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GEOLOGY AND DIAMOND DRILLING REPORT

on the

UNUK RIVER PROJECT
(Unuk and Coul Claim Groups)

SKEENA MINING DIVISION
NTS 104B/9 and 104B/10

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**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

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22,113

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FEBRUARY 3, 1991

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June 10, 1992

Ministry of Energy, Mines and Petroleum Resources
Geological Survey Branch
Parliament Buildings
Victoria, BC
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Attention: Mr T.E. Kalnins, P.Eng.

Dear Sirs:

Assessment Report Number 22113
1991 Geology and Diamond Drilling Report, Unuk River Project

It has come to our attention that certain column headings in the Diamond Drill Logs of Appendix A to the above captioned report were incorrect.

Please accept the enclosed corrected appendices as replacement for those submitted to the Skeena Gold Commissioner on February 7, 1992.

Sincerely,
GRANGES INC.

Erica Seagel
Land Manager

enclosures

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SUMMARY

The 1991 Unuk Project involved exploration activities conducted during the final year of a three year option, proposed to fulfil the terms of an agreement between the property joint optionors, Springer Resources Ltd. and Cove Resources Corporation., and optionee Granges Inc.

The 1991 field project commenced in June. Field work initially was concentrated on mapping and reevaluating known showings outlined in 1989 and 1990. Areas of interest included the Coul 1 and 2 ('R' and 'G' Grids), Coul 3 and 4 ('J' and Jeff Grids) and the Unuk claims (U2-Tarn Creek Grid).

Picket grids were established on these areas and prospecting and geological mapping was completed by late August.

Approximately 38.0 kilometers of line was cut, 14.6 km on the 'G' Grid (Coul 1 and 2 claims) and 22.4 km on the Jeff Grid (Coul 3 claim). The results of the geological field program, together with soil sampling and geophysical surveys not reported here, were used to locate preliminary diamond drilling targets.

The Tarn Creek (Unuk 11 claim), Jeff Ridge (Coul 3 claim) and 'R' Grid (Coul 1 claim) areas were chosen for preliminary drill testing conducted in September.

The Tarn Creek shear zone was tested by a single 114.6 metre hole and anomalous results warrant additional follow-up drill testing. The 'R' Grid Alice Lake showing and the Creek anomaly were tested by five drill holes totalling 310.9 meters. The Mount Dilworth-Salmon River contact was tested in most holes. The only anomalous results were obtained in holes R91-4 and R91-5. The broad zone of alteration and low, but anomalous, gold values required additional work. Six geochemical and geophysical targets on Jeff Ridge were tested during initial drilling. Positive results from the preliminary drilling led to additional drilling in October. Thirty holes, totalling 5380 meters, were drilled on Jeff Grid. Mineralized intervals intersected in drilling indicate that significant gold values occur in eight drill holes (up to 47.14 g/t Au and 348.4 g/t Ag across 4.0 m in hole J91-7), while an additional ten have anomalous values.

Further work is recommended.

1.0 INTRODUCTION

Exploration work was conducted on the 33-claim Unuk group and the 4-claim Coul group during June to October 1991 by Granges Inc. This work was conducted during the final year of a three year option, proposed to fulfill the terms of an agreement between the property joint optionors, Springer Resources Ltd. and Cove Resources Corporation, and optionee Granges Inc.

The main purpose of the exploration program was to geologically map and evaluate the precious and base metal potential of the claims which occur in a similar geological setting to Eskay Creek, Sulphurets and Iskut River precious metal occurrences.

The discovery and development of the Eskay Creek deposit, 10 km to the northwest, has sparked interest in exploration for similar deposits along the Mount Dilworth/Salmon River stratigraphic boundary. The southern extension of this stratigraphy is found on the Coul claims. Previous mapping suggested that the rocks were folded and faulted in this region and repetitions of the favourable stratigraphy should be present. The continuation of this favourable stratigraphy east of the Unuk River and the presence of significant pyrite alteration suggested additional exploration targets may occur in this eastern area.

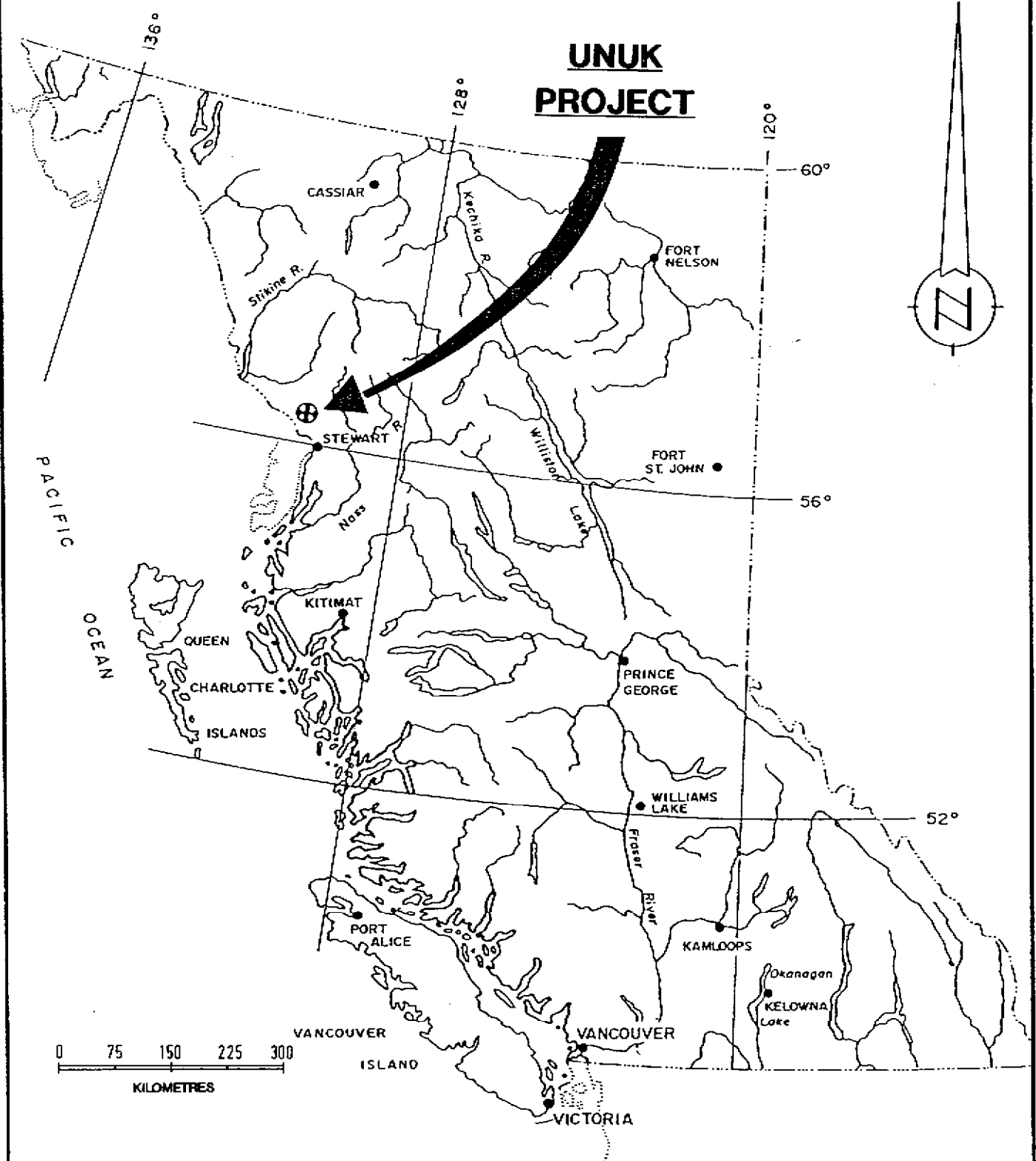
Previous exploration results and showings were reevaluated in light of recent advances in geological knowledge. Geology of the eastern Unuk claim group was poorly known, so part of the work focused on remapping and understanding this complex area.

The project was divided into three general areas of interest to be evaluated. The Unuk claims to the east, which contain several mineral occurrences hosted by structures or older rock units; the Coul 3-4 area along the Unuk River and east slope of John Peaks and the Coul 1-2 area to the west containing the 'R' Grid and possible Mount Dilworth Formation. Each area was assigned to one of the senior geologists. They were responsible for mapping and evaluating the exploration work as it progressed.

1.1 Location and Access

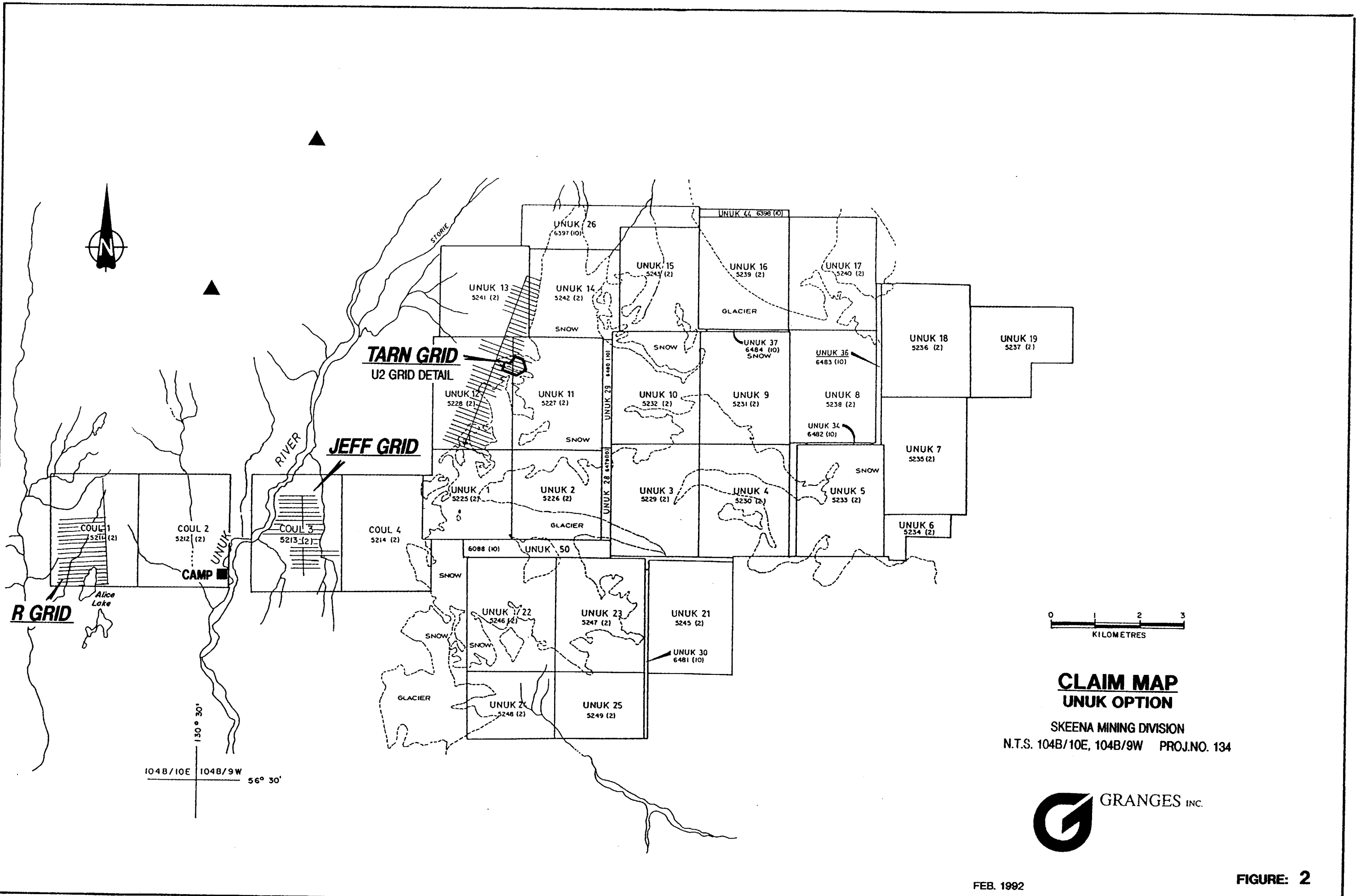
The properties are all located in the Skeena Mining Division, 65 kilometers north of Stewart, BC, on NTS map sheets 104B/9 and 104B/10 as shown in Figures 1 and 2. Access to the project is presently by helicopter from Bell II located on the Stewart-Cassiar Highway #37, approximately 50 km east of the property.

UNUK PROJECT



PROPERTY LOCATION MAP

UNUK OPTION
SKEENA MINING DIVISION, B. C.



CLAIM MAP
UNUK OPTION
 SKEENA MINING DIVISION
 N.T.S. 104B/10E, 104B/9W PROJ.NO. 134



1.2 Physiography

The project is located in the margin of the Coast Ranges. It is characterized by steep vegetation covered slopes to 1200 meters elevation with alpine vegetation, icefields and glaciers at higher elevations. The Camp located on the Unuk River, is at 240 meters, while John Peaks are at 2300 meters elevation.

1.3 Claim Data

The property comprises 683 recorded units (17,075 hectares) and includes the 33-claim Unuk group, 4-claim Coul group, 2-claim Knip group, 3-claim Bow group and the single IRV claim (Figure 2).

The claims are recorded as follows:

<u>Claim Name</u>	<u>Record No.</u>	<u>Tenure No.</u>	<u>Claim Size</u>
COUL 1	5211	251344	20.00
COUL 2	5212	251345	20.00
COUL 3	5213	251346	20.00
COUL 4	5214	251347	20.00
BOU 1	5217	251350	6.00
BOU 2	5218	251351	15.00
BOU 3	5219	251352	20.00
KNIP 1	5220	251353	16.00
KNIP 2	5221	251354	20.00
IRV	5222	251355	5.00
ICEY 1	5223	251356	8.00
ICEY 2	5224	251357	9.00
UNUK 1	5225	251358	20.00
UNUK 2	5226	251359	20.00
UNUK 11	5227	251360	20.00
UNUK 12	5228	251361	20.00
UNUK 3	5229	251362	20.00
UNUK 4	5230	251363	20.00
UNUK 9	5231	251364	20.00
UNUK 10	5232	251365	20.00
UNUK 5	5233	251366	20.00
UNUK 6	5234	251367	8.00
UNUK 7	5235	251368	20.00
UNUK 18	5236	251369	20.00
UNUK 19	5237	251370	20.00
UNUK 8	5238	251371	20.00
UNUK 16	5239	251372	20.00
UNUK 17	5240	251373	20.00
UNUK 13	5241	251374	16.00
UNUK 14	5242	251375	16.00
UNUK 15	5243	251376	20.00
UNUK 21	5245	251378	20.00

<u>Claim Name</u>	<u>Record No</u>	<u>Tenure No</u>	<u>Claim Size</u>
UNUK 22	5246	251379	20.00
UNUK 23	5247	251380	20.00
UNUK 24	5248	251381	12.00
UNUK 25	5249	251382	12.00
UNUK 26	6397	251965	16.00
UNUK 44	6398	215966	4.00
UNUK 28	6479	252005	4.00
UNUK 29	6480	252006	5.00
UNUK 30	6481	252007	8.00
UNUK 34	6482	252008	3.00
UNUK 36	6483	252009	8.00
UNUK 37	6484	252010	4.00
UNUK 50	8088	253293	8.00

Malcolm Bell, Clive Ashworth, Ashworth Exploration Ltd. and Granges Inc. are the registered owners of the claims. The claims are held by Granges Inc. under option from Springer Resources Ltd. and Cove Resources Corporation. Under terms of the option agreement, Granges Inc. earned 50% interest in the property in September 1991.

1.4 Regional Economic Setting: History and Previous Work

1.4.1 History of Area

The project lies within an historically active mining and exploration area that extends from Stewart in the south to near Telegraph Creek in the north. Within this area, which has been referred to as the Stikine Arch, active mining goes back to the turn of the century. Due to the size of the region it has historically been referred to by more specific area names (i.e. the Stewart, Sulphurets, Eskay Creek, Iskut River and Galore Creek areas). All of these individual camps, however, appear to be related to the Stikine Arch as a whole. The entire area can be considered as one large mineralized province with attendant subareas.

The project is located on the western flank of the Iskut-Sulphurets area which has seen extensive exploration in the last three years. The area originally attracted interest at the turn of the century when prospectors, returning south from the Yukon, searched for placer gold and staked bedrock gossans.

In the 1970's, the porphyry copper exploration boom drew many companies into the area. A new era of gold exploration began in 1979 with the option of the Sulphurets claim block by Esso Minerals Canada and the 1980 acquisition of the Johnny

Mountain claims by Skyline Exploration Ltd. (now Skyline Gold Corporation). Skyline commissioned its mill in July 1988, but production has now been suspended. Cominco Ltd. and Prime Resources Group Inc. have recently put the adjacent Snip deposit into production.

Beyond these projects, and except for limited early placer gold production from some creeks, the area has had no mineral production history. Since 1979, more than 70 new mineral prospects have been identified, though ground acquisition was relatively slow until the fall of 1987 when promising results from summer exploration programs became known and the provincial government released analytical results from a regional stream sediment survey.

1.4.2 Previous Unuk Property Work

The Unuk claims were initially staked in 1986 and 1987. Initial work in 1986 involved an airborne VLF-Mag survey commissioned by Hi-Tec Resource Management Ltd., followed by a four day follow-up property examination by J.P. Sorbara and Associates. In September and October of 1987, Hi-Tec Ltd. conducted a two-phase reconnaissance exploration program to discover precious metal mineralization similar to that found in the Sulphurets area. A similar program was undertaken in September 1988, to follow-up results of the previous work and to outline additional areas of interest on which to focus future exploration. Six areas of interest were outlined. These include:

1.	Zone 1/AP Zone	Unuk 14, 15, 26 claims
2.	'R' Grid	Coul 1
3.	Beedee Zone	Unuk 18 and 19
4.	Zone 2/U2	Unuk 11 and 12
5.	'J' Grid	Coul 4, Unuk 1
6.	McTagg Creek	Unuk 3 and 4

In 1989, a field camp was constructed by Granges Inc. on the west side of the Unuk River, just upstream from the Coulter Creek junction. The 1989 field work was divided between follow-up of known areas of interest and locating new areas. Detailed work involved establishing control grids with 100 m spaced lines on the 'R' Grid (Coul 1), 'J' Grid (Coul 4), Zone 1 (Unuk 14-15) and Zone 2 (Unuk 11 and 12). A total of 1501 soil, 164 silt and 1113 rock samples were collected. VLF-Mag geophysical surveys were conducted on the 'R' Grid and Zone 1 Grid. During the later part of the 1989 season, five holes totalling 566.94 m were drilled on the south Zone 1, AP structure, while 3 holes totalling 344.43 m were drilled on the 'R' Grid creek showing.

The 1990 Unuk project exploration concentrated on areas of known mineralization (Zone 1 - Unuk 14 and 26; 'R' Grid - Coul 1; and Beedee Zone - Unuk 18 and 19), as well as the development of new targets on the Zone 2/U2 Grid - Unuk 11 and 12.

1990 exploration in the Zone 1 area included mapping, sampling and an IP survey covering property targets selected from the 1989 data. Thirteen drill holes totalling 2678 meters tested these areas. Tracer gold values were encountered in sheared felsic volcanic-sedimentary rock north of L12+00N. Anomalous gold values up to 7.91 g/t gold across 0.4 meters were intersected in drilling the Cliff Zone between L7+00N and L12+00N. Gold values up to 3.77 g/t gold across 1.0 meters were obtained from the AP structure north along strike from the area drilled in 1989.

1990 remapping on the 'R' Grid (Coul 1) verified favourable Eskay stratigraphy. Drill targets were established from geological, geochemical and geophysical data. Three holes totalling 656.6 meters were drilled, but yielded discouraging results.

Mapping and resampling at the Beedee Zone indicated that gold mineralization is located in contact aureoles peripheral to altered mafic dykes. Work on the U2 Grid (Unuk 11 and 12) identified three areas of interest. Bruno's showing which contains gold values to 15.7 g/t from breccia veins is in close proximity to an airborne magnetic/resistivity anomaly. The U2 north area has low gold values associated with arsenopyrite and occurs in a structural setting similar to the Zone 1/AP Zone. The Stibnite Showing has low gold values associated with arsenopyrite and stibnite mineralization occurring in a structure which is traced along-strike for 150 meters.

1.5 Lithology Code

In the process of geological mapping, a lithology code was developed to describe rocks systematically in the field. This was particularly useful, because in some regions, it was uncertain at the beginning of the study where the rocks fit in the stratigraphic section. Rocks were classified in a nested set of codes as follows:

1.5.1 Rock Type

Major lithologic units were defined numerically as follows:

1. Mafic Volcanic Rocks, (mainly medium to dark green) including basalt, basaltic andesite, andesite; generally with 25-50% mafic minerals, mainly chlorite and tremolite/ actinolite.
2. Intermediate Volcanic Rocks, (mainly light to medium green andesite and latite, generally with 10-25% mafic minerals, mainly chlorite.
3. Felsic Volcanic Rocks, (mainly light grey to greenish grey and cream) including latite, dacite, rhyodacite, trachy-latite and trachyte; generally with 0-10% mafic minerals, mainly chlorite and sericite.

In the field, felsic rocks were not subdivided further. After hand samples were stained for K-feldspar, they could be divided into two units as follows:

4. Latite-Dacite: unstained or weakly stained
5. Rhyodacite-Trachy-latite (moderately stained), Trachyte (strongly stained)

In many fragmental rocks, fragments of trachyte-trachy-latite, and rhyodacite are enclosed in a groundmass of latite-dacite.

6. Carbonates: including limestone (Unit 6) and dolomite (Unit 6R). Limestone generally is light grey in color, and dolomite generally is pale cream with a buff to brown weathering color.
7. Clastic Sedimentary Rocks: including mudstone, siltstone, sandstone, conglomerate. Also grouped in this unit is minor chert which is interbedded with the clastic sedimentary rocks.
8. Mafic Intrusive Rocks: including diorite-gabbro of the John Peaks intrusion and related microdiorite to diabase dykes; aphanitic basalt dykes.
9. Intermediate Intrusive Rocks: ranging from quartz diorite and diorite to microdiorite and andesite with a low content of mafic minerals.
10. Felsic Intrusive Rocks: mainly leucocratic, rhyodacite/ rhyolite to hypabyssal quartz monzonite and granodiorite.

1.5.2 Major Subdivisions

These are coded with a capital letter, whose significance depends on the major rock classification.

The following letters refer to rocks of units 1, 2, and 3:

- A - fine-grained tuff
- B - medium-grained tuff
- C - coarse-grained tuff
- D - lapilli tuff
- E - tuff breccia
- F - volcanic breccia
- G - flow
- H - flow breccia
- T - tuffaceous sedimentary rocks

The following letters refer to rocks of Unit 7

- J - mudstone
- K - siltstone
- L - sandstone, wacke, arenite
- M - conglomerate
- N - cherty sedimentary rocks
- O - debris flow

The following letter refers to rocks of Unit 6

- R - dolomite, ankeritic carbonate

The following letters refer to rocks of Units 8, 9, and 10:

- W - aphanitic
- X - very fine- to fine-grained
- Y - medium-grained
- Z - coarse-grained

1.5.3 Minor Subdivisions

Rocks are further subdivided on the basis of minor characteristics designated by lower case letters as follows:

- a - amygdaloidal
- b - bedded
- c - calcareous
- d - spherulitic
- e - fossiliferous
- f - flow- banded
- g - graphitic
- h - hematitic
- i - hornfels

j - argillaceous
 k - chloritic
 K - potassic
 l - leucocratic
 m - magnetite
 n - massive
 o - welded tuff
 p - pillowed
 q - quartz-bearing
 r - sheared
 s - siliceous, cherty
 t - phyllitic, sericitic
 u - fragmental (e.g. 3D,3Dou = fragments of 3Do in 3D)
 v - quartz phyric
 w - feldspar phyric
 x - quartz, feldspar phyric
 y - mafic phyric
 z - mafic, feldspar phyric

1.5.4 Alteration, Replacement, Vein Mineralogy

Minerals are identified by standard double letter symbols separated from the primary rock symbols by a period; if more than one is present they are separated by hyphens, eg., 3b.qz-se means quartz-sericite alteration of 3b.

Veins are of similar minerals, and are indicated by a suffix "v", e.g., 3b.cb.qz-cbv, would mean a medium felsic tuff with carbonate alteration and quartz-carbonate veins.

ac - actinolite
 Ag - native silver
 ak - ankerite
 Au - native gold
 az - azurite
 bo - bornite (bn)
 ca - calcite
 cb - carbonate (ankerite/dolomite)
 cl - chlorite
 cp - chalcopyrite
 do - dolomite
 el - electrum
 ep - epidote
 ga - galena
 go - goethite
 he - hematite
 hg - cinnabar (ci)
 ka - kaolinite
 Kf - K-feldspar
 li - limonite
 mn - manganese oxides
 mg - magnetite (mt)

mo - molybdenite (mb)
 po - pyrrhotite
 py - pyrite
 qz - quartz
 sb - stibnite
 se - sericite
 si - silica (chalcedonic)
 sl - sphalerite
 th - tetrahedrite
 tr - tremolite
 xa - xanthophyllite

Additional qualifying symbols are:

r - as a prefix to the basic rock type, indicates rubble or abundant float giving an indication of the underlying rock type.
 () a symbol in parenthesis means that this characteristic or rock type is a minor constituent, vaguely developed, or poorly defined.
 . a period within the code separates the basic lithology from additional information such as fragment or alteration types and veins.
 bx breccia
 cr crenulation foliation or bedding (in drill logs)
 / a slash in the code between two rock types indicates uncertainty of classification.
 , a comma in the code between two rock types or features indicates that both are present.
 - a dash in the code between two rock types indicates a gradation between the two.

2.0 REGIONAL AND PROPERTY GEOLOGY

The geology of the region has been studied by many authors over the last several years, but interpretation still remains unclear because of complex structure, rapid facies changes, and lack of sufficient critical fossil and radiometric data. Major regional problems exist in assignment of ages to, and correlation of certain lithological units. On the property, the major uncertainty of correlation concerns some of the rocks in the fault block along Unuk River. Some controversy exists as to the age of the felsic units on the slope east of Unuk River.

Fossils collected in this study were examined briefly by Tim Tozer of the Geological Survey of Canada in Vancouver, an expert on Triassic fossils, and have been sent for further study to Genga Nadaraju of the Mineral Deposits Research Unit. Radiometric dating of some rocks in the region is planned by the Mineral Deposits Research Unit and the Geological Survey of Canada. Both these techniques will help unravel some of the uncertainties regarding the geological history of the region.

During the present study, concurrent studies were being made on the property and surrounding regions by Rod Kirkham, Jack Henderson, and Mariette Henderson of the Geological Association of Canada, and by Peter Lewis and Roland Bartsch of the Mineral Deposits Research Unit. Their work and our discussions with them were helpful to Granges' understanding of the regional geology. Some of their data and ideas are incorporated in the maps and text, respectively, in this report. The seminar at Bronson on August 29, 1991, also provided useful discussion of regional problems.

2.1 Regional Geology

The property is in the Stikine terrain of the Intermontane tectonic belt near the western border of the Middle Jurassic Bowser Basin. It is underlain by up to 7 kilometers of Upper Triassic to Lower Jurassic volcano-sedimentary arc-complex lithologies of the Stuhini and Hazelton Groups. The following table shows the basic stratigraphy of the property area:

JURASSIC

- 6 BOWSER LAKE GROUP
- 2-5 HAZELTON GROUP
- 5 SALMON RIVER FORMATION
- 4 MT. DILWORTH FORMATION
- 3 BETTY CREEK FORMATION
- 3A BETTY CREEK FELSITE
- 3B BETTY CREEK ANDESITE
- 2 UNUK RIVER FORMATION

UPPER TRIASSIC

- 1 STUHINI GROUP

The Hazelton Group consists of, in order from oldest to youngest, the Unuk River Formation, the Betty Creek Formation, the Mount Dilworth Formation, and the Salmon River Formation. These rocks are capped by Middle Jurassic marine-basin sedimentary rocks of the Bowser Lake Group. Some authors include rocks of the Salmon River Formation as part of the Hazelton Group, whereas others would position these rocks between those of the Hazelton Group and the overlying Bowser Lake Group.

The Salmon River-Mount Dilworth contact hosts the Eskay Creek Au-Ag Deposit.

The stratigraphic sequence was cut by plutons and dykes of several major intrusive episodes ranging in age from Late Triassic to Tertiary. As well, granitoid boulders in a marker conglomerate at the base of the Hazelton Group indicate an earlier, as yet undated plutonic event in the region. The high potassium content of many of the Stuhini mafic volcanic rocks suggests contamination by a pre-Triassic sialic basement.

Two major unconformities are present, one at the top of the Stuhini Group, and the other at the base of the Mount Dilworth Formation. Some evidence suggests that rocks of the Stuhini Group were deformed prior to deposition of rocks of the Hazelton Group. A third unconformity may exist between the Mount Dilworth Formation and the overlying rocks of the Salmon River Formation and Bowser Lake Group.

2.2 Stratigraphy

The property geology is shown in Figures 3 to 10. The Jonathan Fault separates two distinct structural blocks, herein designated the McTagg Anticlinorium Block (to the east) and the Unuk River Block (to the west). The stratigraphy of each of these blocks is described separately. The detailed

geology of areas of economic interest is described in Sections 3, 4, 5 and 6.

2.2.1 McTagg Anticlinorium Block

2.2.1.1 Stuhini Group

Rocks of the Stuhini Group are exposed in the core of a broad anticlinorium, herein designated the McTagg Anticlinorium, whose axial zone crosses the property just east of Lower McTagg Creek (Figure 4). There the axial zone trends north-south, whereas further north it trends north-northeast and is more diffuse.

The oldest rocks in the core consist of a sequence of clastic sedimentary rocks, dominated by well and finely bedded turbidite sequences of mudstone, siltstone, and fine wacke, and a few distinct layers and intervals of coarser-grained, more massive, arkosic wacke. Some thickly bedded, plagioclase-rich wackes weather a characteristic light grey, and have a glassy, black colour on the fresh surface. A fossil occurrence on West McTagg Ridge (Figure 5) on the west limb of the McTagg Anticlinorium yielded a poorly preserved Haloba, indicating a Karnian (Lower Upper Triassic) age (Tim Tizer, pers comm.).

Higher in the section are lensy intervals up to a few tens of meters thick of mafic and intermediate volcanic rocks interlayered with intervals of sedimentary rocks, the latter generally similar to those lower in the section. Volcanic rocks are dominated by flow and debris breccias, in part with moderately abundant, well rounded fragments of intermediate to mafic volcanic flow and hypabyssal rocks. With increasing abundance of rounded fragments, the debris breccia grades into immature volcanic conglomerate.

Northeast of Jack Glacier are three localities of poorly bedded mudstone/siltstone containing abundant Monotis, a characteristic Norian (Upper Upper Triassic) pelecypod. Two are on Jack Ridge (Figure 5), on either limb of the McTagg Anticlinorium, and the third is to the north in the north-facing nose of the anticlinorium on Ceparly Ridge. The three localities may represent a single time-horizon. Most of the fossils are preserved in a stratigraphic thickness of less than 10 cm. Much less abundant Monotis occur over a width of a few meters enclosing the fossil-rich bed. Just north of the Monotis locality on Ceparly Ridge are two limestone beds containing numerous non-diagnostic fossils including a large gastropod, rugose and fixed corals, branching bryozoa, and a crinoid stem. Rocks here locally dip to the southwest, so the stratigraphic relationship with the Monotis locality is uncertain. Minor limestone intervals are scattered elsewhere

in the section, and numerous other mudstone and siltstone intervals are slightly to moderately calcareous.

In the southeast corner of the property is a distinct interval containing up to 50% beds of pebble- to fine-cobble conglomerate, in which almost all fragments are of fine-grained, clastic, sedimentary rocks. These are interlayered with coarse- to fine-grained wackes and minor, well bedded siltstone and mudstone intervals.

On the northeast side of Jack Glacier (Figures 3 and 5) about half-way up the Stuhini section is a sedimentary interval a few meters thick containing abundant conglomerate beds with rounded pebbles and cobbles dominated by volcanic rocks with much less abundant but distinct grey-weathering limestone. No granitoid cobbles were recognized.

On the west and northwest limb of the McTagg Anticlinorium, at or near the top of the Stuhini section is a thick sequence of mafic volcanic flows, flow and debris breccias, and much less abundant, finer tuffaceous rocks of similar composition. Some of the flows have well formed pillows up to several meters in size. Some pillows have characteristic shapes with rounded tops and pointed bottoms, which indicate the facing direction to the west. On Lawrence Ridge (Figures 4, 5 and 8), a major pillowed flow ends abruptly along strike against a section of turbidites showing abundant features formed by soft-sediment deformation. Such rapid facies changes are common, and complicate stratigraphic correlation.

Some mafic flows and breccias contain prominent clinopyroxene phenocrysts, whereas others are characterized by phenocrysts of plagioclase and less commonly mixed plagioclase and hornblende. An unusual feature is that many of these rocks contain abundant, primary K-feldspar in the groundmass. Chemical analyses yield values of K₂O from 4 to 6%. The origin of the magma is interpreted as having been a normal mafic magma contaminated by K-rich crustal material.

In the northern part of the property and beyond, the upper mafic volcanic section is overlain by a sedimentary wedge up to two kilometers thick of well and finely laminated, rhythmic turbidites. Towards the top of this interval, thicker beds of wacke are more prominent and the wacke approaches an arkose in composition. On the northeast side of Jack Glacier, in the middle of the turbidite section is a granitoid-boulder conglomerate a few meters thick. It is similar to the conglomerate which marks the base of the Unuk River Formation further south. This suggests that uplift of the source area began during the Late Upper Triassic and continued into the Lower Jurassic.

At the headwaters of Gingras Creek (Figures 4 and 6), the upper part of the Stuhini section consists of grey to black, aphanitic to fine-grained, clastic sedimentary rocks interbedded with very fine to fine, light to medium green, andesite to latite tuffs, and minor tuff breccia and limestone.

2.2.1.2 Hazelton Group

Rocks of the Hazelton Group outcrop along the west side of the McTagg Anticlinorium on the ridge overlooking the Unuk River. The Hazelton Group is divided into four formations as follows:

Top	Salmon River Formation	
	Mount Dilworth Formation	
	Betty Creek Formation	
Base	Unuk River Formation	(Jack Formation)*

The lithology of some intervals in the Betty Creek and Unuk River Formations differ greatly from those at the type localities, suggesting that new formational names might be adopted to describe these different lithological units in this region. As well, the lithology of the Unuk River Formation varies widely from place to place in the property.

2.2.1.2.1 Unuk River Formation (Jack Formation)

At the base of the Unuk River Formation along the west side of the McTagg Anticlinorium is a mature, basal conglomerate up to 20 meters thick containing abundant, well rounded cobbles and boulders of volcanic and plutonic rocks (Figure 5). The largest boulders, locally up to 1 meter across, are of a medium-grained granodiorite of unknown age and origin.

* Mainly on the basis of work to the north of the property, Henderson and Kirkham (pers comm. 1991) proposed that the Unuk River Formation in this area be renamed the Jack Formation (after the type section near nose of Jack Glacier). This is mainly because the dominantly sedimentary section in this region is not similar to the typical section of the Unuk River Formation in the Sulphurets area to the east, where it is dominated by plagioclase-phyric andesite and dacitic andesite flows and flow breccias, with only minor sedimentary intervals.

The granodiorite is dissimilar from any known intrusive rocks in the Sulphurets area to the east (Kirkham, pers. comm.), and probably was derived from an unknown western source. The conglomerate also contains scattered limestone pebbles and cobbles. From Lawrence Ridge to the ridge south of Gingras Creek (Figure 4), it rests conformably to unconformably on mafic flows, flow breccias and tuffs of the Stuhini Formation. Upwards, it grades into an interbedded sequence of pebble and granule conglomerate interbedded with coarse to fine, fairly mature sandstone. The whole section becomes finer towards the top. The conglomerate can be traced from southeast of John Peaks, where it is the thickest, to the north end of Lawrence Ridge, where it thins rapidly. Just south of Tarn Lake a one-metre-thick bed of conglomerate occurs in the upper part of the Stuhini Group interbedded with fine to coarse clastic rocks showing abundant soft-sediment deformation features. No conglomerate was seen in the interval from Tarn Lake to Jack Glacier.

On the southwest side of Jack Glacier, a major unconformity is well exposed between the Stuhini and Hazelton Groups. Turbidites at the top of the Stuhini Formation are truncated at a low to moderate angle by rocks of the Unuk River Formation. Within a metre of the base of the Unuk River Formation are beds up to several centimeters thick dominated by angular fragments averaging a few centimeters across of the underlying turbidites. Locally a "terra rosa" (regolith) occurs on the contact, indicating exposure to the atmosphere during uplift and tilting of the Stuhini rocks. In the Unuk River Formation, within a few meters of the unconformity, is a cobble- to locally boulder-conglomerate dominated by fragments of felsic tuff, and devoid of fragments of granitoid rocks or limestone. Many rocks on both sides of the unconformity contain moderate to strong, carbonate-hematite alteration (probably related to abundant later, mainly north- to northeast- trending, irregular felsic to intermediate dykes averaging 1-3 meters thick).

Higher in the section in the south, the mature, buff coloured sandstone is overlain by a volcanic conglomerate/breccia unit dominated by angular to rounded fragments of intermediate volcanic flows with minor limestone and granodiorite. Overlying this unit is a mixed zone of finer intermediate tuffs and fine clastic

sediments. Towards the top of this section, rocks become increasingly calcareous, and a few limestone lenses occur. Here are abundant fossils including Weyla clams, other pelecypods, gastropods, bryozoans, belemnites, corals, and ammonites. West of Tarn Lake (Figures 4, 5 and 9), these rocks are tightly folded in the core of a synclinal warp on the west flank of the McTagg Anticlinorium, and are truncated to the north along the Tarn Lake Fault.

North of the Tarn Lake Fault, the Unuk River section is much thinner and less deformed than to the south. The lower conglomerate-sandstone unit and overlying volcanic conglomerate-breccia unit are absent. Here, fine intermediate to felsic tuffs overlie mafic to intermediate flows of the Stuhini Group. Higher in the section are calcareous, clastic sediments and several, thin limestone intervals containing characteristic fossil assemblages as to the south. Near the top of the section are a few graded beds of felsic lapilli to fine tuff interlayered with mudstone and siltstone. The felsic tuff is similar in composition to overlying rocks of the Betty Creek Felsite (large label 3A on Figures 5, 8, 9 and 10), and may represent an early stage of that felsic volcanism.

Further north near the nose of Jack Glacier above the fossiliferous unit are several tens of meters of dark carbonaceous, siliceous mudstone and lesser interbedded, medium grey wacke/sandstone.

2.2.1.2.2 Betty Creek Formation

Some ambiguity exists as to the position of the boundary of the Unuk River and Betty Creek Formations. In this study, it is placed at the base of the major felsic unit (Betty Creek Felsite) which extends from south of John Peaks to the north end of AP Ridge. Some workers have suggested that this felsite unit may be part of the Mount Dilworth Formation. However, they have difficulty in explaining the presence of the Betty Creek Andesite higher in the stratigraphic section to the west.

The Betty Creek Felsite is an unusual member of the Betty Creek Formation, and has not been described regionally beyond the west limb of the McTagg Anticlinorium. As indicated above, thin felsic tuff layers in the upper part of the Unuk River Formation may represent early eruptive precursors to the main felsic event.

The main felsic event started with the eruption of a trachyte welded tuff up to a few tens of meters thick.

It contains strongly flattened, greyish to brown fiamme up to several cm long, and scattered angular felsite fragments mainly less than 1 cm across in a generally white to pale grey or cream-coloured, trachytic matrix. Overlying the welded tuff is a thick, lenticular section of tuff breccia and lapilli tuff, which contains fragments averaging 2-20 cm in size and locally up to 80 cm across of a variety of felsic volcanic and hypabyssal rocks (ranging from trachyte to latite/dacite) in a variable, pale to dark grey or cream to pink groundmass, commonly of latite or trachy-latite composition. Some of the larger fragments are of the underlying trachyte welded tuff. The tuff breccia is thickest from north of Tarn Lake to just beyond the toe of Bruce Glacier. In places, abundant hematite colours the groundmass and/or fragments deep brownish red; this suggests that these rocks were exposed to atmospheric oxygen. Thin, commonly well bedded, fine to medium latite tuff intervals are minor.

Associated with the trachyte welded tuff are discontinuous lenses of flow-banded, slightly porphyritic trachyte. Flow-banding commonly is parallel to primary layering in the welded tuff, but elsewhere is widely divergent in orientation. Some flow-banded units contain minor to very abundant plagioclase spherulites averaging 0.5-1 cm across. Associated with some of these are what appear to be bedded tuffs composed mainly of similar spherulites.

Intrusive into the felsic unit in several localities are sub-volcanic plugs up to a few tens of meters across of massive, aphanitic trachy-latite. These are similar in composition and texture to the Hope Plug (see Section 2.3). Because of their spatial relationship to the Betty Creek Felsite, and because fragments of similar rocks occur in the tuff breccias, these intrusions are considered to be coeval with the felsic extrusive rocks.

Overlying the Betty Creek Felsite is an interval up to a few hundred meters thick of andesite to basaltic andesite lapilli tuff, with much less tuff, and minor flows, designated the Betty Creek Andesite. These rocks are typical of the Betty Creek Formation regionally. Only the tuff intervals are well bedded. Rocks commonly contain fragments of medium green andesite and basaltic andesite flow and tuff in a medium to dark green groundmass. Locally, the groundmass has a light to moderate maroon colour, also a typical regional feature of the Betty Creek Formation. The maroon colour is prominent locally, as in rocks just below the contact

with the overlying Mount Dilworth Formation on Boundary Creek near the north border of the Coul 3-4 Claims.

2.2.1.2.3 Mount Dilworth Formation

The Mount Dilworth Formation is exposed on the west limb of the McTagg Anticlinorium and on Alice Lake Ridge in the Unuk River Block. Correlation between areas is tenuous, and based on general stratigraphic and lithological similarities rather than on identification of marker units, fossils or radiometric data.

Just east of Jonathan and Storie Creeks, rhyodacite to latite lapilli tuff and tuff of the Mount Dilworth Formation is exposed in large cliffs. It is altered moderately to strongly to quartz-sericite-(pyrite), and weathered cliffs are stained red-orange by limonite. Pyrite is particularly abundant north of the property above Storie Creek. The Anna Showing occurs at the south end of this zone. Further south, rocks of the Mount Dilworth Formation pinch out just east of Jonathan Fault.

2.2.1.3 Bowser Lake Group

Without the presence of the pillowed andesite flows, which are typical of the Salmon River Formation, it is difficult to classify fine clastic rocks as Salmon River or the Bowser Lake Group. On the west edge of the McTagg block, interbedded carbonaceous mudstone and siltstone of the Bowser Lake Group lie west of the rocks of the Mount Dilworth Formation. The contact is conformable and dips moderately to steeply to the east, indicating that the section is overturned.

Further north along Storie Creek, deformed rocks of the Bowser Lake Group dip moderately to gently southeast beneath rocks of the Betty Creek Formation. However, it is probable that they are separated by a major fault along and just southeast of Storie Creek. Outcropping rocks of the Bowser Lake Group widen greatly at the north end of the McTagg Anticlinorium north of the headwaters of Storie Creek.

Rocks of the Salmon River Formation have not been reported in the McTagg Block.

2.2.2 Unuk River Block

The stratigraphy in this block is not as well understood as that in the McTagg Anticlinorium Block. No rocks of the Stuhini Group are present nor are any which are diagnostic of the Unuk River Formation.

2.2.2.1 Hazelton Group

2.2.2.1.1 Betty Creek Formation

On Jeff Ridge, rocks of the Betty Creek Formation are dominated by basalt to latite flows, tuff and lapilli tuff, and minor trachy-latite flows and lapilli tuff. These rocks commonly are altered moderately to strongly, with secondary K-feldspar, ankerite, and pyrite. Scattered lenses on Jeff Ridge and in drill holes consist of very amygdaloidal andesite/basalt flow less than several meters thick. These rocks are similar to some of those of the Betty Creek Formation in the footwall of the Eskay Creek deposit. On a cliff face at the east side of the ridge, at the top of the section of altered volcanic rocks are lensy zones up to a few mm across and several centimeters thick containing abundant, delicate spheroidal aggregates of pyrite and quartz, whose textures suggest formation at the rock-sea water interface. Similar textures were seen locally in drill cores in sulphide-rich zones on the west side of the ridge.

Also on the west side of the ridge is a thin zone of trachy-latite tuff and lapilli tuff interlayered with mudstone. This zone contains the main anomalous surface values of gold on the Jeff Grid. Data from drill core indicate that secondary quartz, pyrite, and ankerite are associated with moderately abundant arsenopyrite, sphalerite, and galena, with minor tetrahedrite, stibnite, and electrum. Near the north end of Jeff Grid, pyrrhotite and much less chalcopyrite and sphalerite occur with pyrite.

Further west, near the Unuk River, are intervals of andesite flow, tuff, and minor lapilli tuff interlayered with those of well bedded mudstone and siltstone. It is uncertain whether the sedimentary rocks are part of the Betty Creek Formation or are fault-bounded blocks of the Salmon River Formation or Bowser Lake Group.

On Alice Lake Ridge (Figures 3 and 11), the Betty Creek Formation consists of a complex section of mainly andesite flows, lapilli tuff, and tuff, with intervals of fine clastic sedimentary rocks. Near the top is a latite lapilli tuff containing fragments of latite and minor trachy-latite in an argillaceous groundmass. This grades into more sedimentary member with much less abundant and commonly smaller felsic fragments.

2.2.2.1.2 Mount Dilworth Formation

Just west of Unuk River on the east flank of Coulter Ridge is an isolated outcrop 10 m across of trachyte and trachy-latite lapilli tuff. It contains fragments of trachyte in a latitic groundmass and is surrounded by mudstone, mudstone with felsic fragments, and minor intermediate tuff of the Betty Creek Formation. Stratigraphic and structural relations in this region are obscured by abundant late diabase dykes.

West of Coulter Creek, felsic volcanic rocks of the Mount Dilworth Formation are exposed on the east-facing slope and western part of the crest of Alice Lake Ridge. Here the unit is discontinuous, either as a result of original deposition on an irregular terrain, or because of erosion. Rocks are dominantly latite and trachy-latite flows, flow breccia, lapilli tuff and coarse tuff. Bedding surfaces are rare and facing directions are absent, making stratigraphic and structural interpretation difficult. Stratigraphically beneath the felsic rocks is the heterolithic, carbonaceous latite tuff to lapilli tuff of the Betty Creek Formation, which contains abundant fragments of felsic volcanic rocks in a slightly to moderately carbonaceous groundmass. Rocks in this region have been traced to the north by Roland Bartsch (pers. comm.), who equates them with the Mount Dilworth Formation at Eskay Creek.

In the northwest corner of the Coul 1 Claim (Figures 3 and 11) is a oval-shaped plug 250 x 500 meters across of slightly to strongly brecciated trachyte/latite. Breccia zones are most intense near the margins of the plug, and contain minor to locally moderately abundant pyrite. Because this plug cuts rocks of the Betty Creek Formation, it is grouped with the Mount Dilworth Formation. It is similar in some respects to the Hope Plug (See Section 2.3).

2.2.2.1.3 Salmon River Formation

Southwest of John Peaks, Peter Lewis (pers. comm.) mapped easterly facing pillowed andesite flows of the Salmon River Formation both in the narrow block between Jonathan Fault and Jeff Fault, and west of Jeff Fault. These rocks do not continue as far north as the Coul 3-4 Claims, but indicate the structural orientation of rocks in this block.

On Jeff Ridge, rocks of the Salmon River Formation are structurally interlayered with those of the Betty Creek Formation. Some contain characteristic belemnites,

similar to those seen in rocks of the Salmon River Formation at Eskay Creek. Minor weakly deformed, black mudstone and siltstone in this region may belong to the Bowser Lake Group.

The crest of Alice Lake Ridge is underlain by massive, plagioclase phyric andesite and latite flows, which correlate with similar rocks to the north mapped as Salmon River Formation by Roland Bartsch (pers. comm.). In places, these unconformably overlie rocks of the Betty Creek and Mount Dilworth Formations, and in places they are in fault contact with those rocks.

The knob between Lower Coulter Creek and Unuk River is crested by a massive, pillowed andesite flow, herein assigned to the Salmon River Formation (Figures 3 and 11). To the west, it is in probable fault contact with rocks of the Bowser Lake Group, which dip beneath the ridge. To the east, contacts of the andesite with other rocks are obscured by abundant diabase dykes and faults. Scattered outcrops on the upper part of the eastern slope of the ridge are of mudstone and tuffaceous mudstone of the Betty Creek Formation. Lower down towards the Unuk River are intermediate to felsic tuffs and mudstone/siltstone intervals of uncertain age.

2.2.2.2 Bowser Lake Group

Just west of Jeff Creek Fault, rocks of the Bowser Lake Group conformably overlie those of the Betty Creek Formation. Although no facing directions were found in this region on the property, data to the south in this block indicates that the section faces east. Drill data from the Jeff Grid indicate graded beds face both east and west, suggesting tight folding (see Section 5).

In and west of Coulter Creek, mudstone and siltstone of the Bowser Lake Group are folded tightly about axes trending north-south. This is a southerly continuation of the major tightly folded synclinerium in similar rocks west of Eskay Creek. At the west side of this belt, rocks of the Bowser Lake Group overlie unconformably more strongly folded rocks of the Hazelton Group.

2.3 Intrusive Rocks

Intrusive rocks on the property are divided into the following main types:

1. pre-Lower Jurassic granodiorite boulders in conglomerate at the base of the Hazelton Section (see Section 2.2.1.2.1);

2. pre-deformation intermediate dykes and sills in rocks of the Unuk River Formation;
3. pre-deformation Hope Plug and similar smaller plugs, dykes and sills (probably related to Betty Creek Felsite and less probably to the Mount Dilworth Formation);
4. post-deformation John Peaks Diorite and related(?) diabase, diorite, and gabbro sills, in part brecciated;
5. late felsic dykes;
6. basalt dykes.

On the cliff face northeast of Tarn Lake, an andesite/latite sill up to 25 cm wide was boudinaged along foliation in a strongly foliated mudstone interval in rocks of the Unuk River Formation. Elsewhere, a few intermediate dykes and sills have irregular contacts with host rocks of the Stuhini Group and Unuk River Formation, suggesting that they were intruded prior to deformation.

The Hope Plug is an oval-shaped body a few hundred meters across, which intruded mafic volcanic rocks and turbidite sequences of the upper part of the Stuhini Group and mainly sedimentary rocks of the Unuk River Formation. It is mainly aphanitic latite to trachy-latite in composition, and contains minor plagioclase phenocrysts. The colour is mainly pale to light green, but irregular patches up to several tens of meters across are medium to dark green and black. Towards the margin is a zone up to a few meters across containing weak, delicate flow-banding, mainly parallel to the contact. Along the margin is a zone a few meters wide containing lenses and patches of finely brecciated felsite in a siliceous groundmass and patches of an irregular fine to coarse breccia containing unusual, commonly dark green to black fragments. Near the margins of the body, pyrite is common in the breccia matrix as disseminated grains and replacement patches and in veinlets. In the core of the body are sets of well developed, columnar joints.

Three dykes up to a few meters across of similar composition cut mafic volcanic rocks of the Stuhini Group at the Stibnite Showing (Figures 6 and 9) just north of Lawrence Peak. These contain abundant gash veins dominated by quartz with less carbonate, chlorite, and sulphides.

Other small felsite plugs up to a few tens of meters across intrude welded trachyte tuff of the Betty Creek Formation at the AP Showing, and cut trachy-latite to

latite tuff breccia bodies to the northwest near Bruce Glacier. One of the latter intrusions has a well developed contact zone up to 2 meters wide containing unusual fragments of aphanitic felsite in a groundmass of altered felsite. Some fragments are coated by quartz which shows comb-textures and in part fills cavities. The contact zone is somewhat similar to the contact zone of the Hope Plug. The spatial proximity of these rocks to the Betty Creek Felsite and the inclusion of fragments of similar composition and texture in the upper tuff-breccia of the Betty Creek Felsite suggest a genetic association.

The John Peaks diorite is an elongate intrusion of fine to medium and locally coarse grained diorite. It probably was intruded after the main deformation events, and produced a moderate contact metamorphic aureole in surrounding fine clastic sedimentary rocks. At the north end it contains abundant veins and veinlets dominated by quartz and epidote. Glacial debris in this region contains abundant boulders of altered diorite and skarn containing moderately abundant patches of massive sulphide, dominated by pyrite, pyrrhotite, and sphalerite. These probably were formed in a contact metamorphic aureole surrounding the intrusion. In detail, the north end of the diorite intrusion is irregular against altered and folded mudstone and limestone of the Unuk River Formation.

Numerous mafic to intermediate dykes cut rocks of the Stuhini and Lower Hazelton Groups. Some of these are concentrated in swarms of subparallel dykes averaging 2-5 meters in width. They include fine-grained diorite and diabase, and porphyritic hypabyssal andesite and latite.

On Gord Ridge, a very fine-grained diabase dyke/sill was intruded parallel to stratigraphy in the upper part of the Unuk River Formation. It commonly has a border zone up to a few mm wide of an aphanitic basalt containing abundant to very abundant amygdules averaging 0.5-2 mm in size of quartz, carbonate, and less chlorite. A prominent set of diabase dykes was intruded along the Unuk River. A fine-grained diorite/monzonite dyke forms a prominent cliff at the south end of Jeff Grid.

A few late, aphanitic to very fine-grained, felsic dykes cut rocks of the Stuhini and Hazelton Groups. Some may be feeders for the Mount Dilworth Formation. As was mentioned previously, the oval-shaped plug of latite and trachy-latite in the northwest corner of Coul 1 Claim may be associated with the Mount Dilworth Formation (see Section 2.2.2.1.2).

A basalt dyke swarm trending east-southeast cuts rocks of the Betty Creek Felsite and Unuk River Formation at the AP showing and along the west side of Bruce Glacier. Dykes average a few to several meters wide, and commonly were intruded along faults. Just north of the AP zone, an oval-shaped body of similar basalt appears to be folded with lapilli tuff and tuff breccia of the Betty Creek Felsite.

2.4 Structure

2.4.1 Structural Elements

2.4.1.1. Primary Features

Primary features include bedding and facing indicators. Bedding is well developed in most sedimentary intervals, especially in rhythmic turbidites. In strongly deformed regions, bedding commonly was transposed parallel to a steeply dipping foliation (indicated on the geological maps by the symbol, 0-1, beside the foliation symbol.)

Facing indicators are well developed in turbidite intervals, and much more poorly developed elsewhere. They are critical to the understanding of the nature of folding, especially in the tightly folded rocks in the core of the McTagg Anticlinorium, and in the Unuk River valley (where such indicators are absent).

Graded beds are common and almost all are normally graded. A graded section is present in the lower part of the Unuk River Formation, where boulder- and cobble-conglomerate beds are overlain by pebble- and granule-conglomerate beds interlayered with coarse grained arenites, which in turn are overlain by finer grained arenites.

Cross beds are present locally in turbidite intervals; as well as giving unequivocal facing indications, these give current directions.

Ball-and-pillow structures, caused by different densities of soft sediments, are widespread in turbidite intervals, and are developed where arenite beds overlie mudstone.

Scour-channel-fill and lag deposits in turbidites are mainly of fine sandstone, locally containing pebbles or cobbles in mudstone or siltstone. Lag deposits, ranging from sandstone to cobble-conglomerate, fill erosion channels in finer-grained clastic sedimentary rocks.

2.4.1.2 Soft-Sediment Deformation Features

These are deformation features in sedimentary rocks which have no systematic pattern relative to regional stress fields. In places they have been overprinted by deformational features related to regional stress fields. However, folds formed during such overprinting have no systematic orientation. Most features of soft-sediment deformation are indicative of ductile deformation, and high-energy environments, such as might be produced in tectonically active areas. These features are common in the Unuk River Formation near Tarn Lake.

Soft sediment deformation features include:

- 1) convolute bedding caused by slumping of beds, which behave like a thin crumpled sheet between more resistant layers. The orientation of the slump indicates slope direction.
- 2) rip-up clasts, mainly of bedded mudstone in coarser clastic sediments; the orientation of clasts may indicate flow direction.
- 3) debris flows up to a few meters thick which contain chaotic folding patterns and large angular blocks. Generally, features are too chaotic to indicate slope directions.
- 4) minor transform faults which locally offset certain layers while not affecting those above or below. They are indicative of high hydrostatic pressure, which allowed brittle deformation to occur even before the sediments were lithified.

2.4.1.3 Regional Deformation Features

Regional deformation produced broad warping and folding and sparse parasitic folds. A poorly to moderately developed regional foliation was developed and is axial planar to major folds. Clasts are flattened moderately to strongly in this plane. The foliation cuts bedding and offsets it slightly in noses of small folds. On limbs of folds, bedding was transformed subparallel to regional foliation. In noses of several anticlines in the McTagg Anticlinorium, bedding was transposed parallel to a well developed, axial planar foliation.

Lineations are developed poorly. Most common are mineral lineations indicating the intersection of bedding and foliation planes. Less common are fold axis lineations marking axes of folds. In places these two types are

subparallel. However, wide diversity in orientation of lineations in different parts of the property suggest that lineations were formed in more than one stage of deformation, and that some early-formed lineations were rotated by later folding or faulting.

Although some data suggest more than one penetrative regional deformation event, they are too sparse to define such events on the scale of the property.

2.4.1.4 Major Faults

Major, generally north-south trending, steeply dipping faults occupy linear depressions and are exposed only locally. Commonly they are marked by sharp changes in lithology and/or structural style and orientation on opposite sides. Associated with some in mudstone/ siltstone of the Bowser Lake Group are zones up to a few tens of meters across of irregular block-faulting and tight kink-folding, probably formed during movement on the main fault. The nature of the faults is uncertain; regional data suggest that some are thrust faults and others are normal faults.

2.4.1.5 Minor Faults

Numerous smaller faults cut all the blocks; they are exposed best on ridges, where they commonly occupy saddles. Many contain complex carbonate veins and breccia veins which grew as the faults were opening in a tensional regime. These commonly contain fragments up to several cm across of wall rocks, mainly black mudstone. Many have delicate, spheroidal textures, and some have vuggy cores, in part filled by coarse-grained calcite. Most are cream-coloured dolomite to ankerite, with minor growth zones of hematite. A few are of light to medium grey calcite. They are most obvious on ridges in the Stuhini Group rocks and in drill core. Where faults cut intermediate to mafic volcanic rocks of the Hazelton and Stuhini Groups, ankerite alteration halos are common. Offset on the faults is difficult to determine, but generally is less than a few tens of meters.

Several faults contain prominent slickensides, which generally dip gently. In several faults, carbonate and quartz-(pyrite) veins were emplaced in part before and in part after slickensides were formed.

2.4.2 Structure by Regions

2.4.2.1 Major Bounding Faults

The region is divided into a few structural blocks by major faults; these include the Harrymel Fault to the west, the

Jonathan Fault just east of Unuk River, and the Sulphurets Thrust Fault Zone just beyond the eastern margin of the property. A fault along the Unuk River (Unuk River Fault) may divide the Unuk River Stratigraphic Block into two smaller blocks, but structural and stratigraphic relations across this fault are not clear. Smaller faults in these major blocks show a variety of offset types.

The Harrymel Fault is a north-south fault zone up to a few hundred meters wide. West of the property it dips steeply to the east. Normal offset on the fault exposes older rocks (including those of the Stuhini Group) to the west against younger rocks of the Hazelton Group to the east. Further south the fault is subvertical; it is being studied in this region by Peter Lewis (pers. comm).

The Jonathan Fault marks the eastern boundary of the Unuk River Block. It and the Jeff Fault have been described in some detail above. The overturned western limb of the McTagg Anticlinorium east of Jonathan Fault suggests that rocks of the McTagg Block were thrust over rocks to the west. To the north they may connect with the fault which cuts the axial zone of the Eskay Creek Anticline. Alternately, and more probably, they bend to the east (as do many features in this region) and extend up the Storie Creek and Unuk River valleys.

Just east and southeast of the property thrust movement on the Sulphurets Thrust Fault carried rocks of the Stuhini Group eastward and southeastward across strongly altered rocks of the Hazelton Group in the Sulphurets camp. These faults probably were formed during late stages of the major east-west crustal shortening which accompanied deformation of the Bowser Lake Group rocks.

2.4.2.2 West Unuk River Block

In this zone, bedding attitudes and facing directions are rare, making structural and stratigraphic interpretation difficult. On Alice Lake Ridge, rocks are folded about gently plunging, open to isoclinal, north-south fold axes. Deformation, including foliation and lineation, is weak to moderate in mudstone and siltstone of the Bowser Lake Group and generally weak in the underlying rocks of the Hazelton Group.

On the west side of Alice Ridge, rocks of the Mount Dilworth Formation are exposed on the crest of a broad anticline (Alice Lake Anticline). Directly beneath the felsite is an unusual fragmental mudstone containing minor to abundant coarse tuff to lapilli sized fragments of altered felsite. Westward to the Harrymel Fault in Harrymel Creek, the structure is uncertain.

A major shear zone on the west side of Alice Lake separates rocks of the Betty Creek and Mount Dilworth Formations to the west from andesite flows of the Salmon River Formation to the east. This contains a quartz vein with anomalous gold values (See Section 3.3).

On the east side of Alice Ridge, a major shear zone occurs along Anomaly Creek (Figure 11) in rocks of the Betty Creek and Mount Dilworth Formations.

Previous studies suggested that a major north-south fault (Coulter Creek Fault) occurred along Coulter Creek. North of the property, regional studies showed a fault in the creek which truncated the southern extension of the Salmon River/Mount Dilworth section at Eskay Creek against rocks of the Bowser Lake Group. In the northern part of the Coul 2 Claim and further north, along Coulter Creek rocks are complexly warped and block faulted, suggesting the presence of a major fault. Early, north-south trending, close to isoclinal folds plunge gently to the north or south. Further south, the creek occupies a bedding plane contact in uniformly steeply dipping, well bedded mudstone and siltstone of the Bowser Lake Group. It may be that this zone of complex deformation and faulting crosses the region of no outcrop on the slope just west of Coulter Creek. However, little offset of rocks occurs in Coulter Creek.

North of the property, Roland Bartsch (pers comm.) reinterpreted the Coulter Creek Fault to be a westerly directed thrust fault, along which rocks of the Salmon River and Mount Dilworth Formations were thrust over tightly folded rocks of the Bowser Lake Group. The southern extension of this fault lies east of Coulter Creek, and is interpreted to pass through the ridge east of Lower Coulter Creek where the cliff-forming pillowed andesite flow of the Salmon River Formation overlies folded rocks of the Bowser Lake Group (Figure 3).

A prominent linear feature extends north-northeastward from the west side of the Unuk River along a broad creek valley. Outcrop is poor along this zone. This creek marks the approximate western boundary of the zone of strong, moderately easterly to northeasterly dipping foliation in the East Unuk River Block. To the west, rocks dip moderately eastward to northward and are foliated only weakly. A fault, herein designated the Unuk River Fault, is interpreted to extend along this zone. This zone is the axis of later intrusion of several diabase dykes in what must have become a tensional regime. The age relation between faulting and dyke intrusion is uncertain.

2.4.2.3 East Unuk River Zone

Rocks in this block are characterized by a stronger foliation than elsewhere in the region, except in the core of the McTagg Anticlinorium; foliation strikes north to northwest and dips moderately to the east to northeast, and is subparallel to bedding. A prominent lineation marking their intersection plunges moderately to the east. The nature and orientation of these structural features is difficult to correlate with deformation features east of Jonathan Creek.

The small block between Jeff and Jonathan Faults (Figures 3 and 13) consists entirely of rocks of the Salmon River Formation/Bowser Group. In it, both bedding and foliation dip moderately to the south, and a prominent lineation marking their intersection plunges gently to the south. This suggests that this narrow block was rotated strongly during faulting; however, in that model, reconstructing the blocks to produce a consistent, pre-faulted fabric orientation encounters "room" problems.

The presence in drill holes in the Jeff Grid of graded beds facing both east (upright) and west (overturned) has not yet been explained.

2.4.2.4 McTagg Anticlinorium Block

At first glance, the McTagg Anticlinorium appears to be a simple, broad anticlinorium affecting all the Triassic and Jurassic rocks. However, the following features indicate that the rocks were folded more than once:

- 1) The core of the anticlinorium is strongly foliated (in part mylonitic) zone containing three or four anticlines and two or three synclines. Noses of anticlines are strongly sheared, and anticlinal closures were not seen. Noses of synclines are preserved, and are obvious on the slopes above East McTagg Creek/Glacier. The zone of shear deformation in the core of the anticlinorium extends to the south at least several kilometers into a zone of highly deformed and moderately metamorphosed rocks, possibly of Lower Stuhini or Upper Paleozoic age (Tom Wright, pers. comm.).
- 2) On both limbs of the anticlinorium, beds are overturned moderately to strongly, with dips from 45-70 degrees.
- 3) To the north, the fold is much simpler and more open. Foliation is weak to absent, and beds are folded broadly around a moderately to steeply north-plunging axis. Numerous block faults have broken the nose of the fold,

and minor secondary folds with an east-west orientation are present, e.g., on the ridge between Ceparley and Roensfeld Glaciers.

- 4) Broad warps on the flanks of the main fold have been documented in Hazelton Group rocks near and underlying Bruce Glacier and in Stuhini Group rocks on a north-south ridge south of West McTagg Glacier. In the latter, a prominent lineation plunges northwest at 45 degrees, suggesting that this fold is not associated with the development of the north-plunging McTagg Anticlinorium.
- 5) A strong east-west foliation is developed locally in rocks on the ridge south of Gingras Creek. A similar strong east-west foliation is developed in the southeastern corner of the property and further east along Mitchell Glacier (R. Kirkham, pers. comm.).

Several important faults cut the McTagg Block.

Just north of Tarn Lake, a major resistant block of Betty Creek Felsite was thrust to the east over rocks of the Unuk River Formation on the north side of the west-northwest trending Tarn Lake Fault. A small fault dipping 50 degrees west was mapped along the lower contact of the Betty Creek Felsite against the western end of the Hope Plug. The thrust component is suggested because the thickness of the section of the Unuk River Formation north of Tarn Lake Fault is much less than to the south of the fault. Alternately, some of the difference in thickness of the Unuk River Formation may be because of an original topographic high in the underlying Stuhini Group rocks. This fault may represent a late stage in the east-west compression which produced the McTagg Anticlinorium.

The northern extension of the Brucejack Lineament is projected to cross the eastern part of the property in the region of the Johnstone Icefield. A few major faults were mapped along Jack Ridge to the north. Probably the Brucejack Lineament extends northwest through Ceparley Glacier. Across the glacier, this fault has an apparent left-lateral offset of up to a few hundred meters of the contact of the Upper Stuhini mafic flows and flow breccias with an underlying turbidite interval.

A prominent south-dipping fault occurs along the south side of Tarn Glacier, where it cuts and offsets by several meters the contact between the Hope Plug and Stuhini Group tuffaceous andesites. Near its east end, a branch extends steeply up the ridge to the south along the contact between the Hope plug and Stuhini mafic volcanic flows, pillowed flows, and tuffs.

Further south, this fault disappears, and the contact between the Hope plug and Stuhini group rocks is exposed and is folded moderately.

A prominent ankerite-quartz alteration zone up to a few meters wide occurs along a steeply dipping northwest-trending fault which cuts Stibnite Ridge. In this zone, mafic volcanic rocks are altered strongly to a light blue-grey rock which elsewhere might be described as felsite.

A fault up to 20 cm wide occurs at the southeast side of the AP Glacier. It strikes about north-south and dips steeply to the east. It contains a quartz vein with abundant disseminated pyrite. Slickensides on the fault and in the vein are parallel to the dip.

Northwest of the AP Zone, several faults juxtapose well foliated welded tuff against massive tuff breccia or felsite intrusive rocks. These may be intraformational faults, formed during extrusion of the Betty Creek tuff breccia.

2.4.2.5 Sulphurets Block

The major thrust faults exposed just beyond the southeast corner of the property, separate an overlying block of broadly folded, unaltered, Stuhini Group rocks on the east limb of the McTagg Anticlinorium over massive, strongly altered intermediate to felsic volcanic rocks of the Hazelton Group.

2.4.2.6 Structural Interpretation

Data suggest the following structural interpretation. During an early deformation, rocks of the Stuhini Group were tilted, uplifted and folded. Evidence for tilting includes the angular unconformity southwest of Jack Glacier and regional unconformities reported elsewhere. Evidence for uplift includes the basal granitoid-boulder conglomerate along the western margin of the Stuhini rocks and the local development of "terra rosa" along the unconformity southwest of Jack Glacier. Evidence for early folding is inconclusive; however, a suggestion of early folding comes from the contrast between strongly folded Stuhini Group rocks in the core of the McTagg Anticlinorium and the broadly warped rocks of the Hazelton Group to the north.

The wide lateral distribution of the relatively thin Mount Dilworth Formation has lead many authors to conclude that it was deposited on a surface of very low relief, indicating a major erosional period after formation of the Betty Creek Andesite. Workers in the Eskay Creek area suggest an unconformity at the top of the Mount Dilworth Formation.

After deposition of the rocks of the Bowser Lake Group, east-west compressional folding produced the broad, north-plunging arch which is part of the McTagg Anticlinorium. A few major parasitic folds were developed on its limbs. The most prominent of these is in the Betty Creek Felsite under Bruce Glacier. In this fold, the massive basal welded tuff is warped broadly, whereas tuff-breccia and lapilli tuff units above contain a moderate to strong, axial planar foliation striking 000-030 degrees and dipping 70-80 degrees southeast.

Later(?) deformation in some areas is associated with a steeply dipping, east-west cleavage, and a moderately prominent lineation. South of McTagg West Glacier, a prominent lineation plunges 45-55 degrees northwest, and is developed mainly in the nose of a northwest facing broad warp in bedding in sedimentary rocks of the Stuhini Group.

Major thrust faulting probably represents a late-stage in the major east-west compression of the Cretaceous Stikine Folding. Thrusting was of massive, dominantly volcanic blocks over more-readily deformed, dominantly sedimentary blocks.

2.5 Economic Geology

In this section of the report are documented the relationships between zones of economic interest and local structure and stratigraphy. Details of the deposits and showings are in Sections 3, 4, 5, and 6.

2.5.1 Unuk River Block

2.5.1.1 'R' Grid Creek Showing

The area west and north of Alice Lake on the 'R' Grid, Coul 1 Claim, is underlain by intercalated argillite, sandstone, argillaceous debris flow and intermediate to felsic volcanic units. Stratigraphy in the area is poorly understood, but it is assumed that the intermediate volcanic rocks are part of the Betty Creek Formation and that the felsic volcanic rocks are part of the Mount Dilworth Formation.

The Creek Showing, approximately 475 m northwest of the north end of Alice Lake, occurs in mudstone and debris flow units which physically, and possibly stratigraphically, underlie the felsic volcanic unit(s). It was drilled in 1991 and includes a roughly 8 m interval of mudstone with possibly exhalative bedded pyrite which averages 0.9 g/t gold. Unless the sequence is overturned, it appears that the showing is stratigraphically below the Mount Dilworth Formation and therefore not in the same stratigraphic position as the Eskay

Creek deposit. However, the rocks are physically similar to the 'Eskay Creek' stratigraphy and should be a prime exploration target.

2.5.1.2 Jeff Showing (Jeff Grid)

Rocks of the Betty Creek Formation underlie much of Jeff Ridge, and near the north end of the property (Coul 3) extend westward to Unuk River. They are altered moderately to strongly to quartz-ankerite-pyrite, and contain local concentrations of base metals, to the south mainly sphalerite and galena, and to the north mainly pyrrhotite and chalcopyrite. Anomalous values of gold and silver associated with arsenic and antimony in soils and rocks were tested by diamond drilling.

Drill results show electrum and minor native gold associated with sphalerite, galena, and pyrite, and minor tetrahedrite and cinnabar in replacement patches and veins with a gangue dominated by quartz and ankerite. The highest gold values are associated with cinnabar and quartz.

2.5.1.3 Anna Showing

Rocks of the Mount Dilworth Formation are exposed in cliffs above the Unuk River and Storie Creek valleys. Some outcrops are marked by prominent limonitic gossans; most of these are northwest of the boundary of the Unuk Claim block. At the south end of this zone, in Coul 3-4 Claims, latite/rhyodacite lapilli tuff contains moderately abundant, disseminated pyrite and minor quartz-pyrite veinlets. As yet, no anomalous values in base or precious metals have been encountered.

2.5.2 McTaqq Block

2.5.2.1 AP Zone

The AP-Zone occurs in the Betty Creek Felsite. The presence of strongly rotated blocks of the basal welded tuff, small plugs of aphanitic felsite, and strong alteration and sulphide mineralization suggest that the AP zone is centred on a felsic volcanic vent. The alteration assemblage is dominated by pervasive silicification and disseminated pyrite. Veins of quartz, carbonate, and pyrite with locally abundant galena cut the host rocks. The best showings are in the volcanic neck near the south end of AP Ridge. In drilling in 1989 and 1990, anomalous gold values were encountered over widths of several meters. Further north, scattered values of gold were reported from surface and previous drilling. Still further north are a few localities containing several major, west-northwest trending zones up to a few meters wide of strong pyrite

alteration. Although the AP Zone was drilled extensively in previous years, some major zones of silicification and pyrite-galena veins were not tested properly.

2.5.2.2 Hope Intrusions

The Tarn Creek showing is near the northeast margin of the Hope Plug in strongly deformed rocks of the Unuk River Formation near their contact with rocks of the Stuhini Group.

A roughly 50 m wide by 300 m long northeast-trending zone with sporadic carbonate alteration (orange weathering) and discontinuous north to northwest-trending quartz stringers and gash veins occurs east of Tarn Lake (Figures 5 and 8). These stringers are sporadically mineralized with pyrite, arsenopyrite, sphalerite and galena.

This area has subsequently been mapped, covered by magnetic and IP surveys, and tested by one drill hole. A more detailed discussion of the area follows in section 6.0.

The Stibnite Showing is in and near tension-filling quartz veins and veinlets cutting two felsite dykes up to 3 meters wide and surrounding Stuhini andesite/basalt flows and lapilli tuffs. The dykes are similar in composition and texture to the Hope Plug, and probably are offshoots from that body. Veins contain local concentrations of stibnite and minor native gold. No significant economic tonnage is expected from this zone.

2.5.2.3 John Peaks Diorite

In the north end of the John Peaks intrusion and in surrounding hornfelsed rocks of the Unuk River Formation are abundant veins dominated by quartz and epidote. The abundance of sulphide-bearing boulders nearby suggests that a contact metamorphic zone exists around the intrusion. Sulphides are dominated by pyrite and pyrrhotite, with locally abundant sphalerite, galena, and chalcopyrite.

2.5.2.4 Unuk 1 Showing

Abundant mineralized boulders occur on the Unuk 1 claim west of the Stuhini Group-Unuk River Formation contact (Figure 8).

Felsic fragment boulders contain fine-grained pyrite and stibnite in their matrix. This float may have originated from a strike projection of the Stibnite Showing to the east. Gold content in this material is low and follow-up may not be warranted.

2.5.2.5 Gord Ridge Showing

The Gord Ridge Showing is located on the Unuk 12 claim (Figure 8) near 21+00N, 16+25E (U2 grid). A northeast-trending silicified shear or vein zone up to 2m wide is hosted in phyllitic sediment or tuff in the lower part of the Betty Creek Formation(?). The structure can be traced for approximately 100m and is sporadically mineralized with sphalerite, pyrite and galena.

Several northeast-trending lineaments or faults parallel to this structure crosscut stratigraphy in the area, some of which may also be mineralized. These lineaments could be tested by collecting a series of soil samples taken from as deep into the sediment in the gullies as possible. Alteration adjacent these probable structures, however, is minimal and this project should have low priority.

2.5.2.6 Gord Creek Showing

Numerous boulders and cobbles of fine to coarse-grained tuff and possibly sedimentary rocks cut by pyrite and sphalerite-bearing quartz veins occur on the Unuk 12 claim (approximate UTM coordinates: 413,900E/ 6,271,525N). This material occurs along what appears to be a lateral moraine from a glacier to the south which probably flowed north along the Unuk River Formation - Stuhini Formation contact. No source for this material has been found and more follow-up is needed.

2.5.2.7 Stuhini Group Rocks

Near the junction of East and West McTagg Creeks, several prominent gossans and minor values in gold occur in pyrite- or pyrrhotite-bearing mudstone, siliceous mudstone, and bedded chert. Some of these are contact metamorphic zones adjacent to moderately abundant diorite/gabbro sills and dykes. A pyritic quartz vein on the ridge south of West McTagg Glacier contains no anomalous base or precious metal values.

The Bee Dee showing north of Johnstone Icefield probably is a contact metamorphic zone bordering a small diorite dyke (interpretation of 1990 data; this zone was not visited in 1991).

At the top of the major mafic volcanic unit at or near the top of the Stuhini Group section are abundant veinlets and veins dominated by pyrite and calcite, with minor quartz and secondary copper minerals. These are prominent on Jack Ridge just above Jack Glacier and on the ridge northeast of Tarn Creek.

2.5.3 Sulphurets Block

The underlying block of altered Hazelton Group rocks is suspected to represent a broad alteration zone above a mesothermal felsic intrusive body (Rod Kirkham, pers. comm.). The alteration style suggests a major Au-Cu porphyry system. This alteration system extends westward beneath the thrust fault. Discovery and development of economic zones to the east would encourage exploration of their extensions on the Unuk Claim Group in the underlying block beneath the Sulphurets Thrust Fault Zone.

3.0 COUL 1 AND 2 CLAIMS: 1991 EXPLORATION PROGRAM

3.1 Overview of Targets and Work Completed

The Coul 1 and 2 claims are located approximately 10.5 km south-southwest of and apparently on strike with the Eskay Creek deposit. On the basis of a few anomalous sample results from previous programs and the probability that the claims cover the stratigraphy hosting the Eskay Creek deposit, this area was chosen as one of the primary targets of the 1991 exploration program.

The claims, which cover 1000 ha were initially mapped at a scale of 1:5000 to identify areas with probable 'Eskay-type' stratigraphy and/or mineralization (Figure 11). On the basis of this mapping two areas were selected for more detailed work.

In the central part of the Coul 1 claim a showing (Creek showing: 6,820 ppb Au) occurs in 'Eskay-type' stratigraphy in an area covered by the previously established 'R' Grid. On the strength of the lithology and mineralization it was decided to remap the southwest part of the 'R' Grid at a scale of 1:2000 (Figure 12), and to reinterpret the soil geochemistry and geophysical surveys from previous programs using the modified geology base. Five drill holes (R91-1 to R91-50) totalling 310.85m were subsequently drilled in the showing area.

3.2 Geology

The Coul 1 and 2 claims were geologically mapped at a scale of 1:5000. An interpreted geological map of the area (Figure 11) was compiled from data collected by Granges Inc. geologists and by Roland Bartsch of the MDRU (Mineral Deposits Research Unit at UBC)

The map area can be divided into five roughly north-south panels. The west, middle and east panels are composed of intercalated intermediate tuffs, felsic tuffs and brecciated flows, minor debris flows (composed of angular to rounded intermediate to felsic volcanic, argillite and siltstone fragments in a fine-grained soft carbonaceous or argillaceous groundmass), argillite, siltstone, and minor sandstone and conglomerate. This sequence of rocks appears to have been complexly folded and faulted, and in the middle and eastern panels extensively intruded by fine to medium-grained mafic plutonic rocks. These mafic intrusive rocks may be genetically related to (ie. feeders to) the Salmon River Formation mafic volcanic flows. The volcanic rocks, which make up the bulk of the lithology in these areas, are

make up the bulk of the lithology in these areas, are generally massive making structural interpretations difficult. It is probable that these packages of rock include the Betty Creek (intermediate tuff), Mount Dilworth (felsic volcanic rocks) and Salmon River (argillite, possibly debris flows, and minor amygdaloidal and pillowed mafic to intermediate volcanic rocks) Formations and are, therefore, probably correlative to the Eskay Creek stratigraphy.

Western Panel

The westernmost panel of rocks is partly covered by the 'R' Grid and will be discussed in some detail in Section 3.3. Briefly, however, the felsic rocks appear to range from vertical to flat-lying where they overlie (stratigraphically ?) an argillaceous debris flow unit. Both gold-bearing mineral showings on the 'R' Grid occur adjacent to (below?) the felsic volcanic unit either in argillaceous debris flow or argillite.

A rounded unit of brecciated silicified felsic rock occurs in the north part of the western panel (northwest corner of the Coul 1 claim) apparently largely surrounded by intermediate tuff. This rock may be an intrusive plug and is similar to the Hope Plug which intrudes Stuhini Group rocks in the Unuk claims to the east. It is possible that this unit is cutting Betty Creek Formation tuffs and is a feeder to the Mount Dilworth Formation felsic volcanic rocks.

On the east side of the western panel the rocks appear to be in a steep fault contact with mafic to intermediate amygdaloidal flows, lapilli tuffs and possibly pillow breccias, probably of the younger Salmon River Formation.

Middle Panel

The middle panel of rocks is similar to the western panel discussed above except that it includes up to 40 percent mafic intrusive rocks. This panel appears to be unconformably overlain on both margins; by mafic to intermediate rocks of the Salmon River Formation to the west and by argillite and siltstone of the Bowser Group to the east.

Eastern Panel

The easternmost panel of rocks is largely composed of mafic intrusive rocks with remnant xenoliths or slices of intermediate tuff, felsic volcanic, argillaceous debris flow and argillite. One distinctive feature of the eastern panel is a roughly 500 m long lens-shaped unit of mafic to intermediate pillowed flows, probably of the Salmon River Formation. The remnant felsic and intermediate volcanic rocks occur on the

east side of the pillowed unit suggesting that stratigraphic tops are to the west. On the west side this panel is partly in fault contact with and partly unconformably overlain by sedimentary rocks of the Bowser Lake Group.

Alice Lake Panel

The ridge extending north from Alice Lake is largely composed of massive, relatively undeformed mafic to intermediate amygdaloidal volcanic flows, pillow breccias(?) and volcanoclastic rocks probably of the Salmon River Formation. Diamond drilling data from the west shore of Alice Lake (holes R91-1 to R91-3) indicate that these mafic rocks are near vertical whereas to the north Roland Bartsch feels that they are relatively flat-lying (where there are columnar jointed flows, suggesting subaerial deposition). In the north part of the Coul 1 claim these mafic volcanic rocks have been intruded by small medium to coarse-grained quartz-feldspar phyric plugs.

Coulter Creek Panel

The Coulter Creek valley on the Coul 2 claim is largely underlain by a monotonous sequence of thinly laminated argillite and siltstone probably of the Bowser Lake Group. These sedimentary rocks are apparently unconformably overlying older Betty Creek and Mount Dilworth Formation volcanic rocks, and except for one location on the east side, Salmon River Formation volcanic rocks appear to be absent. This suggests that either the Salmon River Formation volcanic rocks were not uniformly distributed or that a significant period of erosion occurred prior to subsidence and deposition of the basinal sediments of the Bowser Lake Group.

Sedimentary rocks in the Coulter Creek valley are concentrically(?) folded about dominantly north-northeast trending fold axes. Foliation cleavage developed in these rocks has considerable range of attitudes suggesting multiphase deformation. Rocks along Coulter Creek are contorted but there is no major fault along the creek valley.

3.3 'R' Grid Area

3.3.1 Geology Of The Southwest Part of the 'R' Grid

To the northwest of Alice Lake a gold-bearing showing occurs closely associated with felsic volcanic rocks of the Mount Dilworth Formation. The southwest part of the 'R' Grid was remapped at a scale of 1:2000 to better understand the geology in this area (Figure 12).

3.3.1.1 Stratigraphy, Lithology, and Structure

This area is divisible into two north-south trending lithological panels:

Western Panel

The western panel is composed of a complexly folded and faulted sequence of intermediate volcanic rocks, argillite, siltstone, debris flow, and felsic volcanic rock. Very little structural data were found making interpretation of the geology of the area difficult and the relative ages of the various units can only be surmised. It seems probable, however, that the intermediate volcanic units are part of the Betty Creek Formation and that the felsic volcanic rocks are part of the Mount Dilworth Formation. If this is correct the stratigraphy is tops east to tops up and the felsic volcanic rocks are the youngest in the panel.

Intermediate to mafic volcanic rocks in this area occur in generally north-south trending units up to 200 m wide (true thickness?). They range from dark to medium greenish-grey and from fine-grained massive tuff (or flow?) to lapilli tuff with distinct feldspar phyric fragments. Most commonly, however, they are medium to dark green fine- to medium-grained tuff with sporadic carbonate alteration.

Intercalated with these volcanic rocks are units of well bedded to massive argillite and siltstone to sandstone.

A debris flow unit(s) (Unit 70) occurs in irregularly shaped masses spatially related (stratigraphically below?) to felsic volcanic rocks of the Mount Dilworth Formation. The unit has a soft fine-grained dark grey to black carbonaceous or argillaceous groundmass with 25-30% rounded to angular lithic fragments up to 10 cm (averaging ≤ 1 cm) in diameter. Lithic fragments are inhomogeneous in size and composition, consisting of:

- 5-70% massive to thinly bedded mudstone and siltstone, commonly with up to 20% fine-grained bedded(?) pyrite.

-20-60% medium to light grey soft possibly clay-altered aphanitic volcanic fragments.

-10-50% aphanitic siliceous felsic volcanic fragments, commonly with flow banding, and rarely spherulitic.

In drill hole R91-3 this unit was intersected between 66.6 m and 77.7 m. Some fragments of siltstone and argillite in this interval are clearly part of larger slabs of soft sediment which broke up during slumping.

This unit is similar to the 'Transition Zone' unit which hosts the Eskay Creek deposit. At Eskay Creek this unit occurs in the Salmon River Formation immediately above the Mount Dilworth Formation(?) rhyolite. On the Coul 1 claim this unit appears to underlie the Mount Dilworth Formation indicating that either it is part of the Betty Creek Formation or that the entire sequence has been overturned.

The felsic rocks west and northwest of Alice Lake have an inhomogeneous texture. They range from massive siliceous aphanitic (possibly flow) rocks in the drill hole R91-4 and R91-5 area to coarse-grained lapilli tuff to tuff breccia with distinct flow-banded fragments on the west shore of Alice Lake. Chemically they are true rhyolites with ≥ 73 weight % SiO₂.

In the northwest corner of Coul 1 is a roughly 300 m x 500 m body of felsic rock which could be an intrusive plug, possibly correlative with the 'Hope Plug' on the Unuk 11 and 12 claims southeast of Tarn Lake. It is an aphanitic siliceous breccia apparently intruding Betty Creek Formation intermediate volcanic rocks and may be a feeder to the Mount Dilworth Formation felsic volcanic rock.

Intermediate volcanic rocks and siltstone (plus felsic rocks?) have been intruded by a few (only two observed) intermediate to mafic fine-grained carbonate-altered feldspar phyric dykes with minor leucoxene.

Bedding in the western panel is rare and restricted almost exclusively to the shale and siltstone units intercalated with the volcanic units. The structural data indicate that the sediments and presumably volcanic rocks have been tightly folded about a north-northeast trending fold axis. Roland Bartsch (MDRU) feels that the felsic units in this area are largely flat-lying and occur as erosional remnants of a broad anticline which closes south of Charlotte Lake. He explains that the steeply dipping and contorted bedding in the sedimentary rocks adjacent to the felsic volcanic unit may simply be due to a contrast in competency of the units. In several locations the felsic volcanic rocks do appear to be

relatively flat lying erosional remnants sitting on sedimentary or debris flow units. Along the west shore of Alice Lake, however, drilling (holes R91-1 to R91-3, Figure 11) indicates that both the felsic volcanic and debris flow units are near vertically dipping.

As with other panels of Betty Creek and Mount Dilworth Formation rocks in this region, the area west of Alice Lake is probably composed of a series of imbricate thrust(?) fault slices. The east margin of this panel is in apparent fault contact with Salmon River Formation volcanic rocks. Within the panel only one fault has been interpreted on the basis of a fault intersected in R91-6. Many more, however, are likely to exist.

Alice Lake Panel

The eastern panel of rocks in the 'R' Grid area (or the 'Alice Lake panel') is composed of mafic to intermediate massive to amygdaloidal very fine-grained feldspar phyric flow rocks to the west and fine-grained tuff to lapilli tuff to the east (Figure 11). These rocks, where intersected in drill holes R91-1 to R91-3, were indistinguishable from volcanic rocks in the hanging wall of the Eskay Creek deposit, and are probably part of the Salmon River Formation.

Tuffaceous rocks in the eastern part of this panel are considered to be part of the Salmon River Formation on the basis of their apparent conformable relationship with the amygdaloidal flow rocks to the west and their apparent unconformable relationship with felsic rocks thought to be of the Mount Dilworth Formation to the east (Figure 11).

Drilling on the west shore of Alice Lake (holes R91-1 to R91-3) indicates that the mafic to intermediate volcanic rocks of the Salmon River Formation are near vertically dipping and in bedding plane fault contact with the Mount Dilworth Formation felsic volcanics to the west. On the east side of the 'Alice Lake lithological panel' the intermediate tuff units may be relatively flat-lying and unconformably overlying a folded sequence of Mount Dilworth Formation felsic volcanic rocks and intermediate volcanic rocks of the Betty Creek Formation.

North of Robin Lake (Figure 11), Roland Bartsch mapped a few small medium-grained quartz-feldspar phyric intrusive plugs (unit 10Yx) which apparently cut both tuffaceous and flow rocks of the Salmon River Formation.

In summary, rocks of the 'Alice Lake' panel are apparently structurally less complex than the adjacent rocks suggesting

that a significant unconformity exists between the Salmon River and Mount Dilworth Formations in this area.

3.3.1.2 Economic Geology Of The Southwest Part of the 'R' Grid

A significant gold-bearing showing occurs on the southwest part of the 'R' Grid on a creek 475 m northwest of the north end of Alic Lake. It occurs in mudstone and/or debris flow units immediately adjacent to (stratigraphically below?) felsic volcanic rocks of the Mount Dilworth Formation (Figure 12).

Several grab samples of pyritic material collected along a strike length of over 200 m from a creek 475 m northwest of the north end of Alice Lake contained highly anomalous gold, silver, arsenic, and antimony. This area was originally sampled in 1989. The creek follows a shear zone cutting a sequence of mudstones and debris flows underlying a siliceous felsic volcanic unit. All units are sporadically pyritic, with gold and pyrite contents being directly proportional. The pyrite is finely disseminated, colloform pyrite fragments up to 5 mm in diameter may suggest an exhalative origin.

Mineralization in this area does not appear to be related to the shear zone in the creek. It is more likely associated with the lower contact of a relatively flat-lying felsic volcanic unit where it is in contact with mudstone and debris flow. The rocks in this area appear to be in an 'Eskay-type' stratigraphic sequence and the showing on the 'R' Grid may in fact be in the same stratigraphic position.

3.3.2 1991 Diamond Drilling Program on the 'R' Grid

Five holes totalling 310.85 m were drilled on the 'R' Grid (Figure 12). Drilling was undertaken by J.T. Thomas Diamond Drilling during the period September 13th to 16th, 1991.

Holes R91-1 through R91-3 were drilled to test the favourable contact on the west shore of Alice Lake. The holes intersected a steeply dipping sequence (from west to east) of felsic lapilli tuff with flow-banded fragments, debris flows, interbedded argillite, sandstone and mafic to intermediate lapilli tuff with amygdaloidal fragments and mafic to intermediate amygdaloidal flow (Figure 12). The sequence is much as was observed on surface.

Mineralized rock was thought to be a silicified debris flow, possibly associated with a fault along a linear topographic fracture. A fault and debris flow unit do appear to be associated with the lineament, but no significant mineralization was noted. The debris flow unit commonly

contains up to 5% sulphide-rich and/or sulphide fragments, but has only rarely weakly anomalous gold values.

It is probable that the mineralized float is derived from the sheared debris flow unit, but that the mineralization is very local or sporadically distributed.

In the past, from relationships interpreted from mapping in the area, it was thought that the felsic volcanic rocks and debris flows in the west were part of the Mount Dilworth Formation (plus?) which were in fault contact with mafic to intermediate volcanic rocks of the Salmon River Formation. This may in fact be correct, but drilling data have provided some possible contradictions to this interpretation. Debris flows occur on both sides of the fault, in what appears to be conformable contact with both the felsic and mafic to intermediate volcanic rocks. Sedimentary rocks intercalated with the mafic to intermediate volcanic rocks have tentative tops to the west. It is possible therefore, that it is a simple conformable sequence with tops west. If this is correct, and the amygdaloidal volcanic rocks are in fact Salmon River Formation, then the felsic volcanic rocks are not Mount Dilworth Formation, but part of the Salmon River Formation. A second possibility is that the felsic volcanic rocks are part of the Mount Dilworth Formation and the more mafic volcanic rocks to the east are Betty Creek Formation. The area is still open to interpretation.

Holes R91-4 and R91-5 were drilled to retest the Creek Showing originally drilled in 1989 with holes R-1 to R-3 (Figures 11 and 12). Previous drilling targeted the showing by drilling to the southwest. No significant mineralization was intersected.

From the mapping conducted this season, it appeared that the mineralization was associated with the lower margin of a flat-lying to gently-dipping felsic unit to the south of the creek (Section 3.3.1.2), and that previous holes would have drilled beneath it. On this basis, it was decided to drill a hole to the north, through the felsic unit on the south side of the creek.

Holes R91-4 and R91-5 intersected an interbedded or intercalated sequence of felsic volcanic rocks, mudstone and debris flow, showing that the area has a more complex stratigraphy than was indicated by surface mapping. It appears that the 1991 holes were collared near the hinge of an open antiform, but bedding orientations are not certain.

The top 26.5 m of hole R91-4 intersected an intercalated sequence of siliceous felsic volcanic rocks (flow(?), flow breccia(?), pyroclastic(?)) and mudstone/siltstone. This

interval is fractured brecciated silicified and contains an average of 5% pyrite. Gold values in this interval are consistently anomalous and apparently directly related to pyrite mineralization. Pyrite in the felsic volcanic rocks and in some mudstone units occurs in stringers and breccia matrices. However, some of the highest gold values in the interval, are from a mudstone unit between 12.12 m and 20.47 m, with 3-8% fine grained pyrite concentrated (up to 60%) along bedding-parallel bands (beds?) up to 1 cm thick. This type of material commonly contains >1 gm gold per tonne.

Hole R91-5 appears to have intersected the same sequence in the upper part of R91-4, but gold values are relatively low.

3.3.3 'R' Grid: Interpretation and Conclusions

The geological interpretation of the area as presented in Section 3.3.1.1 (with two basic lithological panels separated by a fault) is plausible, but the geology is actually poorly understood.

If the felsic units are the youngest rocks in the Western Panel, and if these rocks are Mount Dilworth formation, then Eskay-equivalent stratigraphy does not occur in the panel. It may however, occur at depth in the Alice Lake Panel.

Regardless of how the various units are related, the area is partially underlain by rocks similar in appearance to the 'Eskay Creek Stratigraphy', and in two locations, significant gold-bearing mineralization is associated with these rocks. Detailed mapping on the 'R' Grid is not yet extensive enough to have defined the limits of the Eskay-type stratigraphy in this area, and these rocks may extend well to the north.

The mineralized units intersected in hole R91-4 are the most interesting exploration targets on the Coul 1 and 2 claims to date. Additional drilling is required to follow and test these units.

The 'R' Grid area has favourable stratigraphy and encouraging mineralization. It warrants additional drilling and expanded coverage of mapping, geochemical and geophysical surveys.

4.0 COUL 3 AND 4 CLAIMS: 1991 EXPLORATION PROGRAM

The Coul 3 and 4 mineral claims comprise two blocks, 2.0 x 2.5 km each. They are bounded approximately by John Peaks to the southeast, Unuk River to the west and Boundary Creek to the north. The area is located approximately 1 km east of the Granges Inc. exploration camp. Access to the claims is by helicopter with numerous good helipads located in the vicinity of the zones of interest.

The area is characterized by moderate to steep vegetation-covered slopes with several abrupt cliffs and numerous creeks draining the area to the west. Elevation generally increases from approximately 260 m on the west Coul 3 claim boundary (Unuk River) to 1800 m on the east of the Coul 4 claim boundary. Vegetation varies from coniferous on the lower elevations and moderately steep slopes through dense undergrowth along the creeks, steep slopes and avalanche runouts, to subalpine and alpine at higher elevations.

Very limited geological data was collected on the Coul 3 and 4 claims prior to the 1991 field program. Results from airborne geophysical surveys - 1986 by Western Geophysical Aerodat and 1989 by Aerodat Airborne Geophysical Surveys, along with exploration programs completed by Granges Inc. in 1989 and 1990, were used to identify the Coul 3 and 4 claims as an area of interest requiring additional, more detailed exploration work.

Three apparent geophysical anomalies, a few moderately anomalous stream sediment and soil samples and the potential existence of favourable Eskay Creek stratigraphy were of particular interest.

4.1 Overview of Targets and Work Completed

The 1991 field program on the Coul 3 and 4 claims started in mid June and concentrated initially on regional 1:5000 mapping and sampling in an attempt to understand the stratigraphy and complex structural setting in the Unuk River and Jeff Creek drainage basin.

The object of the initial regional geological survey was to identify areas of interest on which to focus future exploration efforts. Two areas were selected for detailed exploration: the Jeff Ridge and the area of the newly discovered Anna Showing, both on the Coul 3 claim. Grids were established by Gordon Clarke and Associates between July 8 and August 13, 1991. Detailed 1:2000 scale mapping, sampling and prospecting were completed by late August. Subsequently, distinct soil and rock, gold, silver, arsenic and zinc

anomalies were outlined which, along with corresponding geophysical anomalies and favourable geology, led to proposing the Jeff Grid for preliminary drill testing in September. (The soil and geophysical survey are not included in this assessment report.) Positive results in the preliminary six drill hole program, drilled on the contact between volcanic and sedimentary rocks, led to additional drilling 24 holes, linecutting, soil sampling and limited drill holes and Jeff Grid line surveying in October. The 1991 field exploration program was completed at the end of October 1991.

Thirty diamond drill holes, totalling 5380 m were drilled by J.T. Thomas Diamond Drilling on the Jeff Grid primarily on the 750 and 900 Zones (south end of the grid) with selected results as follows:

900 Zone

DDH J91-4	0.18 oz/t Au over 16.20 ft (6.17 g/t Au over 4.94 m)
DDH J91-7	0.99 oz/t Au over 13.20 ft (34.04 g/t Au over 4.00 m)
	0.16 oz/t Au over 6.56 ft (5.50 g/t Au over 2.00 m)

750 Zone

DDH J91-2	0.18 oz/t Au over 10.50 ft (6.17 g/t Au over 3.20 m)
DDH J91-10	0.35 oz/t Au over 3.22 ft (12.00 g/t Au over 0.98 m)
DDH J91-12	0.35 oz/t Au over 5.58 ft (12.00 g/t Au over 1.70 m)

Significant silver results were also recorded.

4.2 Geology

The regional geology of the Coul 3 and 4 claims and their adjacent area has been divided into two structural blocks by the Jonathan Fault (Figure 13). It is located on the eastern part of the Coul 3 claim and marks the eastern boundary of the Unuk River block. To the west is the Jeff Fault. Both are major, trend generally north-south, are steeply dipping, occupy linear depressions and only locally exposed. They are marked by sharp changes in lithology (especially the Jeff Fault), and/or structural style and orientation on opposite sides. Associated with the Jeff Fault are numerous smaller splay faults, that are best exposed on the Jeff Ridge. These minor faults generally trend southwest-northeast (with some striking east-west) and occupy saddles or sharp topographic depressions often marked by swamps. In places they are marked by steep cliffs. Rocks associated with faults are characterized by deformation and alteration related to the faulting: formation of shear zones, crushed or brecciated

zones, presence of gouge and slickensides (best exposed along the south part of the Jeff Fault).

The narrow block between the Jonathan and Jeff Fault consists entirely of argillites of the Salmon River Formation. Both bedding and foliation dip moderately to the south or east and a prominent lineation marking the intersection plunges gently to the south.

The Jeff Fault, along or near Jeff Creek, marks the eastern boundary of the Betty Creek Formation. To the west on the Jeff Ridge, rocks of this formation are dominated by volcanic flows and tuffs and are altered moderately to strongly with secondary K-feldspar, ankerite and pyrite. On the west side of the ridge is a thin north-south striking zone of trachylatite tuff and lapilli tuff interlayered with mudstone. This zone contains the main anomalous surface values of gold on the Jeff Grid. It is marked by the Basia Showing on the southern part of the grid. In the middle of this zone, the Jeff Showing siliceous rhyodacite crops out as a series of thin lenses which pinch and swell along the north-south strike and dip moderately to the east. Rocks of the Jeff Showing are similar in composition, texture, alteration and mineral association to the rocks of the Anna Showing, and are possibly correlative with rocks of the Anna Showing in the Mount Dilworth Formation.

Further west towards the Unuk River, are intervals of well bedded mudstone, siltstone, sandstone and locally, conglomerate interlayered with minor andesite flow, tuff and minor lapilli tuff. Near the Unuk River, on the eastern section of the Coul 3 claim, the Betty Creek Formation is in an apparent faulted contact with argillite of the Bowser Lake Group. The nature and attitude of the contact is uncertain.

To the south, the Betty Creek Formation is bounded by the Basia Showing Fault (east-west trending, approximately along the 6+50N line of the Jeff Grid), and thus is in contact with argillites of the Salmon River Formation. In it, both bedding and foliation dip moderately to steeply to the northeast. Further south are scattered, John Peaks-related, dioritic subvolcanic intrusions. They form weathering-resistant ridges, knobs or cliffs which increase in number towards the east in the direction of the John Peaks Intrusion and also to the west. To the west along or near the John Creek, the above described Salmon River Unit is in apparent fault contact with the intermediate and felsic volcanic rocks of the Betty Creek Formation. Further west, numerous John Peaks-related intrusions mark the topography of two ridges on the east bank of the Unuk River. These intrusions vary from north-south trending granodiorite to diorite stocks to intermediate and felsic dykes of local range. The limited metamorphic zones

that exist around the intrusions are characterized by hornfelsed alteration and anomalous pyrite and (in places) higher pyrrhotite content within adjacent volcanic rocks of the Betty Creek Formation.

The Jonathan Fault marks the western boundary of the McTagg Anticlinorium, which is moderately to steeply overturned along its northern and western margin. East of Jonathan and Storie Creeks, foliated argillite and siltstone of the Salmon River Formation dip steeply to the east. Further east, rhyodacite to latite lapilli tuff and tuff of the Mount Dilworth Formation are exposed in large cliffs of the Anna Showing. The contact (interpreted) generally strikes north-south, contains anomalous pyrite and is characterized by hornfelsed argillite. The intensely pyritic Anna Showing occurs at the south end of the unit. There are indications (Anna Showing) that the Mount Dilworth Formation dips to the east (steep?). To the east it is in contact with volcanic rocks of the Betty Creek Formation. The Betty Creek Formation has been divided into two subunits on the basis of lithology and the Betty Creek Andesite crops out just east of the Anna Showing. Further east, the Betty Creek Felsite subunit trends northeast-southwest, dips moderately to steeply to the east and to the north, and is cut off by the John Peaks Intrusion. Further east andesite and intermediate volcanic rocks of the Betty Creek Andesite subunit form a weathering-resistant 1578.7 m peak.

To the east, the Betty Creek Formation is in contact with the Salmon River Formation. It consists of well bedded conglomerate, sandstone and argillite which strike north-south and dip vertically or steeply to the east. To the south, this unit is truncated by the John Peaks Intrusion, which occupies most of the southern half of the Coul 4 claim. The John Peaks diorite is an elongate intrusion of fine- to medium- and locally coarse-grained diorite. A contact metamorphic aureole surrounds the intrusion and is characterized by abundance of quartz and epidote (in places sulphide-bearing), veins and by the contact alteration of the adjacent sedimentary rocks.

4.3.1 Jeff Grid

Preliminary geological mapping on the Coul 3 claim indicates that stratigraphic units trend generally north-south and dip moderately to the east in places; to the northeast and southeast (Figure 14). A major north-south striking Jeff Fault along with Jonathan Fault separates rock units on the Coul 3 claim into two structural blocks; the Unuk River Block and the McTagg Block. East of the fault, along Jeff Creek, are sediments comprising well bedded and strongly foliated mudstone, siltstone and argillite of the Salmon River Formation, often broken by minor faults. The Jeff Creek steep

cliffs are the eastern boundary of the Jeff Grid. Within the fault zone this unit is cut by a series of minor faults and shears and in places moderately to intensely silicified with abundant quartz veins, lenses or stringers, often moderately to intensely pyritic. West of the Jeff Fault, on the Jeff Ridge, rocks of the Betty Creek Formation are dominated by basalt to latite flows, tuff and lapilli tuff and minor trachylatite flows and lapilli tuff. These rocks are altered moderately with secondary K-feldspar, ankerite and pyrite. Scattered lenses on the Jeff Ridge and in drill holes consist of very amygdaloidal andesite/basalt flows, less than several meters thick. Rocks of the Jeff Ridge are often phyllitic, strike generally north-south to northeast-southwest and dip moderately to the east. They are cut by several minor splay faults which are part of the Jeff/Jonathan Fault system. These minor faults trend northeast-southwest (occasionally west-east) and are marked by characteristic cliffy topography of the Jeff Ridge. They form local shear zones of intensely phyllitic, in places gougy, rocks along with crushed or brecciated zones. On the west side of the ridge, along the baseline of the Jeff Grid is a thin zone of trachylatite tuff and lapilli tuff interlayered with mudstone. This zone strikes south-north and dips moderately to the east. It contains the main anomalous surface zone, on the Jeff Grid, and is cut off by Basia Showing Fault to the south (along the 6+50N line).

On this southern end of the zone, fine-grained to fragmental intermediate to felsic tuff of Basia Showing crops out. It is intensely phyllitic, siliceous and anomalous in pyrite, sphalerite and galena. The occurrence of the Basia Showing led to diamond drilling and subsequently to discovery of the 750 Zone. To the west, volcanic rocks of the showing are truncated by a fault striking northwest-southeast, and are thus in faulted contact with the foliated argillites of the Salmon River Formation. Further west and south, data from drill holes, in connection with limited surface bedrock exposure, indicates the presence of numerous faults dividing the south and southwest section of the Betty Creek Formation into several minor blocks which moved horizontally. Thus they occur as fault blocks within sedimentary rocks of the Salmon River Formation. One of the blocks contains the 950 Zone.

Geology in the area west of the Basia Showing is based on interpretation of drill hole data. Lack of sufficient bedrock exposure in this area makes interpretation tentative.

Near the north end of the Jeff Grid, the gold-silver anomalous zone crops out east of the Ala Showing as a several meter thick section of the erosion-resistant cliff. This part of the zone is similar in lithology to the Basia Showing, although it does not contain visible sulphides, except pyrite.

It is marked by the gold-silver soil and rock geochemical anomaly, which covers the largest area of the grid.

Brecciated quartz and argillite(?) of the Ala Showing occur in two small outcrops. Sphalerite, galena and chalcopyrite are present.

In the middle of the gold and silver-bearing zone, siliceous rhyodacite of the Jeff Showing crops out as a series of lenses which are typically thin (2-3 m), pinch and swell along the strike, and are intercalated with sedimentary rocks of the Betty Creek Formation(?). Volcanics rocks of the Jeff Showing strike north-south and dip moderately to the east. In places they are intensely mineralized by pyrite and are similar in appearance to (possibly correlative with?) rocks of the Anna Showing in the Mount Dilworth Formation.

West of the above-described gold and silver anomalous zone, near the Unuk River, the Betty Creek Formation is in (possible) faulted contact with the argillite and siltstone of the Bowser Lake Group. There are indications (drill hole data) that the contact strikes north-south.

4.3.2 Anna Showing

The Anna Showing is located at the northeast corner of the Coul 3 claim (Figure 13 and 14). The Anna Showing area encompasses the zone bounded by Boundary Creek to the north, the 600 m contour line to the east, Ross Creek to the south and the 400 m contour line to the west.

The 1989 airborne geophysical survey by Aerodat Ltd. outlined an apparent low resistivity anomaly on the above-described area.

The Anna Showing consists of three abrupt gossanous cliffs with a large zone of debris to the west. The cliffs have been mapped and prospected.

The Anna Zone warrants grid establishment and more geochemical and geological surveying. Upon positive results it should be tested by drilling.

Preliminary mapping and prospecting of the Anna Showing area indicates that it is underlain by felsic volcanic rocks of the Mount Dilworth Formation. To the west it is in contact with the sedimentary Salmon River Formation. The interpreted contact is anomalous in pyrite. To the east it is in contact with mafic to intermediate volcanic rocks of the Betty Creek Andesite subunit.

The Mount Dilworth Formation occurs as an elongated body approximately 660 m long by 70 to 80 m wide and pinches out to the south in a transition zone, where the rock grades into more intermediate compositions. This transition zone is represented by a mixture of felsic and intermediate, pyritic (up to 3%) tuffs, with the characteristic bluish colour. The Mount Dilworth Formation, in the Anna Showing, is characterized by felsic intensely siliceous rocks: rhyolite, rhyolite breccia, lapilli and ash tuffs. These are mineralized in places by massive disseminated and stockwork pyrite of very fine grained crystals. In places, rhyolite grades into obsidian. Weathered rock has the characteristic 'bronze' coating on the surface. It is due to weathering and contains secondary limonite derived from pyrite. Calcareous stringers are found locally.

5.0 JEFF GRID: 1991 DIAMOND DRILL PROGRAM

During the 1991 field exploration program, numerous drill targets were identified on the Jeff Grid. Field work included geological mapping and prospecting (as well as both geochemical and geophysical surveys not here reported). This work outlined coincident geochemical (As, Sb, Hg, Ag, Au) and geophysical (IP) anomalies, many of which have mineralized surface outcrops. Several of these targets along the baseline (750, 900, 1300 and 1700) were drill-tested during the preliminary phase of drilling conducted in September. This initial drilling intersected promising mineralization in several holes (J91-2, J91-3, J91-4 and J91-7). A second phase of drilling was initiated in October to further evaluate the positive preliminary results. Thirty drill holes (J91-1 to J91-30) totalling 5380 meters (17,653 feet) were drilled on Jeff Grid (Figure 14). Drilling was undertaken by J.T. Thomas Diamond Drilling from September 5th to 11th, and September 17th to October 24th, 1991.

5.1 Logging Code

The drill logging code is identical to that used for the geological mapping program and is described in Section 1.5.

Drill core was transported from the drill to camp where it was laid out in sequential order from top to bottom. Footage blocks were converted to metric and recoveries were measured between footage blocks. Geological and structural data were recorded on the logging forms (Appendix A), visually on the strip log, and in the written description, as well as on Sections L7+00N to L18+00N. Upon completion of the logging, core was marked in intervals for sampling. All core intervals requiring analysis were sawn on site and half-core intervals were shipped to Acme Labs in Vancouver for 30-element ICP plus gold analysis (Appendix A). Gold assays were on crushed 30 gram samples. The other half-core is stored in racks at the Granges camp.

5.2 Geology

The Jeff Grid is located on the Coul 3 claim within the Unuk structural Block, a tectonically complex area preserved as a structural block in and along the Unuk River valley. Geology of the Jeff grid area is described in detail in Section 4.3.1 and in the regional geological discussion (Section 2).

Rocks on Jeff Grid consist of a steeply east to northeast dipping, foliated and faulted sequence of clastics and altered volcanics and volcanoclastics. The structural block may be

the result of early folding with overturned limbs being complicated by later thrust faulting and then overprinted by late normal faulting, perhaps with slip-strike movement.

Rock sequences tentatively identified in drill core to date include undeformed to poorly deformed fine to coarse clastics correlated with the Bowser Lake Group. Weakly deformed, thick and poorly-bedded silty mudstone containing nodular pyrite, calcareous concentrations and fossils (belemnites, etc) is correlated with the Salmon River Formation. A variety of strongly deformed volcanics, volcanoclastics and sediments is correlated with the Betty Creek Formation. All the rock sequences are affected by late brittle faulting and barren quartz and quartz-carbonate veining.

Volcanic, volcanoclastic and sedimentary rocks including andesitic flows, volcanic breccia, lapilli, dacitic lithic tuff and argillaceous and tuffaceous sediments are locally strongly deformed, highly altered and mineralized. Two or three episodes of alteration affect these rocks including chloritization, silicification, carbonatization and potassic alteration. A distinctive vesicular flow and flow breccia unit occurs near the top of the sequence. These rocks are host to precious and base metal mineralization in drill core from Jeff Grid. They are thought to be equivalent to the Betty Creek Formation, which on the adjacent Sib and Eskay properties hosts fracture-controlled mineralization in the footwall of the massive sulphide zone.

5.2.1 Lithology: Stratigraphic Section

It is presently thought that rocks occurring in drill core from Jeff Ridge (Coul 3) are probably time-equivalent to the Hazelton and overlying Bowser Lake Group rocks of Lower to Middle Jurassic age. The Hazelton and Bowser Lake Groups have been further divided into various formations. These include, from oldest to youngest, the Unuk River Formation, overlying Ashman Formation, the basal portion of the Bowser Lake Group. The stratigraphic sequence is somewhat similar to that found on the adjacent Sib and Eskay Creek properties to the north.

Weakly deformed clastic sediments, including silty mudstone, fine to medium sandstone, wacke and minor conglomerate are tentatively correlated with the Ashman Formation. Compositionally similar, but pervasively deformed clastic sediments may be older and part of the Betty Creek Formation.

A unit tentatively correlated with the upper part of the Salmon River Formation includes: moderately deformed silty mudstone and lesser limey siltstone with minor tuffaceous interlamination; carbonaceous and calcareous argillites

containing nodular, disseminated and laminated syngenetic pyrite as well as calcareous concretions and nodules; and minor, commonly fossiliferous (belemnites), limestone. Fossils were intersected in drill holes J91-11 (18.6 m), J91-21 (131.45 m) and J91-27 (106.68 m).

The most common unit intersected in drill core is comprised of flows, flow breccia, pillows and pillow breccia, pyroclastics, epiclastics, volcanoclastics and sediments; carbonaceous argillite and wacke are tentatively correlated with part of the Betty Creek Formation.

Drill holes on Jeff Ridge intersect only a partial, faulted stratigraphic sequence. Many drill holes commence in a fault-bound, thin, upper sequence of thinly laminated, pyritic, tuffaceous and silty argillite which may be variably graphitic, chloritic or sericitic and foliated. These rocks are underlain by a distinctive, commonly highly altered and mineralized, vesicular flow and flow breccia, interbedded with pyroclastic and volcanoclastic rocks. The distinctive vesicular habit can often survive even the most intense alteration and mineralization overprint.

The underlying thick sequence of tuffs and tuffaceous argillaceous sediments includes distinctive heterolithic, lithic and tuffaceous sediments interbedded with argillaceous sediments. The interval may contain variable thicknesses of turbidites. These rocks vary rapidly from sedimentary to volcanic facies and may represent a sequence of mixed sedimentary and volcanic turbidites. The unit is commonly so altered as to be unrecognizable through the alteration overprint.

Most holes pass abruptly through a structural zone into well-laminated, graphitic, silty, tuffaceous and pyritic carbonaceous and calcareous argillite commonly locally intensely quartz-carbonate veined. These rocks are of unknown age. However, several holes cross a structural zone and pass downward into intensely foliated meta-andesitic volcanics and sediments, now chlorite-sericite schists and phyllites, which may be older Unuk River Formation rocks.

5.2.2 Alteration and Mineralization

Petrographic work indicates that the volcanic and sedimentary rocks of the Betty Creek Formation have been subject to various intensities of alteration and mineralization. Mineral products include quartz, ankerite/carbonate, pyrite, sericite/feldspar with sulphides, pyrite, pyrrhotite, arsenopyrite, sphalerite, galena, chalcopyrite, tetrahedrite and electrum with occasional cinnabar and stibnite. Drill core analysis shows enrichment in gold, silver, arsenic,

antimony, mercury with copper, lead and zinc in these altered and mineralized areas. Various types of alteration and mineralization have been described for properties within the region. Alteration and mineralization on the Jeff Grid is most like that found on the adjacent Eskay and Sib properties.

Mineralization is manifest as anastomosing stringers, veins and disseminations of sulphides, quartz and carbonate within larger, bleached, siliceous, K-spar altered pyritic zones. The elemental association of greatest economic interest is the gold and silver which occur in the mineral electrum. Electrum has been identified in drill core from the 900 and 750 Zones. Mercury, arsenic and antimony are associated trace elements. These elements are enriched in pyrite, pyrrhotite, galena, sphalerite, chalcopyrite, tetrahedrite and arsenopyrite. They are associated with crosscutting mineral veining within larger domains of altered rock.

Pale zinc and cadmium-rich sphalerite, which displays compositional growth zoning is of particular significance. Similar zoned sphalerites are found in mineralization at Eskay Creek. Sphalerite is associated with precious metal mineralization, where it occurs very early in the paragenetic sequence, usually with arsenopyrite. It is often associated with fracture veins of fine cherty, blue-white, chalcedonic quartz and occasionally pyrobitumen. These early mineral veins are locally overprinted by coarser quartz-carbonate-sulphide veins. The highest gold values obtained in drilling to date are associated with locally developed late stage cinnabar-stibnite veins.

Alteration in drill core is of two types. The most aerially extensive alteration is a pervasive, low grade, greenschist regional alteration. The second type, which is of direct economic significance, is associated with the mineralizing process.

Alteration of the second type is most intensely developed within volcanic and sedimentary rocks of the Betty Creek Formation, which underlies much of Jeff Grid.

Alteration products include silica, carbonates, potassium-feldspar and sulphides. This alteration is crosscut by barren, late quartz-carbonate veins.

Additional petrographic and chemical analyses are required to further identify the various mineral species, alteration products and host-rock environments.

5.2.3 Economic Geology

Drilling was concentrated predominantly in two areas of interest: the 750 and 900 Zones located on southern Jeff Grid. Initial drilling indicated elevated values in gold and silver, the best results occurred in drill hole J91-7, as follows:

<u>DDH No.</u>	<u>Intersection width (m)</u>	<u>Rock Geochemistry</u>	
		<u>Au g/t</u>	<u>Ag g/t</u>
J91-2	3.2	6.37	26.2
	0.65	15.60	140.9
J91-3	1.00	4.22	16.6
	0.92	3.73	11.2
J91-4	4.95 (Upper Zone)	5.24	155.6
	1.15 (Lower Zone)	(0.18 oz/t) 1.06	(4.5 oz/t) 63.0
J91-7	4.00 (Upper Zone)	33.00	248.0
		(0.98 oz/t) 1.21 oz/t*	(7.3 oz/t) 13.38 oz/t*
	2.00 (Lower Zone)	5.44	0.16 oz/t* 6.11 oz/t*

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*assay results

Nine drill holes (J91-2, J91-3, J91-10, J91-12, J91-20, J91-21, J91-25, J91-29, J91-30) totalling 1224.07 meters were drilled on the 750 Zone at fifty meter spacing from L7+00N to L8+50N east of the baseline to test coincident geochemical (Au, Ag, As, Sb, Hg) and geophysical (IP) anomalies with anomalous gold in surface rock samples. The most intense alteration and mineralization discovered to date within the 750 Zone occur in Holes 2 and 3 drilled on Section 7+50N. These drill holes intersected strong alteration and mineralization within an andesitic to latitic vesicular flow interbedded with breccias and pyroclastic rocks. Gold-silver mineralization occurs with elevated values in arsenic, antimony and occasionally mercury, with sporadic high base metals copper, lead and zinc.

Mineralization occurs as anastomosing veins, masses and disseminations of sulphides: pyrite, pyrrhotite with lesser sphalerite, galena and chalcopyrite in altered volcanics containing quartz-rich carbonate and lesser sericite veins and pervasive alteration.

Drilling within the 750 Zone in Holes J91-20, J91-21 and J-91-30 to the south of Hole J91-2 and J91-3, intersected a faulted sequence of altered and mineralized Betty Creek volcanics and sediments uphole to the north and rocks of the Salmon River and Bowser Lake Groups downhole to the south. Hole J91-25, to the north, also intersected Betty Creek volcanics and sediments faulted against younger clastic sediments. Mineralization intersected in holes J91-10 and J91-25 occurs in a similar stratigraphy and has an arsenic, antimony, silver geochemical signature similar to holes J91-2 and J91-3. The highest grades occur just below a graphitic argillite unit within quartz-ankerite-K-spar sulphide altered volcanics. Chalcedonic quartz veins and sulphides are found overprinting pervasively altered volcanic wallrock. To the north, in Hole J91-12 (L8+00W), Betty Creek coarse tuff-breccia and lapilli tuff are mineralized, being enriched in arsenic and antimony with precious and base metals which occur below a fine argillaceous and tuffaceous interval, and in finer volcanoclastics above the sediment level.

A similar situation occurs in hole J91-29 located 50 meters to the north on L8+50W. There, mineralization is enriched in arsenic and antimony as well as gold and silver. It occurs within intermediate lapilli tuff that is pervasively silicified and contains local veins, blebs and disseminations of pyrite and pyrrhotite.

On the 900 Zone, twelve holes (J91-4, J91-7 to J91-9, J91-16 to J91-19, J91-22 to J91-24 and J91-28) totalling 2468.56 meters (8099 feet) were drilled at fifty meter spacings from L8+00N to L10+00N west of the baseline to check coincident geochemical and geophysical anomalies overlying mineralized outcrops. The most intense alteration and mineralization discovered to date within the 900 Zone occurs in Holes J91-4 and J91-7. These drill holes intersected strong alteration and mineralization within a vesicular flow, interbedded with a breccia and pyroclastic rock sequence similar to that on the 750 Zone. Gold, silver mineralization has elevated values in arsenic, antimony and mercury and occurs with sporadic highs in copper, lead and zinc. Mineralization occurs as anastomosing veins, masses and disseminations of sulphides: pyrite, pyrrhotite with lesser sphalerite, galena and chalcopyrite within altered volcanic rocks (flow breccia, tuff breccia) containing quartz carbonate-sericite and feldspar veins. The occurrence of patches and pervasive alteration of late quartz-carbonate veins with cinnabar and stibnite are of interest.

Drill holes J91-4 and J91-7 intersected high gold-silver values within altered vesicular volcanics, thought to be at the top of the Betty Creek Formation section. This interpretation may be more complex, however, as possible fault

repetitions of the stratigraphy may occur within these two holes. The southerly adjacent hole J91-9 containing altered mixed sediments and volcanics must be separated from the other drilling by a northwest-striking, steeply southwest dipping structure.

Close spaced holes drilled to the east and north intersected a similar mixed volcanic-sedimentary stratigraphic sequence to that in holes J91-4 and J91-7, only less altered and mineralized. Elevated values in gold, silver, arsenic and antimony, with locally elevated copper, lead and zinc, exist at similar stratigraphic intervals within adjacent drill holes.

Peripheral, fifty meter spaced drilling adjacent to holes J91-4 and J91-7, intersected weakly mineralized sedimentary and volcanic stratigraphy. The upper strongly mineralized and altered zone intersected in holes J91-4 and J91-7 was not recognized in the adjacent drill holes and this portion of the Betty Creek Section appears to be faulted and missing. In adjacent drill holes, you pass directly from unaltered clastic sediments of unknown age through a low-angle fault into Betty Creek rocks lower in the stratigraphic sequence.

This part of the Betty Creek Formation is dominantly argillaceous tuff and interbedded tuffs. Lower in the stratigraphic sequence occur tuff, flow breccias are intermixed with pyroclastics and epiclastic volcanics. These rocks are commonly altered with pervasive silicification, cut by quartz-carbonate veining, anastomosing sulphide veins, as well as patches and disseminations comprising pyrrhotite, lesser pyrite with traces of sphalerite, galena and chalcopryrite. Within this lower alteration zone occur chalcedonic quartz veins and occasionally pyrobitumen. Elevated values in gold, silver, arsenic, antimony with local copper, lead and zinc can be traced from hole to hole at a similar stratigraphic interval suggesting this mineralizing event is quite widespread and may develop into a zone of economic interest nearby.

Drilling outside the 750 and 900 Zones was concentrated predominantly on two stratigraphic fences on L13+00N and L17+00N.

On Section L13+00N, four drill holes (J91-1, J91-13, J91-14 and J91-15) totalling 772.38 meters were drilled to test several coincident geophysical-geochemical anomalies. Hole J91-1 was drilled to test a gold-silver-arsenic-antimony geochemical anomaly with a corresponding high chargeability response. Drill hole J91-1 intersected only two narrow intervals of mineralization, one at 28.4 meters enriched in

gold (0.92 g/t) and silver (6.9 g/t) with elevated zinc and cadmium values and another at 98.75 meters enriched in lead, zinc, silver and cadmium.

Drill holes J91-13, J91-14 and J91-15 were drilled east of the baseline to test the stratigraphy in an area having a resistivity low coincident with an arsenic-antimony geochemical anomaly. Drill holes J91-13 and J91-14 intersected altered volcanics and sediments of the Betty Creek Formation, but they host only narrow geochemically anomalous intervals. Drill hole J91-15 intersected a 4.5 meter interval at 118.4 meters which contained 1.0 g/t gold and 30.3 g/t silver. This mineralization is hosted by a strongly quartz-carbonate veined section of volcanics adjacent to a large faulted zone.

On and adjacent to Section 17+00N, four drill holes (J91-5, J91-6, J91-26 and J91-27) totalling 613.8 meters were drilled to test several coincident geophysical (chargeability high) and geochemical (Au, Ag, As, Sb) anomalies. Drill holes J91-5, J91-6 and J91-26 were drilled near the baseline. Hole J91-5 (L16+00N) intersected clastic sediments which contained several narrow intervals enriched in base metals. Drill hole J91-6 (L18+00N) intersected clastic sediments and minor tuffs locally anomalous in gold, silver, arsenic and antimony. These anomalous values appear to be correlative with similar geochemically anomalous intervals intersected in Hole J91-26. The upper portion of drill hole J91-26 intersected weakly altered mudstone and argillite thought to be Salmon River Formation. Lower in the hole, tuffaceous sediments from 110 meters to 136 meters display weak alteration and narrow sulphide stringers. This gold-silver-arsenic enriched interval is correlative to that intersected in drill hole J91-6. Mineralization and alteration intersected in drill holes J91-26 and J91-6 indicate a potential new area of economic interest.

Drill hole J91-27 was drilled behind drill hole J91-26 to test the stratigraphy. Only a narrow, 3.5 meter interval, at 140 meters was anomalous in arsenic, antimony and mercury. A structural panel uphole at 106 meters comprises mudstone with a belemnite fossil. This would indicate some form of low-angle faulting to juxtapose Betty Creek volcanics and Salmon River mudstone. This style of faulting may explain various abrupt facies changes seen in other drill holes.

5.2.4 Structure

All rocks observed in drill core from Jeff Grid have structures which range from primary sedimentary features such as bedding, to later brittle and ductile deformation fabric developed during various deformation events. Peter Lewis of

MDRU has mapped south of Jeff Ridge and his findings may explain many of the features seen in drill core. His interpretation would have the McTagg Block to the east folded into an anticline with overturned limbs on the north and west sides. The anticline is then thrust to the north and west over younger rocks of the Unuk Block and possibly the Unuk Block is overthrust on the McKay Block.

This structural event has associated folding, faulting and locally the development of high strain zones and shear fabric. It is thought that these structural features may be related to Cretaceous compression and crustal shortening. Late brittle faulting perhaps with some slip-strike movement locally overprints these earlier structural features, further complicating the geology.

One of the major structural features is the Jeff/Jonathan faults which are thought to be the surface trace of the thrust fault along which rocks of the McTagg Block were thrust over the Unuk Block.

Within drill core, the distribution of various units appears to be controlled, in part, by low angle faulting which may juxtapose various time stratigraphic units. These low-angle faults are manifest as zones of shear fabric, gouge and veining, usually developed within the less competent units. These structures may explain the rapid and abrupt changes in rock types as you pass from one structural panel to the adjacent one. This complex structural setting is further complicated by late brittle normal faulting. The results of this late faulting is observed in drilling on the southern Jeff Grid. In the 750 Zone, late normal faulting juxtaposes barren unaltered rocks of the Salmon River Formation with highly altered and mineralized volcanics belonging to the Betty Creek Formation. In the 900 Zone, a late normal fault must separate unaltered Betty Creek formation sedimentary rocks in drill hole J91-9 from altered and mineralized Betty Creek volcanics and sediments in the adjacent drill holes to the north and east.

Considerable additional geological work will be required to resolve the complicated structural history and the timing of the various structural events.

5.2.5 Interpretation and Conclusions

Mineralization intersected in drill core on the adjacent Sib and Eskay Creek properties has raised expectations for the discovery of economic grades and tonnages similar to the spectacular Eskay Creek deposit located 12.5 km northeast of the Coul Claims.

The Eskay deposit occurs in the hangingwall of a much larger footwall alteration system which contains fracture-controlled precious and base metal mineralization. The alteration zone is dominated by domains of silica, carbonates, feldspar, sericite and locally, magnesian chlorite. Sulphides are enriched in arsenic, antimony, mercury and locally in copper, lead and zinc. Several pulses of mineralization overprint each other at Eskay Creek. Mineralogical and petrographic studies suggest an early quartz-minor sulphides (pyrite)-arsenopyrite-gold with compositionally zoned pale zinc and cadmium-rich sphalerite. This early pulse of mineralization has then been overprinted by the main pulse of gold-base metal mineralization. Finally, precious metal veins enriched in stibnite and cinnabar locally overprinted all earlier mineralization.

Similar fracture-controlled mineralization occurs within this footwall stratigraphic setting at the McKay Adit, Sib and Lakewater showings. It is this type of mineralization that has been intersected in drill core on Jeff Ridge (Coul 3). While To date only fracture-controlled mineralization has been intersected in drilling on Jeff Ridge; spectacular values such as in drill hole J91-7, (4 meters of 33 g/t gold and 240 g/t silver) indicate that the mineralizing process was operative and that at some location mineralization may be concentrated. Of particular interest are the indications of Eskay-type mineralization hosted within Salmon River Formation argillites (J91-26) which may suggest the potential for synsedimentary volcanogenic massive sulphides.

Coincident geochemical/geophysical targets drill-tested along the baseline in the 750, 900, 1300, 1600, 1700, 1800 areas are the result of hydrothermal alteration with base and precious metal mineral veining and disseminations. Results from the drilling indicate that various parts of the stratigraphy have been altered and mineralized. The most intense alteration and mineralization have preferentially affected volcanic facies of the Betty Creek Formation, while other stratigraphic intervals are only weakly mineralized.

5.2.6 Recommendations

Additional geological exploration will be required to resolve the structural history and stratigraphic setting and to determine the economic viability of mineralization discovered on the Jeff Grid.

6.0 TARN CREEK AREA

6.1 Overview of Targets and Work Completed

During prospecting traverses at the head of Tarn Creek near the glacier, several boulders of arsenopyrite and pyrite-bearing quartz stringer material were discovered (Figures 5 and 8). Subsequent prospecting and mapping identified a roughly 50 m x 300 m northeast trending zone with erratic carbonate alteration (orange weathering) and discontinuous north to northwest-trending quartz stringers and gash veins. These stringers were sporadically mineralized with pyrite, arsenopyrite, sphalerite and galena. Grab samples of this material contained up to 13.17 g of gold per tonne.

A grid with 25 m x 25 m stations was established in the showings area, with grid coordinates corresponding to those used in the 1990 'U2' Grid. The grid was mapped at a scale of 1:500. A several meter wide stringer zone was stripped and sampled. A total of 1.5 km of magnetic and IP surveys were conducted over the grid (previously reported). One diamond drill hole (T91-1) totalling 114.6 m was drilled to test the gold-bearing stringer-shear zone identified (Figure 9). Drilling was undertaken by J.T. Thomas Diamond Drilling on September 4th, 1991.

6.2 Geology of the Upper Tarn Creek Area

6.2.1 Stratigraphy, Lithology and Structure

The upper Tarn Creek area is underlain by mafic agglomerates of the Stuhini Group in the northeast which are in contact with argillite, siltstone and sandstone of the Unuk River Formation in the southwest. In the southwest part of the grid, sedimentary rocks of the Unuk River Formation have been cut by an aphanitic siliceous felsic intrusion known as the Hope Plug.

In the northeast part of the grid, Stuhini Group rocks are foliated with strikes to the southeast and moderate dips to the northeast. Rare bedding parallels stratigraphy. The Stuhini Group-Unuk River Formation contact in this area appears to be conformable. In the northwest part of the grid, Stuhini Group rocks contact contorted Unuk River Formation sedimentary rocks along a north-south fault.

6.2.2 Economic Geology

Several quartz stringers and silicified shear zones are hosted in phyllitic to massive mafic tuff to tuff breccia of the

Stuhini Group near its contact with sedimentary rocks of the Unuk River Formation(?).

A zone of phyllitic tuff breccia (and ash tuff?) roughly 100 m wide occurs at the top of the Stuhini Group at the Unuk River Formation contact. These rocks are sporadically carbonate altered (orange weathering; ankeritic) and commonly contain 5-7% fine-grained disseminated pyrite.

Near the southwest contact of the phyllitic unit a 2-3 m wide quartz stringer zone contains 5% pyrite and traces of arsenopyrite and sphalerite. The structure, which parallels foliation at 150/70 NE, was initially only poorly exposed along a strike length of 25m. Subsequent stripping and mapping of this structure (labelled the Tarn Creek Showing on Figure 9) indicate that it is hosted in a 5-7 m wide argillite to siltstone unit which may have been sheared and truncated near an isoclinal fold hinge. Chip sampling of the structure showed it to contain highly anomalous amounts of several metals with gold values up to 12.8 g/tonne across 1.0 m (2.85 g/tonne across 5.3 m). Drill hole T91-1 was drilled to test this structure.

To the northeast of the phyllitic zone the rocks are more massive mafic lapilli tuff to tuff breccia with minor interbedded sandstone. They are sporadically carbonate altered, host irregular discontinuous quartz stringer and silicified zones (+/- pyrite, sphalerite, galena) and are cut by a series of north-northeast trending shears.

The north-northeast trending shears are up to 8 m wide and are generally barren except where they cross (or are crossed by) northwest-trending pyritic quartz-carbonate stringer and vein zones. In one location (U-Grid; 3400N, 2650E) a 5 m wide shear zone at such an intersection is silicified in a zone 1.5 m wide x roughly 7 m long. Quartz stringers in this zone contain up to 10% pyrite and minor sphalerite.

Typically the quartz stringer and silicified zones are up to a few meters wide, but have poorly defined limits and their attitudes are unclear. They may be a series of weak northwest-trending en echelon gash features. Strike lengths appear to be roughly 10-15 m. These structures are generally less than 2 m wide and are sporadically mineralized with up to 15% pyrite and less commonly up to 10% sphalerite.

The felsic Hope Plug, which lies approximately 50 m to the southwest of the main Tarn Creek Showing, may be related to the mineralization in this area.

6.3 Diamond Drilling

The 114.6 m diamond drill hole T91-1 was drilled to test the Tarn Creek showing structure.

A quartz vein fault zone was intersected between 19.57 m and 20.40 m and is probably the Tarn Creek Showing. The structure contained traces of chalcopyrite, but was otherwise barren. Its gold content was not anomalous.

The interval between 27.5 m and 44.6 m is pyrite-rich (3-10%) mafic to intermediate coarse grained to lapilli tuff and argillaceous tuff. This entire sulphide zone has highly elevated levels of silver, arsenic and antimony. An interval between two breccia zones from 38.3 m to 38.92 m contained 1240 ppb Au. Sample R91-25 (22.10 g/t Au) appears to have been collected from this sulphide zone. This zone may correlate with an apparent conductor defined by the IP survey on line 3250N (geophysical survey previously reported).

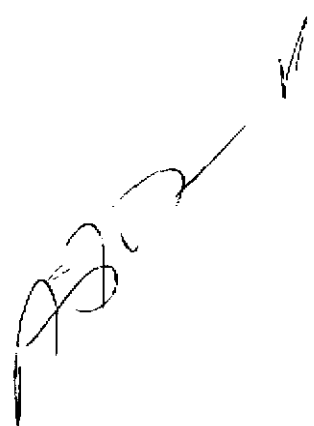
Felsic intrusion was intersected at 110 m, suggesting that the intrusive contact is vertical in this area. The intrusion contained 5-8% pyrite (disseminated and along fractures) and traces of sphalerite and galena. The rocks in the contact area between 104 m and the end of the hole are well mineralized by pyrite and contain elevated levels of arsenic and gold (112.0 m - 113.0 m: 860 ppb Au).

6.4 Interpretation and Conclusions

It seems apparent that gold-bearing mineralization in this area (including the Stibnite Showing) is related to the felsic Hope Plug, and is strongest near its margins. The area has potential to host a contact-related or shear hosted gold-bearing deposit.

7.0 STATEMENT OF EXPENDITURES

Unuk River Field Camp Costs	192,984.91
Communications	24,919.93
Transportation (Northern Mountain Helicopters)	226,157.83
Mob/Demob	35,258.74
Linecutting (Gordon Clark & Associates)	42,150.62
Legal Surveying (McWilliam, Whyte, Goble)	15,169.35
Geological Survey	239,996.78
Diamond Drilling (J.T. Thomas Diamond Drilling)	371,223.26
Assaying (Acme Analytical Laboratories Ltd.)	69,159.88
Data Processing, Drafting, Report Writing	25,361.83
	<hr/>
Total	\$1,242,383.13



STATEMENT OF QUALIFICATIONS

I, Gordon J. Allen, do hereby certify;

- 1) I am a graduate in geology of the University of British Columbia (B.Sc. 1975).
- 2) I have practised as a geologist in mineral exploration for sixteen years.
- 3) I am a member in good standing of the Association of Professional Engineers, Geologists, and Geophysicists of Alberta.
- 4) Many of the opinions, conclusions and recommendations contained herein are based on fieldwork and research performed by me between June 3 and December 17, 1991.
- 5) I own no direct, indirect, or contingent interests in the subject property, or shares or securities of Granges Inc.

Vancouver, B.C.

December 18, 1991



GORDON J. ALLEN, P. GEOL.

CERTIFICATE OF QUALIFICATIONS

I, Arthur John O'Donnell, of Delta, British Columbia do hereby certify that:

- 1) I am Exploration Manager for Granges Inc. with offices at 2300, 885 West Georgia Street, Vancouver, B.C. V6C 3E8.
- 2) I am a graduate of Saint Francis Xavier University, Antigonish, N.S. with a BSc degree in geology. I also took an extra year of geology at Dalhousie University, Halifax, N.S.
- 3) That I have practised my profession for thirty years.
- 4) I have been a member in good standing of the Association of Professional Engineers of the Province of Ontario since 1970 and the Association of Professional Engineers Province of Manitoba since 1980.

Dated at Vancouver, B.C. this 4th day of March, 1991.



A.J. O'Donnell, P.Eng.