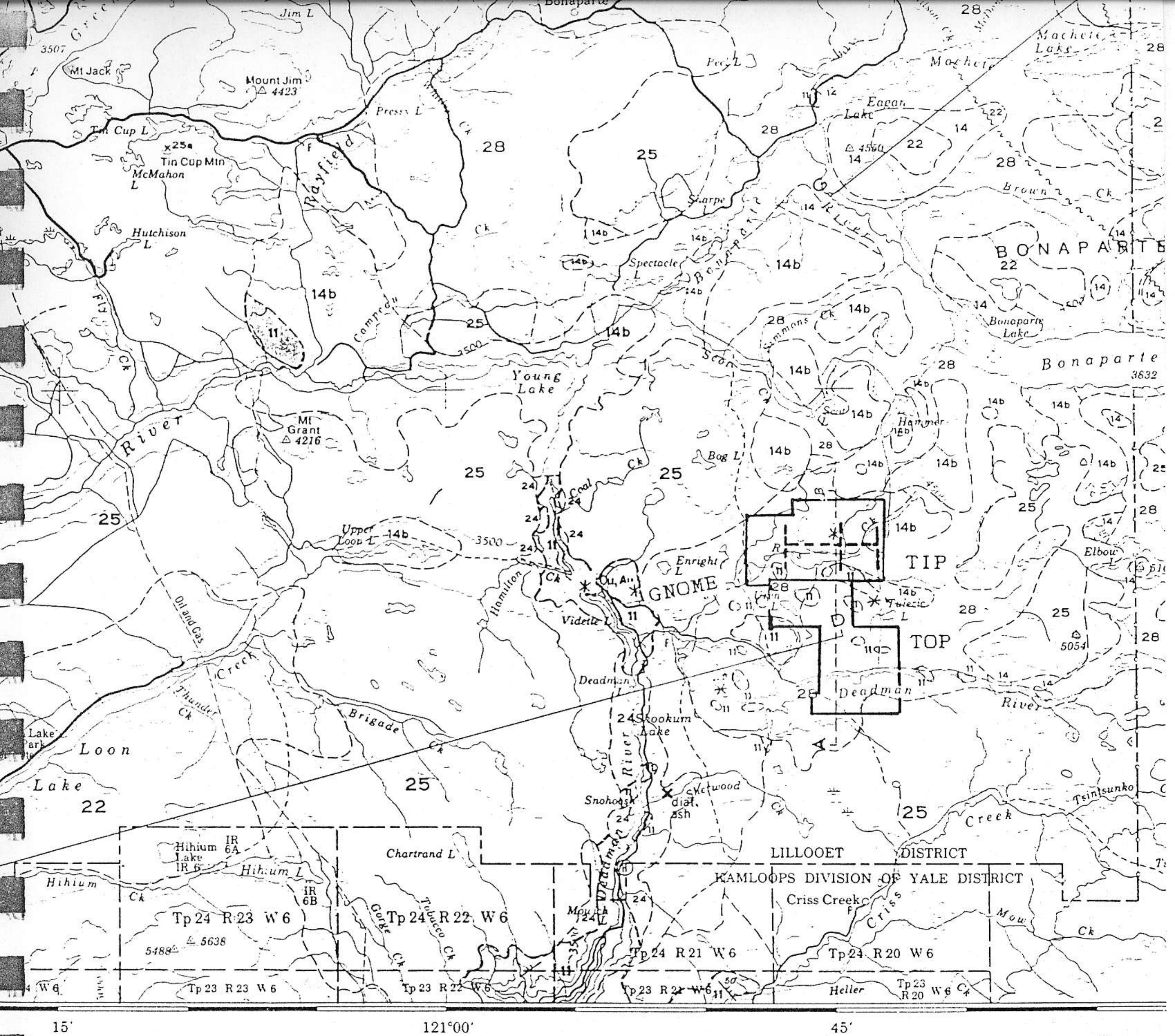
Glacial striae trend SSE -NNW near the center of PLATE 5. However, the direction of ice movement is not given by these. Campbell and Tipper, 1971,(Fig 2), indicate that the ice sheet moved towards the SSE. Glacial features such as meltwater channels and a kettle were recognized in the grid area (PLATE 4a). The depth of overburden is unknown but thought not to be very great because several outcrops and sub-outcrops occur near the center of the valley of Joe Ross Creek. Most of the property area is covered by till which limits detection by soil sampling. Fine sandy soil, probably derived from intrusive terrain to the north, and overlying till, is widespread in the grid area particularly north of Joe Ross Creek.

6.0 REGIONAL GEOLOGY

The TIP-TOP Property lies in the southwestern Intermontane Belt. Among the oldest rocks in the Belt are the Upper Triassic andesitic and basaltic volcanics of the Nicola Group which are thought to have been extruded from volcanic centers located on island arcs (Price and Douglas, p.19). U. Triassic volcanic centers probably existed above batholiths such as the Thuya and the Takomkane both of which lie on a postulated arc extending through the property area and connecting with epizonal to mesozonal plutons of this age such as Guichon Batholith and the Copper Mountain stock situated to the south. The Upper Triassic Nicola volcanics have generally undergone regional metamorphism of the lower greenschist facies. The G. S. C. Bonaparte sheet (Map 1278 A, PLATE 3) is the principal regional geologic reference. According to PLATE 3, the Upper Triassic volcanics of the TIP-TOP property are part of a large window of such rocks in a field of Miocene plateau lava. Underlying the Miocene volcanics, which are essentially undeformed, are the highly deformed Eocene rocks of the Skull Hill Formation. These are equivalent to the Kamloops volcanics found in the Kamloops -Savona area and mapped in detail by Tom Ewing (Ewing, 1977). They consist of dacite, trachyte, basalt, andesite, rhyolite and related breccias. Large areas situated to the west and northeast of the TIP-TOP property are underlain by the Skull Hill rocks (PLATE 3). We assume that rhyolite in the TIP claims (Unit 6, PLATE 5) belongs to that formation because it contains the only known rhyolite in the local stratigraphic column.

The southwestern Intermontane Belt is structurally complex. The area has been subjected to four periods of deformation ranging from pre-Middle Jurassic to Late Cretaceous-Early Tertiary. The latest deformation is related to dextral shearing along the regional Fraser Fault system in which 70 to 90 km of offset are recorded (Monger, 1985 and Monger et al, in print for DNAG). This deformation has affected the entire southwestern Intermontane Belt. Accompanying regional extension, has produced a system of horsts and grabens. Horsts exposed older structural levels including high grade metamorphics and grabens received Eocene volcanics and sediments. The high grade metamorphics exposed in the TIP-TOP constitutes a previously unreported core complex in the Belt.

The foregoing window of Upper Triassic rocks in which the TIP-TOP property has been located contains striking concentric and radial lineaments which are readily apparent on the 1:50,000 topographic map of the area. Patterns of this type are characteristic of collapsed calderas and proximity to the margins of such structures carry positive connotations in terms of potential for epithermal mineral deposits. The calc-alkaline calderas in the San Juan volcanic field in Colorado abound with examples of mineral deposits situated in caldera margins. Such calderas contain base and precious metal deposits which are typically much younger than the caldera forming volcanism and not genetically related to it (Rytuba, 1981). Mineralization is related to hydrothermal activity centered in the caldera margins partly as a result of the ground preparation created by the caldera collapse. This fracturing is not restricted to the caldera margin but can extend for kilometers out into the caldera wallrock along radial fractures. A case in point is the Red Mountain district located in the San Juan volcanic field near the Silverton caldera. This district consists of a series of radial veins which extend in excess of 10 km out into the caldera wall. In this case ore deposits are 10 to 17 million years younger than the caldera volcanism and genetically unrelated to it (Rytuba, 1981). A second derivative interpretation of the existing government aeromagnetic map for CRISS CREEK, Map 5222G, has been made (PLATE 10). This filtering technique describes the relative amount of change between the value at a point and its nearest neighbors (Pettipas, 1988). The resulting pattern is most striking and interesting. It consists of concentric and radial trends centered on approximately the same area as the pattern on PLATE 9 but is more extensive. Overall, the second derivative pattern is only partly consistent with that expected in a collapsed caldera. The concentric and radial patterns on the caldera MARGINS and outside would be quite in order but the same pattern INSIDE the caldera would be difficult to account for without resurgence. If the caldera were to become resurgent, the resulting upward directed force of magma could be expected to enhance preexisting concentric and radial fractures in the caldera wall and could produce a similar pattern within the resurgent dome itself (Jack Souther of the G. S. C., pers. comm.). In view of the foregoing we consider the collapsed caldera model as a first approximation exploration model for this area. The position of the caldera margin is an all important question. It is most likely indicated by the maximum degree of radial and concentric fracture development. It is probably best approximated by the lineament interpretation (PLATE 9). Structures, textures and alteration, typical of epithermal environments occur in the central part of the TIP grid. The attitudes of mineralized structures in the TIP showings area and in the Telluric vein system are essentially those of the local radial fractures (PLATE 9). Some other geological features that are significant in this model include intrusive activity with associated gold in the caldera margin southwest of Semlin Lake (PLATE 9). Also to the west of the caldera margin on the Chevron GNOME property occur highly silicified intrusives which the author has long suspected to be of Tertiary age. The caldera model provides a structural framework whereby it may be possible to tie together the geology of these various outlying areas. Examples of collapsed caldera gold deposits occur in the Cripple Creek camp, Colorado. These deposits were described (Loughlin and Koschmann, 1935) long before the terms collapsed and resurgent calderas were coined. There appears to be little doubt that the related volcanic structure is a collapsed caldera. Ore deposits are localized within or at the margin of subsidence basin or crater. According to Lindgren, 1933, the deposits are veins which are controlled by radiating fissures believed to have resulted from settling of a volcanic mass. Other mineralized structures reported include collapsed breccias. The principal producers were the Portland Mine (3.75 M oz. Au), the Vindicator (2.2 M oz. Au) and the Cresson (+2 M oz. Au) Elevatorski, 1982. Boyle, 1979, describes Cripple Creek.



MAP 1278A

GEOLOGY

BONAPARTE LAKE

BRITISH COLUMBIA

Scale 1:250,000

Miles 4 0 4 8 12 Miles

Kilometres 6 0 6 12 18 Kilometres

PLATE 3

REGIONAL GEOLOGY

* Au

MESOZOIC

TRIASSIC OR JURASSIC

RHAETIAN OR HETTANGIAN

14 — *THUYA AND TAKOMKANE BATHOLITHS AND SIMILAR GRANITIC ROCKS: hornblende-biotite quartz diorite and granodiorite. minor hornblende diorite. monzonite. gabbro. hornblendite* 14a. *diorite and syenodiorite.* 14b. *leuco-quartz monzonite and granodiorite*

13 — 13a. *fine- to medium-grained. pink to brown and grey syenite and monzonite;* 13b. *medium-grained. creamy-buff. locally coarsely porphyritic (K-feldspar) syenite and monzonite*

TRIASSIC

KARNIAN AND NORIAN

NICOLA GROUP

11 — *Augite andesite flows and breccia. tuff. argillite. greywacke. grey limestone;* 11a. *includes minor 3 and 10*

10 — *Black shale, argillite. phyllite. siltstone. black limestone*

PERMIAN AND/OR TRIASSIC

9 — *Serpentinite and serpentinized peridotite*

LATE PERMIAN (?) EARLY AND/OR MIDDLE TRIASSIC

PAVILION GROUP (7, 8)

8 — *Tuff, chert, argillite. limestone. greywacke. andesitic and basaltic flows*

7 — *Chert. argillite. siltstone; minor tuff and limestone*

PALEOZOIC

PERMIAN

GUADALUPIAN

CACHE CREEK GROUP (4 to 6)

6 — *MARBLE CANYON FORMATION: massive limestone. limestone breccia and chert; minor argillite. tuff. andesitic and basaltic flows*

WOLFCAMPIAN TO GUADALUPIAN

5 — *Argillite. basaltic flows. tuff. chert. limestone*

4 — *Basic volcanic flows. tuff. ribbon chert, limestone. argillite*

12 — 12a. *quartzite. quartz-phyllite. quartz-granule conglomerate. argillite. phyllite. calcareous phyllite. marble. greenschist. greenstone;* 12b. *dark grey and black argillite. siltstone. phyllite. minor limestone (Metamorphic equivalents 1. 2. 3. 10)*

PENNSYLVANIAN AND PERMIAN

MORROWAN TO GUADALUPIAN

3 — *Volcanic arenite. greenstone. argillite. phyllite; minor quartz-mica schist. limestone. basaltic and andesitic flows. amphibolite. conglomerate and breccia; includes small bodies of 16a*

MISSISSIPPIAN AND/OR LATER

SLIDE MOUNTAIN GROUP

2 — *FENNELL FORMATION: pillow lava flows. greenstone. foliated greenstone. greenschist. argillite. chert. minor amphibolite. limestone. breccia*

PROTEROZOIC (?)

WINDERMERE OR CAMBRIAN AND LATER

KAZA OR CARIBOO GROUP

1 — *Feldspathic quartz-mica schist. locally garnetiferous. micaceous quartzite. black siliceous phyllite. quartz-hornblende-mica schist. marble. chlorite schist. greenstone. amphibolite*

SHUSWAP METAMORPHIC COMPLEX

CENOZOIC

QUATERNARY

RECENT

29 *Blocky basalt flows*

PLEISTOCENE AND RECENT

28 *Till, gravel, clay, silt, alluvium, (few if any bedrock exposures)*

PLEISTOCENE OR RECENT

27 *Basaltic cinder cone (incorporates cobbles of older rocks)*

TERTIARY OR QUATERNARY

PLIOCENE OR PLEISTOCENE

26 *26a, basaltic arenite, conglomerate breccia, rubble, basaltic flows, locally pillowed; 26b, extinct basaltic volcanoes, basaltic flows and cinder deposits*

TERTIARY

MIOCENE AND/OR PLIOCENE

25 *Plateau lava: olivine basalt, basalt andesite, related ash and breccia beds; basaltic arenite; 25a, olivine gabbro plugs*

MIOCENE

24 *DEADMAN RIVER FORMATION: shale, sandstone, tuff, diatomite, conglomerate, breccia*

OLIGOCENE

23 *Andesite, dacite, felsite, related tuff and breccia; greywacke, shale; minor lignite and conglomerate*

EOCENE AND (?) OLIGOCENE

KAMLOOPS GROUP (21, 22)

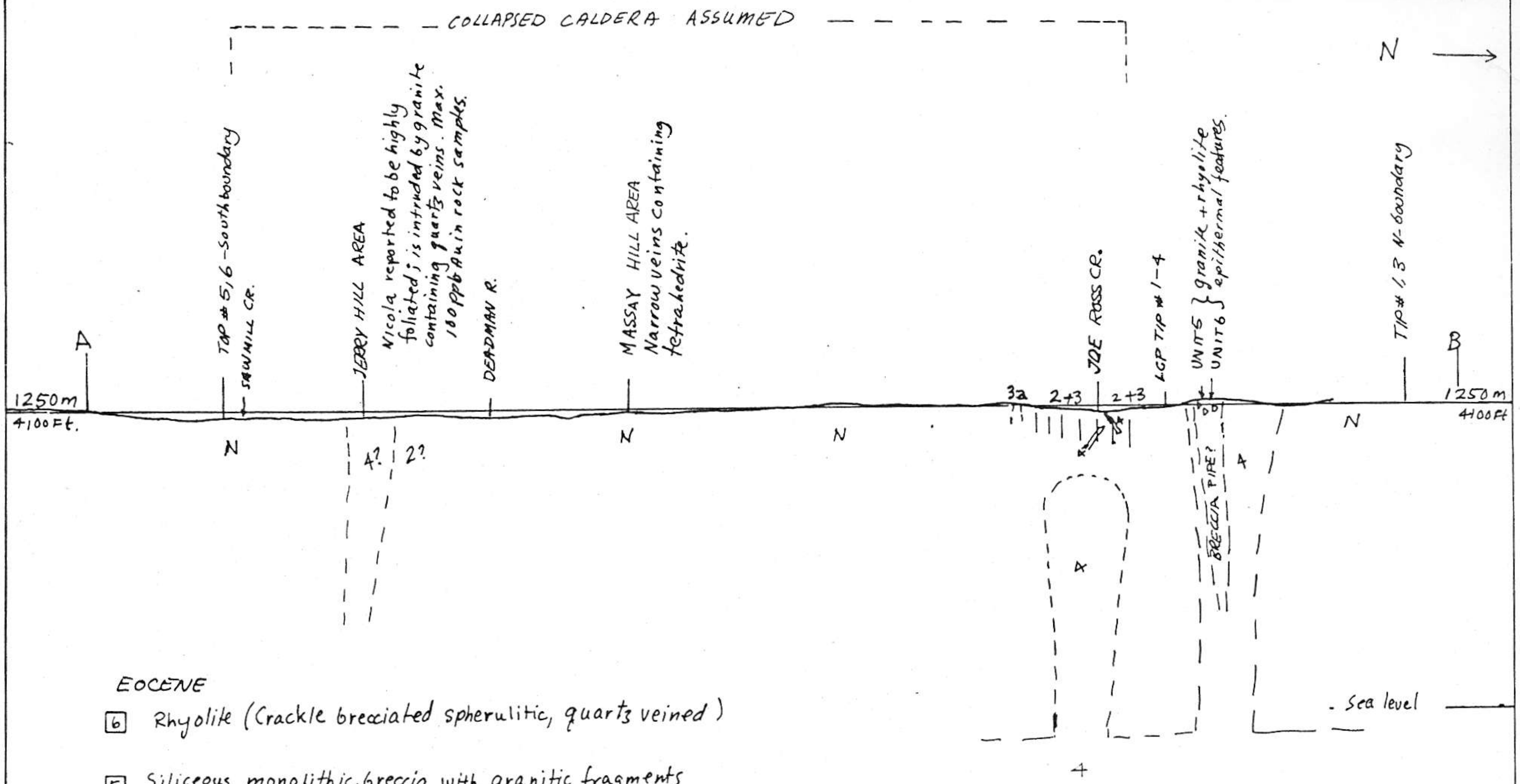
22 *SKULL HILL FORMATION: dacite, trachyte, basalt, andesite, rhyolite, related breccias*

EOCENE

21 *CHU CHUA FORMATION: conglomerate, sandy shale, arkose, coal*

CRETACEOUS

20 *RAFT AND BALDY BATHOLITHS AND SIMILAR GRANITIC ROCKS: biotite quartz monzonite and granodiorite; minor pegmatite, aplite, biotite-hornblende quartz monzonite; 20a, quartz diorite, diorite, granodiorite (may include some*



EOCENE

6 Rhyolite (Crackle brecciated spherulitic, quartz veined)

5 Siliceous monolithic breccia with granitic fragments

CRETACEOUS(?)

4 Granodiorite (massive)

UPPER TRIASSIC

3 Quartz monzodiorite, quartz diorite (both foliated)

3a Diabasic textured hornblende diorite

2 Amphibolitic Nicola; strong fabric

N Nicola; unclassified

||| Fabric in Unit 2, 4/|| Dyke cutting fabric in Unit 2, ΔΔ brecciation

CROSS SECTION 120°45'

SECTION LINE ON PLATE 3

GEOLOGY BASED ON MAPPING IN 1988 AND PROSPECTING REPORTS BY M. DICKENS

0 500 1000 2000 3000 m

1: 50,000

PLATE 3a

7.0 PROPERTY GEOLOGY

Geological mapping of TIP #1-5 at a scale 1:5000 has been completed (PLATES 4a, 4b). Coverage at a scale of 1:500 is available for the discovery area where a number of granitic "crackle breccias" are exposed (PLATE 5). Plutonic rocks have been grouped according to the IUGS Streckeisen classification (Figure A). Detailed descriptions of the rocks are found in Appendix 1.

All rocks exposed in the TIP property are of magmatic origin. They represent at least three, or possibly four, magmatic events commencing with late Upper Triassic Nicola volcanics of andesite-basalt composition (Unit 1). The U. Triassic volcanics of the area are known to be variously alkaline and sub-alkaline. Major element chemical data relevant to the current claims are given in Appendix 4. These data have been plotted relative to the dividing line of Irvine and Baragar, 1971, as well as on an AMF plot, Figures B and C, respectively. The local Nicola rocks are sub-alkaline and plot near the dividing line.

Small exposures of rhyolite and brecciated granite in the showings area (PLATE 5) are thought to be the Eocene and (?) Oligocene Skull Hill Formation of the Kamloops Group (Units 5, 6). Insufficient exposures of these rocks exist to enable them to be traced to the west or NE where large areas of Skull Hill Fm. are indicated on the attached regional geological map (Plate 3).

The relative ages of the other magmatic rocks in the TIP property are known from cross cutting relationships. For instant, dykes of granodiorite composition (Unit 4) in the east central grid area cut Units 2 and 3 (PLATE 4b). A fault trending NE is inferred from the apparent lack of continuity in a plagioclase quartz porphyry felsite dyke (PLATE 4b, Unit 6b) outcropping on the SE side of a strong lineament and granodiorite dykes occur on the NW side of the same structure. The fault could have the same attitude as the fabric in Unit 2. Granodiorite dykes cut the fabric in two locations in the valley of Joe Ross Creek. Major element chemical analyses of granodiorites from the three outcrop areas north and east of Joe Ross Creek cluster tightly in the sub-alkaline field on Figure B . On the AMF plot (FIGURE C), granodiorites (Unit 4) cluster well apart from quartz monzodiorites of Unit 3. The chemistry of Units 3 and 4 supports their classification as distinct rock units. The extent of granodiorite cannot be determined based on existing outcrop. Granodiorite here is thought to form several cupolas at least one of which has been intruded by rhyolite. Other cupolas are probably present in this largely drift covered area. Possibly this cupola and others could be outlined by ground magnetics.

Appendix 1 of this report contains a petrographic study carried out by Charles Greig. This work has improved our understanding of the complex structural, metamorphic and magmatic history of the TIP claims. The principal inferences made from Greig's study are listed below. [Greig is currently completing a M. Sc. thesis on the Eagle plutonic complex in southern B.C. (Greig, 1988, in CURRENT RESEARCH).]

1. The monzodioritic - amphibolitic rocks have reached uppermost greenschist facies (epidote - amphibolite facies) or amphibolite facies with temperatures in the range 450 to 600 o C. and pressure greater than 3 kbar. which is approximately equivalent to that at a depth of 9 km.

2. The Upper Triassic volcanics are the probable protoliths as suggested by clinopyroxene porphyroclasts in some of the amphibolites and the dominance of clinopyroxene porphyries in the Nicola Group.

3. The Nicola rocks are indicated to have been strained prior to or during the metamorphic event. Coplanar fabric in both the amphibolite and the monzodiorite suggests the deformation affected both. However, the discordant nature of some monzodiorite apophyses indicates that the metamorphic rocks had a fabric prior to the monzodiorite emplacement. Accordingly, two periods of deformation may be indicated, one pre and one post- monzodiorite, or a single event overlapping monzodiorite emplacement in time.

4. Ductile deformation textures (as opposed to fabrics) in the amphibolite and monzodiorite are either annealed or are weakly developed suggesting the deformation occurred at relatively high temperatures or that subsequent metamorphism has largely erased textural evidence of deformation.

5. Relatively high temperature syn-intrusive deformation is suggested by the lack of chilled contacts, coplanar fabrics in amphibolitic inclusions and monzodioritic hosts, and the close spatial association of the amphibolitic Nicola rocks with the plutonic rocks of Unit 2.

Metamorphic rocks of the grades note in the TIP could have formed under shear at the base of the Nicola with uplift due to block faulting. Metamorphic rocks of comparable grade occur on the west side of the Nicola Batholith located between Merritt and Kamloops. This core complex is a horst (Monger, 1985). The limits of the high grade metamorphics of the TIP are not known at this time. Similar rocks have been reported from the Uren Lake area (PLATE 8) and as far south as TOP #5 (M. Dickens pers. comm.).

VIEW No.1

A. Large blocks of vuggy, siliceous, monolithic breccia (Unit 5) were apparently ripped from shallow bedrock during road construction. M. Dickens was first to recognize this epithermal alteration (Plate 5).

B. Unit 5 is exposed in two places in this Cat trench.(Plate 5).

C. Crackle brecciated, spherulitic and quartz veined rhyolite of the Eocene Kamloops Group (?) outcrops at the summit of the low hill. This hill which is approximately 600 m wide and roughly circular may have developed due to occurrences of local zones of silicification in the granodiorite. The potential of finding additional breccias in this hill is considered high in view of the tendency of breccias to cluster. Breccias can control a variety of mineral deposits, including gold. Multi-stage brecciation can result in high grades, as well as very large deposits, in many commodities, including gold. Red Mountain, Colorado is a classic locality for breccias (Fischer, Leedy, 1973).

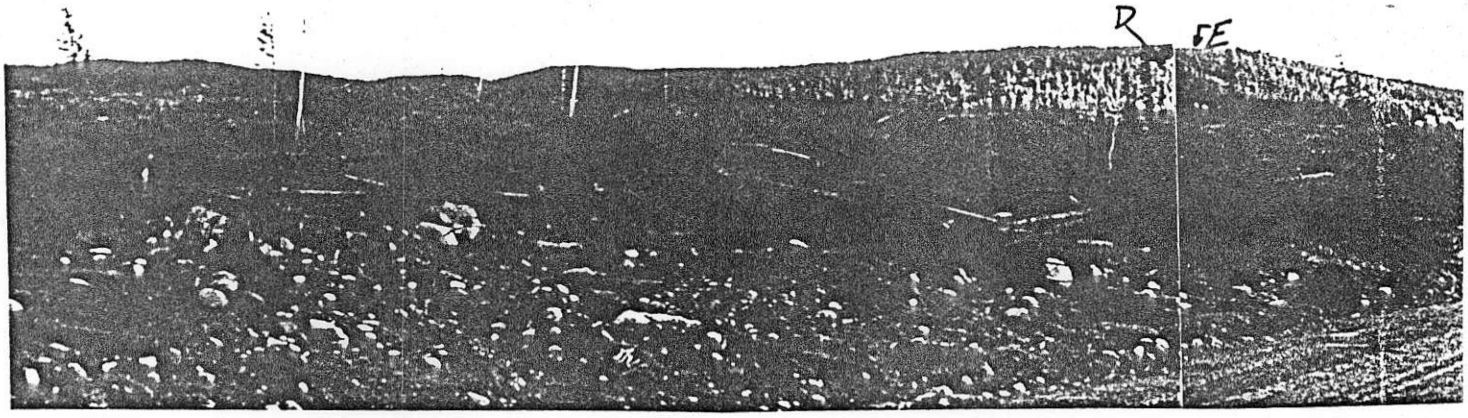
D. This hill is separated from E by a natural trench following the prominent 050 o fabric of local Unit 2 amphibolite. A fault has been inferred in this trench based on the lithology and distribution of dykes. This structural trend is towards the valley of Joe Ross Cr.

E. Abundant outcrops of granodiorite, both modally and chemically, identical to Unit 4 elsewhere in the map area, occur on this summit (Plates 4b and Figures A, B, C).

F. Joe Ross Creek., G. BASE LINE + Line 4+00 W

H. The drainage follows a lineament on the western edge of the hill.

VIEW No.1



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H. The drainage follows a lineament on the western edge of the hill.

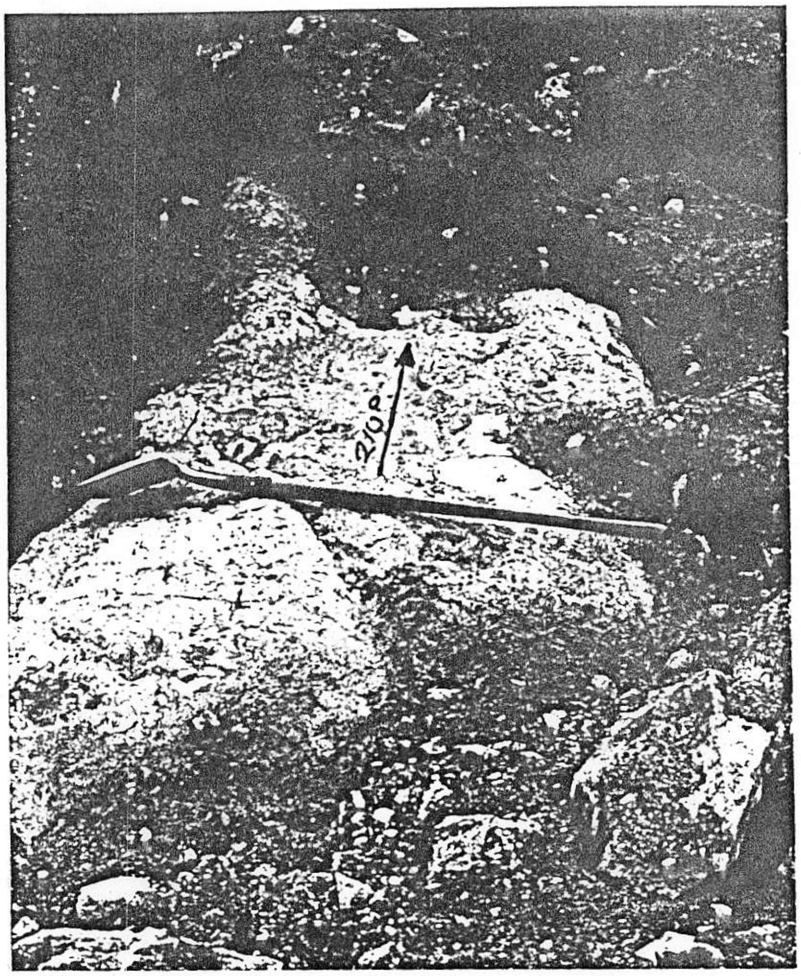
VIEW No. 2

This three- meter block of siliceous, monolithic granitic breccia has been examined petrographically (Appendix 1, p. 16). Fragments are predominantly angular with some sections containing well rounded (milled ?) fragments . The cement is quartz which is commonly comb-textured. Albitic plagioclase is strongly sericitized. The cement includes dark brown oxides and opaques. Limonitic boxwork is probably weathered sulphides. A 2m x 2m chip sample (T-RUB-88-4) gave 25ppb Au, 0.6 ppm Ag, 15 ppm As, 73 ppm Mo (Bruaset, June 88). Mo is a tracer for gold. The indications that the breccia contains sections with angular fragments as well as rounded fragments suggest a minimum of two stages of brecciation. The more times a breccia is reworked the more favorable it is for accumulating economic mineralization. This block, along with two other large masses of breccia, and a large number of smaller pieces were probably derived from the local road cut.

VIEW No. 3

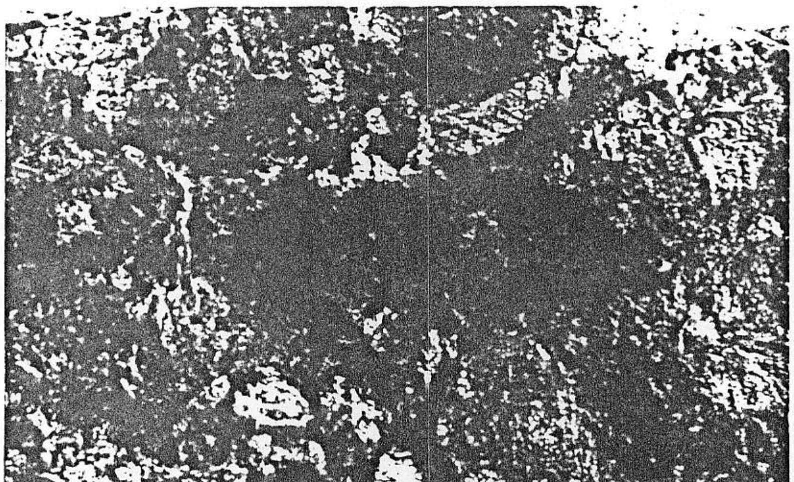
The principal exposure of siliceous monolithic breccia viewed along its 030 o. strike. The motley appearance is caused by hand washing including heavy rain which has concentrated clay in the hollows of the exposure. The breccia exposure is 1.5 m in width x 4.5 m in length. A substantial chip sample, RUB-88-109, taken wherever material could be obtained within this outcrop ran 200 ppb Au, 0.2 ppm Ag, 5 ppm As and 21 ppm Mo. This material is difficult to sample because of its hardness and glacial smoothening. This sampling utilized a heavy sledge hammer. Back-hoe trenching is needed to more fully explore the showing and sampling should include drilling and blasting.

VIEW No. 4



Siliceous monolithic breccia, Unit 5, viewed at 210 o. The light blue color is due to fine clay that has washed into hollows in the outcrop. The original exposure of Unit in the Cat. trench measured about 1 m X 1 m. Hand trenching to a maximum depth of about one meter in the till alongside the structure indicates that it probably dips vertically. Hand trenching over a distance of 5 m, approximately, in the westerly direction from the structure encountered abundant float of Unit 5. The mapping indicates that this breccia zone could be upwards to 5 m wide (Plate 5).

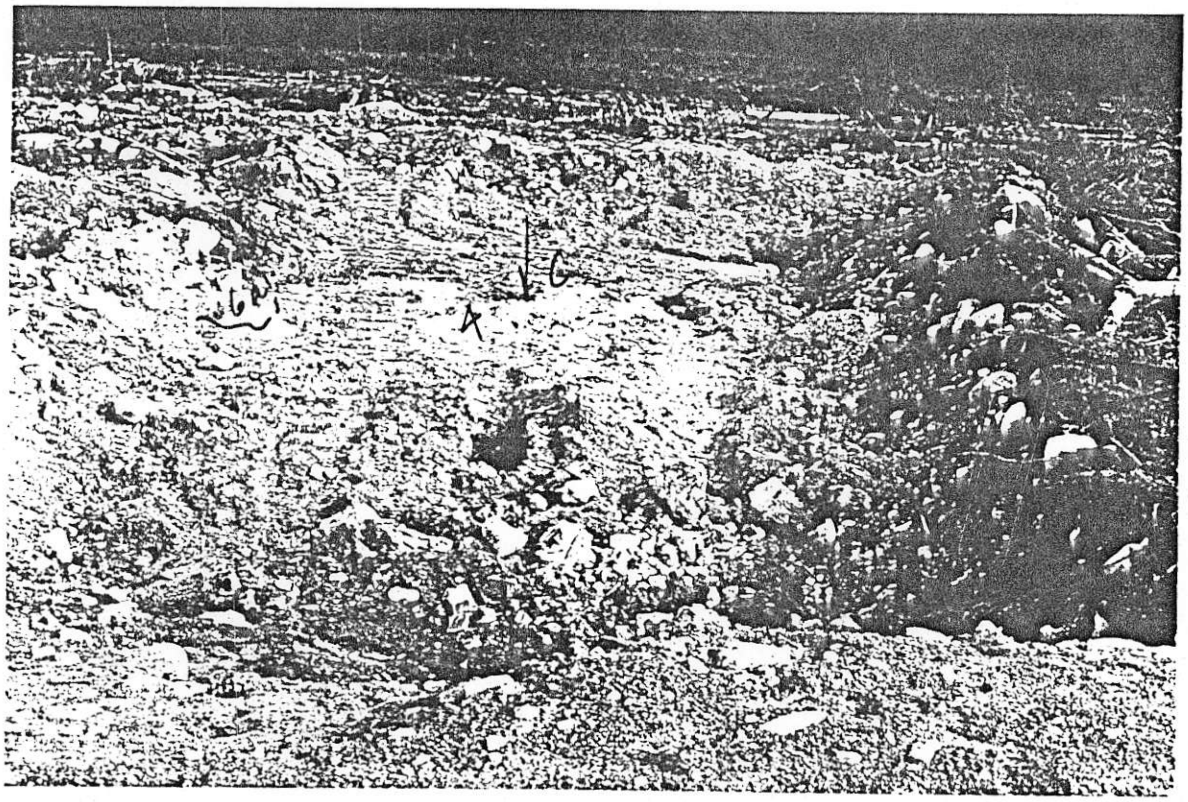
VIEW No. 5




Scale: 1: 5, approx.

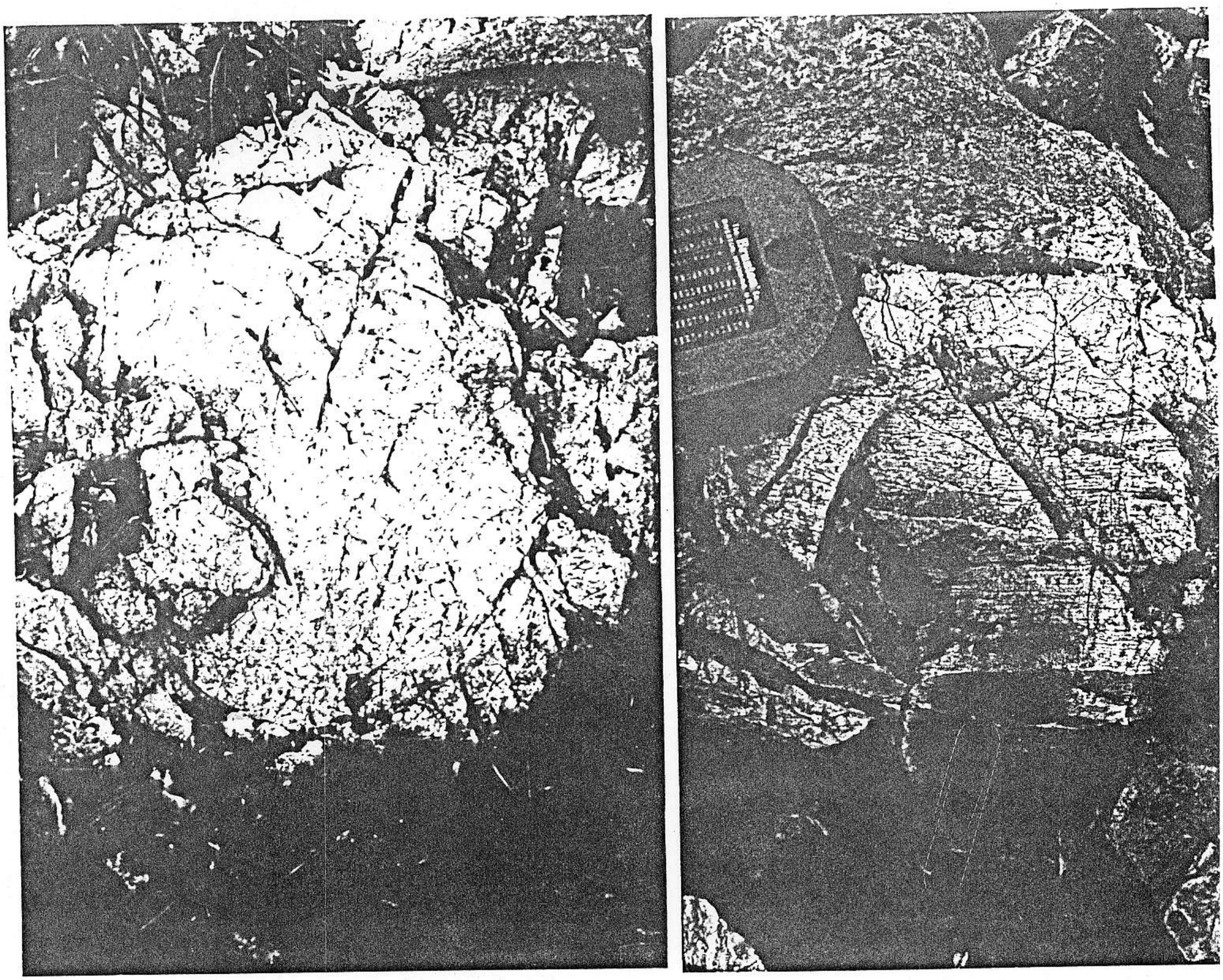
Views of siliceous monolithic breccia -Unit 5. indicating the porous character of the rock. The left view contains rounded fragments suggesting milling has taken place, a phenomena associated with the formation of breccia pipes. Unspecified opaques were noted in thin section of material similar to the right hand sample. Prevalence of comb-textured quartz is a common epithermal characteristic as is brecciation and abundance of drusy cavities.

VIEW No.6



Looking easterly from the top of the "hill" at the site of the sole outcrop of crackle brecciated, spherulitic, quartz veined rhyolite (Unit 6). Rhyolite is exposed over an area 5 m x 9 m. The south end of this outcrop is indicated (6a). The country rock is granodiorite (4). The depth of overburden on the granodiorite is maximum 1 m. A total of four bedrock samples have been taken of the above and the gold content is consistently <5 ppb. Of the three multi-element runs, a sample of granodiorite contained 25 ppb Mo, and rhyolite samples gave 20 and 29 ppm (Appendix 3). A rock sample collected last spring (T RUB-88-1), which has since been shown to be of locally derived float, ran 5 ppb Au and 81 ppm Mo. A small amount of back-hoe trenching is warranted for structural information. For instance, it would be useful in the interest of overall understanding to know, what, if any, relationships exist between Unit 5 and Unit 6 brecciation. The presence of anomalous Mo in both breccias and their close proximity, one lying almost on strike of the other, suggest they may have a common structural control. Petrographically, they are similar.

VIEW No. 7



Both of the pictures are of crackle brecciated, quartz veined and spherulitic rhyolite. The picture on the left is of outcrop. The right picture is of banded rhyolite believed to be locally derived. In thin section, the veins are indicated to contain about 5% open space or dark brown oxides. Drusy cavities are present.

8.0 GROUND CONTROL

Ground control has been established by means of extensive chain and compass traversing of the grid with numerous tie lines and other checks. All roads have been traversed at road center and this incorporated into the overall control. The grid has been tied to the 3800 Road. The principal current controls in the property area are: 3800 and Hummel Roads, the BASELINE AND L0+00. This control permits fairly accurate determinations to be made of the position of the various claims that adjoin the east side of the TIP-TOP group.

The grid plans are intended to show the grid a accurately as possible. This has been achieved to the extent of the available information, however, one problem area exists and this is discussed below.

After the BASE LINE and LINE 0+00 were established TL's 10+00N and 12+00S were cut. Cross lines were variously cut between these controls not always originating at the baseline. Based on chaining along L's 20+00 W and 24+00 W it appears that TL 12+00 S lies somewhat further to the south in the southwest part of the grid than shown on PLATE 4a by perhaps as much as 40 -50 m. Considerable checking was done when the problem was discovered but time did not permit the matter to be resolved. Adjustments that have been made to the grid on paper to allow the present plot are: 1. Taking up the error for L 24+00 W between stations 9+00 S and 10+00 S, and 2. Shortening every 100 m picket spacing along L 20+00 W from 6+00 S to station 12+00 S. as indicated. TL 12+00S lies well to the south of the end of L20+00W. The position of stations along L 24+00 W were checked after Joe Ross Creek became ice covered and there was found to be no significant departure from the original survey.

Grid lines were variously blazed and, or, flagged. Most of the bush in the area is classed as light with sections of very heavy deadfall and "jungle" relatively few. The worst areas are in the valley of Joe Ross Creek on some of the cross line and some western sections of TL's 12+00 S and 10+00 N.

9.0 DEFINING ELEVATED LEVELS FOR GOLD IN B and C HORIZON SOILS

Soil samples with prefixes RB and KC which were obtained from B and C horizons have been considered according to probability statistics (Sinclair, 1973, 1976 and 1987). A population of 45 is considered in a cumulative probability plot for gold which takes into account all B and C horizon values at, and above, the detection level of 5 ppb (FIGURE D). This is a marginal number of samples to be considered for statistics.

The partitioned cumulative probability plot indicates two ideal populations A and B. For the 99 percentile, the upper population A, has a lower threshold of 95 ppb gold and the lower population B, an upper threshold of 72 ppb gold. In view of the small gap that exists between the above levels, the two thresholds have been averaged to obtain a single threshold of 84 ppb Au. This procedure had been suggested, in this case, by Dragon Brabec, PhD. geochemist.

A second category, those with values from 20 to 84 ppb, may be significant for geological reasons as well as for fact that the range of values considered is well above the average gold content of soils (1 ppb) as indicated by Levinson, 1980, Appendix E. The last category is classed as PROBABLY ANOMALOUS. The geological argument for considering this category of elevated values relates to the position of a 20 ppb soil sample collected between two outcrops of siliceous monolithic breccia (Unit 5, Plate 5) one of which has been sampled and is indicated to be geochemically anomalous for gold at 200 ppb. Since the two outcrops are only 3 m apart; it is felt that structural continuity may exists under a thin till cover. On the west side of the 200 ppb exposure, a soil sample of till gave <5 ppb Au. It appears that the overburden is thicker on the west side than on the east side of the anomalous structure. In summary, possible reasons for variations in geochemical response on either side of the mineralized structure include thickness of overburden, presence or absence of structural continuity under the sample and normal variations in gold content of soil.

A third category of elevated gold values in soil are termed MISCELLANEOUS. Values in this group range from 5-15 ppb. The reason for considering such values is the fact that the lower threshold of population B is not defined but could lie below the detection level of 5 ppb. The highest value in this group is slightly above the analytical error of + or - 5ppb implied for samples at the detection level. The upper end of the MISCELLANEOUS group is more than a magnitude above the average in soil given by Levinson, 1980. At this stage when the sample spacing is frequently large and the overall pattern of anomalous values probably incomplete it is preferable to assign at least a minimum rating to these low values to be on the safe side. It is noted in this data on several occasions that values from 10 to 15 ppb occur adjacent to samples in one of the upper categories and given the often large sample spacing, this could indicate important trends in the data. Further, an important epithermal vein structure could have a width considerably less than the sample spacing thereby increasing the chances of failure to detect if thresholds were too high. The principal known mineralizing direction is at 30 o to the cross lines. The direction of the grid is predicated on possible east-west trending zones of mineralization such as those that may be associated with concentric fractures.

10.0 SOIL GEOCHEMISTRY

This report contains data on the following 503 soil samples:.

B and C Horizon samples	(Prefixed RB, KC)	468
Humus samples	(Prefixed RB, KC)	21
B and C Horizon samples	(Prefixed RH)	14

They have been analyzed by Chemex Labs variously for gold by fire assay A.A. finish and for 32 elements ICP. This data is presented in APPENDIX 2. Sample RH 001 introduces a geological element to the determination of "threshold" for the lower population (Refer to 8.0 DEFINING ELEVATED LEVELS FOR GOLD IN B and C HORIZON SOILS).

Gold highs are summarized in TABLE 1. Four are rated as ANOMALOUS and 11 as PROBABLY ANOMALOUS. It is interesting to speculate on the possible implication of TABLE 3. This table divides the grid into 3 equal areas and considers the number of soil values in each that are >/20 ppb Au and does this in relation to the total number of soil samples in each area. The result is a relative favorability index for each area. The western third of the grid appears to be the most favorable followed by the showings area.

Samples containing >/ 5 ppb gold are plotted on Plates 5, 6a and 6b. The ranges in values for ICP determinations are given in TABLE 2 with reference to average values given in Levinson, 1980. TABLE 4 is a summary of correlation coefficients for gold and ICP determined trace elements. This data indicates that no significant correlation exists between gold and the other elements in this case. The highest correlation coefficient between gold and an ICP determined element is with lead at 0.356. Mo and gold have a somewhat higher but negative correlation at -0.452. This relationship is based on only 6 sample pairs and is considered unlikely in view of a strong association between gold and molybdenum in rock in the region. Examples include the Vidette Mine and the Gnome property.

This soil data is based mainly on samples from the B horizon. This horizon typically consists of a thin accumulation of furruginous sand. B horizon usually grades into a grey sandy textured soil (C horizon) which probably overlies till (Plate 5). In most of the bulldozer trenches one finds upwards to a meter of sand overlying grey boulder till. A total of nine soil profiles were sampled in the grid. Their locations are indicated by two or more samples at a station on PLATE 6a and in APPENDIX 2. Soil profiles were taken in order to determine the best horizon to sample for gold. All soil profile sites contain \< 5 ppb gold. For the elevated values on Lines 20+00 W and 24+00 W, the ANOMALOUS and PROBABLY ANOMALOUS samples are in the C horizon whereas in the vicinity of the showings, B horizon soil is present and has been sampled. This includes the strongly anomalous samples KC 606 (400 ppb) and sample KP 777 (280 ppb).

The data on gold for non-humus samples (excluding RH prefixed samples) were processed by Asger Bentzen, computer consultant yielding the percent cumulative frequency diagrams and histograms contained in APPENDIX 2. Handling of gold data with the exclusion of samples with less than 5 ppb required processing of 45 values out of the original total population of 468 B and C horizon samples. The number of samples available for this statistical treatment is small. Nevertheless, the data yields a regular looking bimodal cumulative probability plot (FIGURE D). This plot partitions the original data, shown as black dots, into two ideal components, A and B, as defined by straight lines through calculated points (open circles). The lines A and B represent lognormal populations A and B. The calculations are sensitive to the choice of inflection point. In this case the inflection point is estimated at the 12 percentile indicating a mix of 12 % of the upper population A and 88 % of the lower population B. By combining ideal lognormal populations A and B we derive points (shown as triangles) which fit the original data very closely. This confirms the partitioning. Thresholds are determined at the 99 cumulative percentile for each population. These are 95 ppb for the upper population and 72 ppb for the lower. Section 8.0 contains a note about averaging these thresholds to obtain a single statistical threshold of 84 ppb Au.

TABLE 1. SUMMARY OF GOLD ANOMALIES IN SOIL

AREAS OF ELEVATED GOLD IN SOILS: ANOMALOUS and PROBABLY ANOMALOUS. Areas with values of + 84 ppb are ANOMALOUS (A) and areas of 20- 84 ppb are classes as PROBABLY ANOMALOUS (PA). All soil samples in the above categories are B or C horizon soils. Out of a total of 21 humus soils collected, only one contained gold above the detection limit. That sample, RB 112, contains 15 ppb. A "HIT" is arbitrarily set at >/ 20 ppb gold.

LOCATION	HITS (>/20 ppb)	VALUE (s) ppb	LEVEL
L24+00W 2+00S	1	480	A
L 0+00 8+50N	1	400	A
L 2+00E 6+00N	1	280	A
L24+00W 6+00S (RB191)	1	210	A
L 1+00E 5+00S	4	25-70 *1	PA
L 3+00W 5+00N	1	60 *2	"
L 2+00W 9+00N	1	45	"
L20+00W 1+00S	1	35	"
L16+00W 8+00N	1	35	"
L 1+00W 3+50N	1	25	"
L16+00W 8+00N	1	35	"
L 6+00E 7+00S	1	25	"
L12+00W 2+00N	1	25	"
L 1+00W 3+50N	1	25	"
L10+00E 4+00N	1	25	"

NOTES FOR TABLE 1

*1 The northwestern 1/3 of this gold anomaly overlaps a high Mn area with +907 ppm Mn. This is, by far, the most prominent manganese anomaly in this data with values up to 6030 ppm.

*2 The results from this station are inconclusive. A second sample at this site gave <5 ppb. The original sample was obtained from a thin iron bearing soil classified as B (60 ppb). It is possible that the second sample was taken from the C horizon, which, for this area, is predominantly fine sand. A second station, located 50 m to the north gave 20 ppb at a former <5 ppb site (B horizon). The latter could be due to sampling of different soil horizons or just normal variations in gold at these low levels.

TABLE 2: SUMMARY OF GOLD AND ICP DATA FOR SOILS
(Cert. Nos. A8824826, A8825419, A8825418, and A8824825)

Chemex Lab. analyses: Au: F.A.+ AA; others by 32 ICP

ELEMENT	NON-HUMUS (RB's+KC's) detect. limit ppm (ppb)	NON-HUMUS range ppm (ppb)	NON-HUMUS N	HUMUS (RB's+KC's) detect. limit ppm (ppb)	HUMUS range ppm (ppb)	HUMUS N	Average abundance, Levinson, 1980, Table 2-1 and p. 863 (all PPM)
Au	(5)	(5-480)	45	(5)	(15)	1	0.001
Mo	1	1-9	39	1	1-11	11	2
Ag	0.2	0.2-1.6	302	0.2	0.2-0.8	4	0.1
As	5	5-45	119	5	5- 25	14	1-50
	ONLY KC 712 > 15 ppm			ONLY RB 112 > 10 ppm			
Ba	10	30-700	468	10	50-600	21	100-3000
	SEVEN SAMPLES > 499 ppm			ONE SAMPLE > 499			
Be	0.5	0.5-2	138	0.5	0.5-1.0	2	6
Bi	2	2-4	25	2	2-8	7	little known
Cd	0.5	--	0	0.5	0.5	1	1
Co	1	1-21	468	1	1-15	21	1-40
	TWENTY NINE > 9 ppm			ONE SAMPLE > 9			
Cr	1	7-173	468	1	5-35	21	5-1000
	THIRTY ONE > 29 ppm						
Cu	1	1-651	248	1	4-1590	20	2-100
	SEVEN > 99 ppm			THREE > 99 ppm			
Ga	10	10-20	219	10	10	6	15
Sb	5	5	1	5	5	5	5
W	5	5	1	5	5-10	2	little data
Hg	1	1-2	18	1	1-3	9	0.03
Zn	5	9-135	466	1	4-82	21	10-300
	EIGHTY NINE >49 ppm						

TABLE 2. cont.

	NON-HUMUS (RB's+KP's) detect. limit ppm	range ppm	N	HUMUS (RB's+ KP's) detect. limit ppm	range ppm	N	Average abundance Levinson, 1980
Ni	1	2-43	468	1	2-74	21	5-500
Pb	2	2-12	383	2	2-8	6	2-200
	THIRTEEN > 9ppm.						
Mn	1	41-6030	468	1	27-840	21	850
	SIXTEEN >849						
Tl	10 PPM	10	21	10	10	3	0.1 PPM

TABLE 3, APPARENT GOLD FAVORABILITIES OF SECTIONS OF THE GRID BASED ON SOIL SAMPLING

	PARAMETERS	WESTERN 1/3 L24+00W TO L10+00W incl.	CENTRAL 1/3 L 8+00 W TO L 2+00 E	EASTERN 1/3 L 6+00 E TO L 18+00 E
A	TOTAL NUMBER OF RB+KC series samples	124	273	92
B	TOTAL NUMBER OF SOIL HITS (>/20 ppb)	5	9	2
	PROPORTION $\frac{B}{A}$	0.040	0.033	0.022

TABLE 4: CORRELATION COEFFICIENTS FOR GOLD IN SOILS

Data: 468 samples (RB+KC series). B and C HORIZON SOILS
Chemex Certificates: A8824825, A8825419, A8824826

ELEMENT	Au : CORRELATION COEFFICIENTS	(REASON FOR C.F.=99.000 -UNDEFINED)	NUMBER OF OCCURRENCES OF BOTH VARIABLES >/ DETECTION LIMIT
Au	1.000		(45)
Al	-0.006		(45)
Ag	-0.048		(26)
As	99.000	(As=detect. lim.)	(9)
Ba	-0.086		(45)
Be	0.327		(14)
Bi	99.000	(Bi=detect. lim.)	(2)
Ca	-0.101		(45)
Cd	99.000	(Cd always < d.l.)	(0)
Co	-0.078		(45
Cr	0.007		(45)
Cu	-0.058		(45)
Fe	0.006		(45)
Ga	99.000	(Ga =Detect. lim.)	(23)
Hg	99.000	(Hg always < d.l.)	(0)
K	0.017		(45)
La	-0.164		(13)
Mg	0.048		(45)
Mn	-0.111		(45)
Mo	-0.452		(6)
Na	0.037		(45)
Ni	-0.098		(45)
P	-0.009		(45)
Pb	0.356		(34)
Sb	99.000	(Sb always < d.l.)	(0)
Sc	-0.079		(45)
Sr	-0.082		(45)
Ti	0.131		(45)
Tl	99.000	(Tl= detect. lim.)	(3)
U	99.000	(U always < d. l.)	(0)
V	0.046		(45)
W	99.000	(W = detect. lim)	(1)
Zn	0.005		(45)

11.0 ROCK GEOCHEMISTRY

All of the rock samples were analyzed for gold (ppb). Selected rocks were analyzed for 32 element ICP. Several plutonic rocks and metamorphosed Nicola volcanics have been analyzed for classic whole-rock using ICP. Results are given in APPENDIX 4.

Rock samples considered to be geochemically significant for gold are listed in TABLE 5. The highest value is 200 ppb Au in a chip sample of siliceous monolithic breccia containing granitic fragments (UNIT 5, PLATE 5).

TABLE 5: GOLD ANOMALIES IN ROCK

SAMPLE NO.	MAP REF.	LOCATION	GOLD VALUE	ASSOCIATED ELEVATED PATHFINDER ELEMENT
RUB 88 109	5	L 4+00 W 2+80 N (relative to 2+50 N)	200 ppb 1.5 m X 4.5 m	21ppm Mo
KP 19	4a, 6a	L 6+00 W 8+40 S	20 ppb 1.7 m	0.6 ppm Ag, 15 ppm As
KP20	"	L 6+00 W 8+40 S	15 ppb 0.2 m	none

12.0 BIOGEOCHEMISTRY

A biogeochemical orientation survey was carried out using Douglas fir bark as medium. A total of twelve samples were collected. These were taken variously from areas of known, or suspected mineralization and background. The sample locations are shown on PLATES 5, 6a and 6b. Bark sampling has the potential for augmenting a geochemical survey by tapping metals residing in bedrock, where roots reach bedrock, or trace element dispersions that occur in the C horizon.

Bark sampling is a well tested technique of exploration sampling in widespread use in the Soviet Union (C. E. Dunn, pers. comm.). The method is finding increased acceptance in North America. In Canada, the principal proponent and researcher is Colin Dunn of the G. S. C. He has published extensively on biogeochemistry, including bark sampling in the gold and uranium belts of Saskatchewan, and elsewhere . APPENDIX 5 contains a list of his publications.

Bark sampling appears to have contributed to the exploration success of the Jolu Mine (Rod Zone), La Ronge area, Saskatchewan. During the past field season Dr. Dunn was engaged in biogeochemical sampling at the Mascot Mine at Hedley B. C. This latest study is expected to be dealt with at the upcoming Cordilleran Exploration Round-Up in February. Reference to the Jolu Mine which is now being fast-tracked into production is found in the Northern Miner Vol. 74, No. 36 p. 1. The following is an excerpt from Dunn, 1986, dealing with the biogeochemical sampling program on the Rod.

" ROD ZONE - Mallard Lake Area (Dunn, 1986)

In September 1985, a traverse was made along the Rod Zone, northward from the main trenched occurrence that contains native gold and molybdenite in quartz veins. Since both outcrop and gold mineralization are sporadic along this shear zone, spruce bark and alder twigs were sampled in an attempt to identify auriferous sections. Table 1 shows the great variation in gold content of spruce bark along the transect. The strong response above the main trenched occurrence is repeated elsewhere, which suggests that mineralization is also located at sites 10+00N, 11+00N and 13+00N.

TABLE 1-Gold Content (ppb) of Ashed Bark Scales from Black Spruce Along the Rod Zone.

Cut-line Coordinates Along Baseline	Distance (m) Northeastward from Trench with Au and Mo	Gold(ppb) in Spruce Bark Ash
6+50	0	230
9+50	300	24
10+00	350	120
10+50	400	23
11+00	450	690
11+50	500	40
12+00	550	6
12+50	600	55
13+00	650	450
13+50	700	10
14+00	750	10

No other element shows enrichment in the spruce bark. The alder twigs yielded one to three times background concentrations of gold along the traverse, and indicate local enrichment in Mo (61 ppm) and Co (28).

Subsequent exploration in this area by Mahogany Minerals has led to the discovery of gold mineralization (0.1 oz./ton Au) close to the site that gave 690 ppb Au in the bark, and a probable economic deposit (0.5 oz./ton Au) has been found less than 50 m from the site with 450 ppb Au in spruce bark (G. Burrill, pers. comm.). Farther south, about 150 m from the main trench, drilling has intersected mineralization with locally over 1.0 oz./ton Au at a location which had previously yielded 200 ppb Au in bark. Clearly the amount of gold in the vegetation is not proportional to the grade of gold mineralization, but this is to be expected unless all the mineralization is at bedrock surface. The deeper the mineralized body occurs, the more dissipated the geochemical signature becomes. The important point is that anomalous biogeochemical values (whether high or low in magnitude) can be evidence of local mineralization." *

* Colin E. Dunn :Biogeochemical Studies in the Saskatchewan Gold Belt, 1986; in Summary of Investigations 1986, Saskatchewan Geological Survey; Saskatchewan Energy and Mines, Misc. Report 86-4 pp. 129-135

One of the purposes of our program was to determine if bark sampling would detect the extension of the siliceous monolithic breccia containing 200 ppb gold in the showings area (PLATE 5). This area has been clearcut with the exception of a few mature, Douglas fir trees conveniently left standing in the sampling area. Because our target area occurs within the "dust zone" of a major logging road we sampled the central bark which we expect to be relatively dust free It has since come to the attention of the sampler that dusty bark at the Cluff Mine, Saskatchewan appears to have had a diluting effect on uranium content of bark (C. E. Dunn, pers. comm.). Occasionally duplicate samples were collected and submitted as check samples. Samples were stored in Kraft envelopes. Analytical work was performed by Min.En Laboratories Ltd. Samples were ashed and gold and 31 element ICP determinations carried out according to the procedures given in APPENDIX 5.

Bark is a particularly convenient medium for sampling because it can be taken irrespective of the season and shows little seasonal variation (Dunn, 1985). The reproducibility of bark in our samples appears to be very high for gold. Some factors to be considered in bark sampling are:

1. Species to be sampled: Lodge pole pine, Douglas fir, Ponderosa pine etc. all work well (C. E. Dunn, pers. comm.).

2. Sampling inner or outer bark. Gold is zoned in bark such that the outer dead bark contains accumulated gold and the inner bark contains gold being transmitted through the bark. Attention is drawn to line 19 from the bottom on the next page.

3. Ash weight gold of + 20 ppb is usually considered anomalous but lower anomalous values do occur (C. E. Dunn, pers. comm.). Gold results may be quoted as " ash weight" or " dry weight". Douglas fir gives an ash yield of about 1% while other trees such as Lodgepole pine give ash weights of about 2% C. E. Dunn, pers. comm.).

4. Bark may be contaminated by dust, if for instance, an open pit mine is located nearby. In some cases, the dust has had a diluting effect.

5 Effect of overburden. If the roots of the tree being sampled extended into bedrock, the metal content of the bark would probably reflect the bedrock chemistry, otherwise it would probably reflect the composition of the C horizon.

The results of this survey is summarized as follow:

1. Bark sample RUB 88-123 is anomalous in gold at 26.6 ppb ash.

weight. The tree which was sampled grows astride a quartz vein about 0.5 m wide. Two surface samples of the vein reported by Stevenson, 1936 ran from 0.10 to 0.20 oz./ton gold and trace silver both across 45 cm in the vicinity of our bark sample. The tree which we sampled appears to be close to the site of the lower gold assay. This is the possible surface outcrop of the vein found underground (Stevenson, 1936).

2. Low background in gold is inferred from this data. Values about 10 ppb gold may be anomalous, but little data exist with which to compare. In the case of the Seebee gold property at Laonil Lake, Saskatchewan, background values are less than 10 ppb in spruce bark (C. Dunn, 1986). Highly anomalous concentrations were 45 to 330 ppb. Anomalies of lesser magnitude were 22 to 26 ppb Au. The TIP data cluster in the range 1 to 2 ppb. Three elevated samples are 9.9, 10.0 and 26.6 We assume these to be in the anomalous range (TABLE 6). A total of seven samples collected in the main showings area contained background gold (PLATE 5). The reason for the relatively low values in the showings area are not now known but one possibility is masking by overburden. The roots of the trees sampled are probably set in the C horizon if the overburden were more than 3 m thick. If this were the case, the gold uptake of these firs could be low. Hand trenching west of the mineralized structure (Unit 5) indicates that the overburden thickness probably increase in that direction and could do the same to the SSW. A hand trench situates on strike about 5 m SSW of the Unit 5 breccia encountered an angular block of float of Unit 5 at a depth of 0.4 m but no bedrock (Plate 5). Data which has come to our attention recently (Dunn, Sept. 1988), indicates Au in red spruce in eastern Nova Scotia contains the following gold values in the inner and outer bark, respectively : Tree A: <5 and 51, Tree B: 5 and 9 and Tree C: 9 or 7 and 126, all ash weight ppb gold. In view on this, some preliminary resampling should be conducted in the showings area to determine the gold content of the outer bark. Back-hoe trenching is expected to determine the cause of the low biogeochemical response in the extension of the breccia zone. It is noted that the lowest value reported for gold is 0.1 ppb read on graphite furnace AA. This method normally gives reliable results and the lowest value reported can be taken as the detection limit (Hart Bichler, Chemex Lab). Since values at the detection limit have error limits of + or - the detection limit i.e., in this case 0 ppb or 0.2 ppb, it follows that the two analyses of 2.0 ppb at 20X the detection level are analytically significant. In light of the above and the overall distribution of gold in bark in the showings area, including sample 88-113 giving the highest value, it appears likely that a faint "signal" from the extension of the main structure may have been detected by the highest sample (PLATE 5).

3. Two pairs of samples RUB 88-101 , - 202 and RUB 88-113, -143, which gave (1.2 - 1.0 ppb) and(2.0 -2.0 ppb), suggest a high degree of uniformity within a sample sites.

4. Copper is high in the ash and quite uniform. Copper in the soils in the grid area is for the most part very low, typically about 5 ppm. In the showings area, soil rarely contains >5 ppm Cu. The rocks too, contain very low copper here, usually from 1-3 ppm. Again, concentration through ashing is probable. The concentration factor for fir bark ash is about 100.

5. Lithium has a good biological response according to Levinson p. 873. Geochemical associates includes Mo which is anomalous in rock in the showings area.

TABLE 6. BIOGEOCHEMICAL ANOMALIES FOR GOLD IN DOUGLAS FIR BARK

ANOMALOUS SAMPLE No.	POSITION RELATIVE TO GRID		VALUE (ASH WEIGHT) ppb Au
RUB 88 123	24+50 S	14+00 E	26.6
609	7+00 S	19+20 E	9.9
615	10+20 S	28+90 W	10.0

NOTE: The balance of the samples (9) range from 0.1 ppb to 2.0 ppb Au

TABLE 7: SUMMARY OF BIOGEOCHEMISTRY

ELEMENT	RANGE (ppm except as stated)	LEVINSON, 80 Appendix E Vegetation ash (BROOKS, 1972)	APPARENT ANOMALIES INDICATED IN TIP	
Au (Ash weight ppb	0.1 - 26.6 ppb.	5 ppb	(5 ppb)	**
Tl	< 10 ppb	N/D		
Ag	0.5-1.9	1	(1)	
Al	2660 -14290	N/D		
As	109 -268	0.3-6000	(4)	
B	67- 121	400	(700)	
Ba	19-96	600	(288)	
Be	0.5-0.8	3	(0.7)	
Bi	1	<5	(1.2)	
Ca	46290-232720	N/D		
Cd	3.1 -5.3	0.1(?)	(0.1)	**
Co	6 -9	15	(9)	
Cu	221- 434	20	(180)	**
FE	610- 4170	N/D	(6700)	
K	6680- 15470	N/D		
Li	37-112	6	(2)	**
Mg	2440-7000	N/D		
Mn	530- 4707	N/D	(4800)	
Mo	8-17	9	(13)	
Na	140-1370	N/D		
Ni	15-27	20	(65)	
P	6890- 13790	N/D		
Pb	9-32	10	(70)	
Sb	1-7	N/D	(1)	
Sr	86-206	N/D	(30)	
Th	1	N/D	(20)	
U	1	0.5	(0.6)	
V	7.4 -23.7	60	(22)	
Zn	8- 170	900	(1400)	
Ga	1-3	N/D	(1)	
Sn	1-3	5	(1)	
W	1-2	N/D	(0.5)	
Cr	22-34	90	(9)	

13.0 AREAS OF INTEREST ON THE TOP CLAIMS

The reader is referred to Plate 8 for the locations of areas of interest. These targets have been reported by M. Dickens.

A. This showing is situated on Massey Hill. M. Dickens reports finding narrow veins containing tetrahedrite in old pits near the top of the hill. The area is very poorly exposed.

B. When Placer had the Precisely-Epi-Casa property under option, and near the end of its final program, a highly anomalous soil sample was obtained which was assayed and found to contain about 0.3 oz./ton gold. Apparently they did not follow up on this anomaly because the decision had been made to return the property. This sample is reported to have been obtained near the NE corner of Casa 1 (PLATE 8).

C. Quartz veins with pyrite occur in old pits. A sample taken by M. Dickens reportedly contained about 200 ppm Bi. This is very highly anomalous. According to Levinson, 1980, p. 866, bismuth averages 0.17 ppm in igneous rocks. Bismuth is a path finder for gold.

D. The Nicola is reportedly highly foliated and has been intruded by a granite which contains quartz veins. Rock samples gave maximum gold of about 100 ppb.

E. The Nicola is extensively altered in the central area of TOP #5. Dickens notes that this alteration extends for about 100 m onto TOP # 6 but it decreases eastward on that claim.

14.0 CONCLUSIONS

1. The road accessible TIP-TOP property consists of 181 optioned claims which cover the north and east margins of a possible resurgent caldera of Upper Triassic age.

2. Precious metal deposits in caldera margins are typically controlled by structures developed as a result of caldera collapse but the deposits tend to be much younger than caldera forming volcanism and are genetically unrelated to it.

3. Relevant mineralized structures in the caldera model tend to be breccias and veins oriented concentrically or radially with respect to the caldera. High grade deposits in the +2 M oz. category occur in collapsed caldera environments and some of the more illustrious examples are found in the Cripple Creek Camp, Colorado. Notable examples include the Portland Mine (3.75 M oz. Au), the Cresson Mine (+2 M oz. Au) and the Vindicator Mine (2.2 M oz. Au).

4. Systematic exploration involving geochemical sampling and geological mapping has been carried out on the northern caldera margin with the grid centered on a breccia showing containing 200 ppb gold and associated anomalous molybdenum. This structure is sub-parallel to local radial lineament trends.

5. The mineralized breccia has an exposed width of 1.5 m and a possible overall width of 5 m.

6. The breccia is hosted by granodiorite (Cretaceous ?) which may be a cupola emplaced in the caldera margin. The mineralization, alteration and brecciation is related to Tertiary felsic intrusives.

7. The 2.2 km by 4.2 km grid area contains much less than 0.1 % outcrop and the soil is generally poorly developed. A total 15 soil anomalies, mostly one point, with one cluster, are indicated. Elevated values range from 25 ppb to 480 ppb.

8. One point anomalies may be significant in this grid because both the linespacings (100 to 400 m) and the sample spacings (50-100 m) are large in relation to possible deposit widths.

9. Even though soil development in the area is poor by most standards, B and C horizons soils do yield strong responses occasionally. Multi-element analysis has not proven useful to date but this may be due to high detection limits for some of the key tracers some of which could be anomalous below the detection level. Manganese displays local correlation with gold in soil.

10. Gold and molybdenum are sometimes associated in gold deposits. This association is noted in the TIP property as well as in the Vidette Mine and the Gnome property located west of the TIP claims.

11. Several showings with precious metal potential occur along the eastern caldera margin on the TOP claims. Granite is locally reported to contain quartz veins with associated anomalous gold.

12. Soil sampling on widespread lines is an effective method for screening the caldera margin. A total of about 10 km of caldera margin occurs on the TIP-TOP claim, and about half of this has now received a first pass and resulted in a number of soil anomalies requiring follow-up.

13. Ground magnetics could be effective in detecting granodiorite cupolas in the caldera margin provided sufficient susceptibility contrast existed between the granodiorite and the Nicola volcanic country rock. It is important to know the locations of cupolas because they are potentially mineralizing centers.

14. Drusy, comb-textured silica found in the crackle breccias, is indicative of silica deposition in a high structural level in the epithermal system. The prominence of breccias, and particularly crackle breccias, is further suggestive of a high structural level.

15. The rhyolite and granitic crackle breccia outcrops in a low hill. The two outcrops that occur are intensely silicified and the resulting rock resistant to erosion. The hill being a topographic feature 600 m wide with only outcrop as indicated on PLATE 5 could contain substantial mineralized zones under the cover. Breccias tend to cluster. They can host large and often high grade precious metal deposits. An example is the + 2 M ton Cresson Mine in the Cripple Creek Camp which averaged 0.45 oz./to Au.

16. Detailed soil sampling has not been carried out in the showings area. The mineralized structure is sufficiently strong, and occurs close enough to the surface to constitute a back-hoe trenching target. It is suspected that 20 ppb in the till near the breccia is a significant anomaly. About 250 m NNE on strike occurs 60 ppb Au in a B horizon sample. On the SSW there is a faint biogeochemical response in Douglas fir bark which could signify the extension of the breccias under rapidly thickening overburden.