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FROM  
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SECURITY - CLASSIFICATION - DE SÉCURITÉ
OUR FILE - N / RÉFÉRENCE
YOUR FILE - V / RÉFÉRENCE
DATE 31 March, 1987

SUBJECT  
OBJET

**Application for British Columbia Geoscience Research Grant**

Title of proposed Research Project:

'Comparative studies of alteration and vein mineralogy and geochemistry, and hydrothermal fluid temperatures and compositions determined from fluid inclusions and stable isotopes of epithermal vein deposits at Lawyers, Toodoggone District (94E/6) and Cinola, Graham Island (103F/9) British Columbia'.

1. Definition of Problem

A. **Lawyers deposit, Toodoggone District.** These epithermal deposits, emplaced in Lower Jurassic volcanic rocks have been dated as 190 Ma (Early Jurassic) by K/Ar on alunite (Schroeder, 1982), but the single age of mineralization has not been confirmed. Mineral zonation apparently related to the present glaciated surface raises the possibility of a younger mineralization age. Quartz-sericite alteration envelopes exist at deeper levels in the deposit, suitable for K/Ar dating. A minimum age of mineralization could be determined from mafic phonolite dykes which cut mineralized quartz breccia. A detailed study of the complex ore textures in light of present knowledge of hydrothermal explosion brecciation and seal-break cycling could shed more light on the genesis of the deposit.

Availability of 75,000' of diamond drill core plus access to underground workings allows the documentation of vertical and lateral zonation in ore and alteration mineralogy and geochemistry of the system. Stable isotopic studies of vein quartz, correlated with fluid inclusion compositional and filling temperature data as well as mineralogical and geochemical data should serve to characterize the conditions of vein formation.

B. **Cinola deposit, Graham Island.** This large, low-grade gold deposit within silicified and peripherally argillized Miocene clastic sedimentary rocks possesses characteristics of hot-spring-related epithermal deposits, yet has been assigned a depth of formation of 1.1 to 1.8 km on fluid inclusion, radiometric age and stratigraphic data by Shen et al. (1982).

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Textures indicative of shallow level mineralization, boiling and other hot spring characteristics should be sought. Fluid inclusion data should be verified. Stable isotope data would confirm depth of formation and relationship of mineralization to adjacent Miocene rhyolite porphyry dyke. Detailed mineralogical and geochemical data would better characterize the deposit.

2. Methodology of Study

The two deposits will be visited and studied during the 1988 field season, Lawyers in the company of Dave Lefebure. Underground workings will be mapped, drill core logged, and samples taken for fluid inclusions, O<sub>2</sub> and H<sub>2</sub> isotopes, ore and alteration mineralogy and geochemistry, and K/Ar dating.

Most analytical work will be done at UBC, stable isotopes at GSC, Ottawa under Bruce Taylor.

3. Qualifications of Researcher

See enclosed Resume and Publications. Christie is a minerals geologist with the New Zealand Geological Survey with extensive research experience in the geology and geochemistry of epithermal precious metal deposits and mineralization in active geothermal fields.

4. Technical Resources

Christie will hold the position of Honorary Adjunct Professor at UBC and will have access to all required analytical equipment; under the supervision of A.J. Sinclair and C.I. Godwin. As an Exchange Scientist with the GSC, Christie will have access to all GSC facilities both in Vancouver and Ottawa, particularly the stable isotope lab under Bruce Taylor.

5. Financial Resources Required

Field travel, accomo., meals	\$ 2,000
Vehicle rental	2,500
Fixed wing, rotary wing charter	1,500
Field supplies, fuel	2,000
Analytical expenses	<u>2,500</u>
Total	\$10,500

6. Reporting Format

A manuscript will be submitted in format suitable for publication in either 'Fieldwork' or 'Current Research', on or before March 31, 1989.

7. Related Research

A proposed Post-Doctoral candidate, Greg Gosson plans to join the GSC Cordilleran Division in January 1988. He has worked extensively in mapping and petrologic studies of Tertiary volcanics in New Zealand, and epithermal and active hotspring-related mineralization in New Zealand and New Guinea. Gosson plans to carry out studies of Toodoggone geology and mineral deposits in conjunction with Christie's research.

8. Supporting Individuals and Organizations

UBC Dept. of Geological Sciences: Drs. Sinclair and Godwin

GSC Mineral Resources Division: Drs. Bruce Taylor, Francois Robert

GSC Cordilleran Division: Drs. D.J. Tempelman-Kluit and H. Gabrielse, Dr. Greg Gosson

BCMEMPR Geological Survey Branch: Dr. Andre Panteleyev, Dave Lefebure, Tom Schroeder

9. Relevance of Research

A better understanding of timing and genesis of both Lawyers and Cinola deposits would be of great assistance to the mineral exploration community, at a time when both deposits are undergoing active development for production.

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