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# BRITISH COLUMBIA MINERAL DEPOSIT PROFILES

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*KEYWORDS:* economic geology, mineral deposits, mineral potential, models, British Columbia, metallic, industrial minerals, coal, gemstones, gold skarn.

## INTRODUCTION

The British Columbia Geological Survey Branch started a mineral potential assessment in 1992 utilizing deposit models for defining and characterizing mineral and coal deposits which exist, or for which favourable geological environments could exist, in the province. The current methodology for this resource assessment process is described by Grunsky *et al.* (1994), Kilby (1995, this volume) and Grunsky (1995, this volume). A fundamental part of this process is compilation of information about mineral deposits including descriptions, classification and resource data. The resulting deposit models are being used to classify known deposits and occurrences, to guide experts in their identification of possible undiscovered mineral deposits, and to group deposits to allow compilation of representative grade and tonnage data.

The Branch initially relied on mineral deposit models published by the United States Geological Survey (USGS) and Geological Survey of Canada (GSC). However, it became apparent that some models needed revision and that there are British Columbia deposit types lacking published models. This work is proceeding using the Branch's considerable in-house expertise (McMillan *et al.*, 1991) with assistance from economic geologists of the GSC, USGS and industry.

These revised deposit models are called 'deposit profiles' to distinguish them from the USGS 'deposit models' and to underline their relationship to the province's mineral occurrence database (MINFILE). The profiles will provide geologists and prospectors with a reference guide to deposits with which they may have little familiarity. In some cases they may encourage consideration of new exploration targets within the province.

## BACKGROUND

*"An ore deposit model is a conceptual and/or empirical standard, embodying both the descriptive features of the deposit type, and an explanation of these features in terms of geological processes."*

Hodgson, 1993

In recent years there has been considerable discussion of the importance of deposit models and their relevance to exploration (Cox, 1993). One of the points underscored by this debate is that while models are an extremely useful method of organizing data, they may lead to over simplification of complex natural phenomena. This may result in failure to consider relevant data which do not fit the model. It is important to remember that any model has limitations, particularly those attempting to portray the essential features of natural phenomena.

Interactions between the constructors of models, who are often government and academic geologists, and the explorationists who use them, is critical to the evolution of more accurate and useable models (Hodgson, 1993). Often it is the deposits that can not be classified, or the observation that can not be explained by an existing model, which leads to an advance in our understanding of ore-forming processes or products.

Critical elements of mineral potential assessments are standard deposit-type descriptions that are used to establish groups of similar deposits. These standard descriptions can then be used as "deposit definitions" for expert analysis of the mineral potential of geological tracts, as well as providing the basis for selecting resource data for quantitative assessments, such as tabulations of grade and tonnage data (Grunsky, 1995, this volume).

Complete suites of deposit models are desirable, even though mineral assessments and exploration programs may focus on a restricted number of deposit types at any one time. For government, it is important to assess all the resource values with an eye to future exploitation of resources. There will be land tracts that will have increased mineral potential if deposit types of little significance today can be identified as possible mines of tomorrow. For industry, it is critical to be able to decide that a particular occurrence belongs to a deposit type that is not economically interesting at the present time. This helps focus exploration efforts on targets with a greater chance of economic return.

The USGS published the first comprehensive set of mineral deposit models and related grade and tonnage probability curves (Cox and Singer, 1986). They present 85 mineral deposit models and 60 associated grade and tonnage curves. Almost all the deposits described are metallic. Since then the USGS has produced a number of other publications containing summary deposit models, including two significant Open File reports with a large number of industrial minerals models (Orris and Bliss, 1991, 1992). The USGS continues to work on deposit models, however, it has yet to publish models for some deposits that have been found, or could exist, in British Columbia.

## B.C. MINERAL DEPOSIT PROFILES

Profiles are based on a combination of published information and the personal knowledge of the authors and, in some cases, information provided informally by industry geologists. More than 140 general deposit models are relevant to British Columbia, including 79 metal, 71 industrial mineral and four coal profiles. The Branch is completing descriptions for approximately 100 of these deposit models. It is also compiling grade and tonnage data for selected models (Grunsky, 1995, this volume).

With new data being produced every day by industry and research geologists, it is a given that some of today's models will be out-of-date tomorrow. Our profiles are intended to be part of the dynamic process described by Erickson (1982), playing their part in the continuing evolution of better deposit models to assist the exploration community and resource assessment geologists.

### *Deposit Profiles Format*

The profiles are designed to be global models with sufficient information to describe the deposit type anywhere in the world. However, they do incorporate more information specific to British Columbia with respect to tectonic setting, age of mineralization, examples, references, resource data and economic factors.

Profiles are concise descriptions tied to a series of headings which will fit on two or three pages. A sample profile for gold skarns is presented in Table 1. This format is similar to deposit model publications by the Geological Survey of Canada and the USGS (Eckstrand, 1984; Cox and Singer, 1986). They are designed to be primarily descriptive because the ore-forming processes are sometimes poorly understood. However, a section on 'genetic models' is now part of many profiles because many of the authors and reviewers of the draft information argued strongly for its inclusion.

### *Classification*

Another aspect of the profiles has generated considerable discussion - grouping of the different deposit types. This reflects the difficulties in any subdivision of complex natural phenomena, particularly when some deposit types are end members of a continuum. The many classification systems developed since Agricola are testimony to the elusive nature of a satisfactory classification scheme for mineral deposits. This is not surprising given the ongoing advances in our understanding of ore-forming processes. The reader is directed to summaries by Jensen and Bateman (1979) and Peters (1978) for a review of different classification systems.

With the profiles, the approach has been to regard the deposit models as the key element and any classification system as an index for placing the models in a useful context for the user. Profiles will be published with multiple indexes, such as by commodity, host lithology and deposits. An example of providing indexes to mineral deposit types is Laznicka's text (1985) which proved invaluable in researching international examples of deposits similar to those in British Columbia.

Two classification schemes for British Columbia deposit profiles are presented in this paper. The first is organized by association (Table 2) which uses a combination of characteristics to separate deposits into groupings frequently used by geologists. This is a single-entry listing with headings, such as porphyry, industrial rocks, organic and placer deposits which often relates well to areas of expertise of economic geologists. The second classification system presents the profiles grouped according to the most commonly associated host lithologies and is a multiple entry index (Table 3). This latter scheme is similar to the principle USGS classification system of Cox and Singer (1986) and is particularly useful for mineral potential assessments where the bedrock geology is the most important criteria for estimating the number of undiscovered deposits.

Within the British Columbia mineral resource assessment process more than 9900 of the occurrences in the province listed in MINFILE were classified by detailed deposit type. This assisted the analysis of the mineral potential of individual geological tracts by identifying all the deposit types that exist within the tract. It also provided a check on the effectiveness of existing deposit models to adequately describe the complete array of mineral occurrences in British Columbia. Geologists classifying occurrences quickly pointed out that there were a number of occurrences that did not fit any of the existing profiles and some that did not fit any of the USGS models either. In some cases this reflected the difficulty of classifying poorly described showings and prospects. However, it also led to identifying more deposit models that needed to be written. This exercise should be completed in any area of mineral potential assessments as it provides a very useful check on the applicability and completeness of global models being applied.

Within the two classification schemes of deposit types for British Columbia (Tables 2 and 3), the reader will notice several new deposit types that reflect the influence of new discoveries or new data. For example, there is a deposit model for Shallow Subaqueous Hot Spring Au-Ag. This is based on the Eskay Creek deposit and recent research results from the southeast Pacific (Hannington, 1993) documenting shallow, precious metal rich exhalative sulphide deposits. As more data are collected on these new deposits our increased understanding may allow them to be merged with an existing deposit model.

## ACKNOWLEDGMENTS

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**Table 1. EXAMPLE DEPOSIT PROFILE FOR AU SKARN**

# Au SKARNS K04

by Gerald E. Ray

## *IDENTIFICATION*

SYNONYMS: Pyrometasomatic, tactite, or contact metasomatic gold deposits.

COMMODITIES (BYPRODUCTS): Au (Cu, Ag).

EXAMPLES (British Columbia - *International*): Nickel Plate (092HSE 038), French (092HSE 059), Canty (092HSE 064), Good Hope (092HSE 060); *Fortitude (USNV), McCoy (USNV), Tomboy-Minnie (USNV), Buckhorn Mountain (USWA), Butte Highlands (USMT), Thanksgiving (PLPN), Browns Creek (AUNS), Mount Biggenden (AUQL), Nambija (ECDR).*

## *GEOLOGICAL CHARACTERISTICS*

CAPSULE DESCRIPTION: Gold-dominant mineralization genetically associated with a skarn gangue consisting of calcium-iron-magnesium silicates. It includes calcic and magnesian Au skarns.

TECTONIC SETTINGS: Most Au skarns form in orogenic belts at convergent plate margins. They tend to be associated with syn to late intra oceanic island-arc intrusions emplaced into calcareous sequences in arc or back-arc environments. However, the Butte Highlands Au skarn in Montana, U.S. (Ettlinger *et al.*, in prep) is hosted by platformal carbonates and is probably associated with melts derived from continent crust.

DEPOSITIONAL ENVIRONMENT / GEOLOGICAL SETTING: Most are related to plutonism associated with the development of oceanic island arcs or back arcs, such as the Late Triassic-Early Jurassic Nicola Group in British Columbia.

AGE OF MINERALIZATION: Phanerozoic (mostly Cenozoic and Mesozoic); in British Columbia they are mainly of Early to mid-Jurassic age. The unusual magnesian Au skarns of Western Australia are Archean.

HOST/ASSOCIATED ROCK TYPES: High to intermediate level stocks, sills and dikes of gabbro, quartz diorite or granodiorite intruding carbonate, calcareous clastic or volcaniclastic rocks. The island arc related, I-type intrusions are commonly porphyritic and iron rich, and have low $Fe_2O_3/FeO$ ratios.

DEPOSIT FORM: Variable from irregular lenses and veins to tabular or stratiform orebodies with lengths and widths ranging up to many hundreds of metres.

TEXTURE/STRUCTURE: Igneous textures in endoskarn. Coarse to fine-grained, massive granoblastic to layered textures in exoskarn. Some hornfelsic textures. Faults and fractures can be an important loci for mineralization.

ORE MINERALOGY(Principal and *subordinate*):
Calcic Au skarns: Native gold ± chalcopyrite ± pyrrhotite ± arsenopyrite ± *tellurides* (e.g. *hedleyite, tetradymite, altaite* and *hessite*) ● *bismuthinite ± cobaltite ± native bismuth ± pyrite ± sphalerite ± maldonite.* Generally high sulphide content and pyrrhotite:pyrite ratios, and low Cu:Au (<2000), Cu:Ag (<1000), Zn:Au (<100) and Ag/Au (<1) ratios. Gold is commonly present as micron-sized inclusions in sulphides, or at sulphide grain boundaries associated with tellurides. Therefore, to the naked eye, Au skarn ore is often indistinguishable from waste rock.
Magnesian Au skarns: Native gold ± pyrrhotite ± chalcopyrite ± pyrite ± *magnetite ± galena ± tetrahedrite.*

EXOSKARN MINERALOGY (GANGUE):
Calcic Au skarns: extensive exoskarn, generally with high pyroxene:garnet ratios, although at the Fortitude deposit in Nevada, some higher gold values are concentrated in thin, structurally controlled garnet-rich zones. Prograde minerals include K-feldspar, Fe-rich biotite, low Mn grandite garnet ($Ad_{10-100}$), wollastonite, diopside-hedenbergite clinopyroxene ($Hd_{20-100}$) and vesuvianite. Other less common minerals include rutile, axinite and sphene. Mineral and metal zoning common in skarn envelope with proximal coarse-grained, garnet-rich skarn containing high Cu:Au ratios, and distal finer grained pyroxene-rich skarn containing low Cu:Au ratios and gold-sulphide orebodies. Late or retrograde minerals include epidote, chlorite, clinozoisite, vesuvianite, scapolite, tremolite-actinolite, sericite and prehnite.
Magnesian Au skarns: olivine, clinopyroxene ($Hd_{2-50}$), garnet ($Ad_{7-30}$) and chondrodite. Retrograde minerals include serpentine, epidote, vesuvianite, tremolite-actinolite, phlogopite, talc, K-feldspar and chlorite.

# Au SKARNS K04

ENDOSKARN MINERALOGY (GANGUE):
Calcic Au skarns: moderate endoskarn with K-feldspar, biotite, Mg-pyroxene ($Hd_{5-30}$) and garnet.
Magnesian Au skarns: details on endoskarn are poorly documented. Argillic and propyllitic alteration with some garnet, *clinopyroxene and epidote occurs in the endoskarn at the Butte Highlands Au skarn.*

WEATHERING: In temperate climates, skarns often form topographic features with positive relief.

ORE CONTROLS: Stratigraphic and structural controls. Sulphide-rich ore commonly develops in distal, pyroxene-dominant portion of the skarn envelope. Some orebodies form along sill-dike intersections, sill-fault or bedding-fault intersections as well as along fold axes. In some districts, specific suites of reduced, Fe-rich intrusions are spatially related to mineralization

GENETIC MODEL: Mineral assemblages and low $Fe_2O_3/FeO$ ratios indicate that most calcic Au skarns are highly reduced systems. However, the McCoy Au skarn in Nevada represents a more oxidized system. There is a worldwide spatial and temporal association between porphyry copper provinces and gold skarns.

ASSOCIATED DEPOSIT TYPES:
Calcic Au skarns: Au placers (C01,C02), calcic Fe and Cu skarns (K03, K01), porphyry Cu deposits (L04) and Au-bearing quartz and/or sulphide veins (I01, I02).
Magnesian Au skarns: Au placers (Co1,C02), Cu skarns (K01), porphyry Cu and Mo deposits (I04, L05), Au-bearing quartz and/or sulphide veins (I01, I02); possibly W skarns ( K05).

COMMENTS: Most Au skarns throughout the world are calcic and are associated with island arc plutonism. However, unusual and distinct magnesian Au skarns are reported in the Archean greenstones of Western Australia and in Cambrian platformal dolomites at Butte Highlands in Montana, U.S.A.

## *EXPLORATION GUIDES*

GEOCHEMICAL SIGNATURE: Au, As, Bi, Te, Co, Cu anomalies, as well as some geochemical zoning patterns throughout the skarn envelope (notably in Cu/Au ratios). Calcic Au skarns tend to have lower Zn/Au, Cu/Au and Ag/Au ratios than any other skarn class. Their genetically related intrusions may be relatively enriched in the compatible elements Cr, Sc and V, and depleted in lithophile incompatible elements (Rb, Zr, Ce, Nb, and La), compared to intrusions associated with most other skarn classes.

GEOPHYSICAL SIGNATURE: Airborne magnetic or gravity surveys to locate plutons. Ground IP and magnetic follow-up surveys can outline some deposits (magnesian skarns tend to be magnetite bearing).

OTHER EXPLORATION GUIDES: Old placer workings.
Calcic Au skarns: Pyroxene and pyrrhotite-dominant exoskarn envelopes associated with reduced, Fe-rich intrusions in island arc environments.
Magnesian Au skarns: granodiorite intrusions in dolomitic sedimentary rocks.

## *ECONOMIC IMPORTANCE*

TYPICAL GRADE AND TONNAGE: These deposits range from 0.4 to 10 Mt and from 2 to 15 g/t gold. Theodore *et al.* (1991) report median grades and tonnage of 8.6 g/t , 5.0 g/t Ag and 213 000 t. Nickel Plate has produced over 8 Mt grading 7.4 g/t Au. Average grade worldwide is approximately 4.5 g/t gold.

IMPORTANCE: Recently, there have been some significant Au skarn deposits discovered around the world. Nevertheless, total historic production of gold from skarn (approximately 1000 tonnes of metal) is minute compared to production from other deposit types. The Nickel Plate deposit (Hedley, British Columbia) was probably one of the earliest major gold skarns in the world to be mined. Skarns have accounted for about 16 % of British Columbia's gold production, although nearly half of this was derived as a byproduct from Cu and Fe skarns

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## Table 2. B. C. Mineral Deposit Profiles Listed by Association (December 15, 1994)

| BC PROFILE # | DEPOSIT TYPE | SYNONYMS |
|---|---|---|
| **A - ORGANIC** | | |
| A01 | Peat | |
| A02 | Lignitic coal | "Brown coal" |
| A03 | Sub-bituminous coal | Thermal coal, Black lignite |
| A04 | Bituminous coal | Coking coal, Thermal coal |
| A05 | Anthracitic coal | Stone coal |
| **B - RESIDUAL/SURFICIAL** | | |
| B01* | Laterite Fe | Gossan Fe |
| B02* | Laterite Ni | |
| B03* | Laterite-Saprolite Au | Eluvial placers |
| B04* | Bauxite Al | Lateritic bauxite |
| B05 | Residual kaolin | Primary kaolin |
| B06 | Fireclay | Refractory shale |
| B07* | Bog Fe, Mn, U, Cu, Au | |
| B08 | Surficial U | "Calcrete U" |
| B09* | Karst-hosted Fe, Al, Pb-Zn | |
| B10 | "Terra Rossa" Au-Ag | Residual Au; Precious metal gossans |
| B11* | Marl | |
| B12* | Sand and Gravel | |
| **C - PLACER** | | |
| C01 | Surficial placers | Placer U-Au-PGE-Sn-diamond-magnetite-garnet, gems |
| C02 | Buried-channel placers | |
| C03* | Marine placers | Off-shore heavy mineral sediments |
| C04* | Paleoplacer U-Au-PGE-Sn-diamond-Ti-mag-gar-zir | |
| **D- CONTINENTAL SEDIMENTS & VOLCANICS** | | |
| D01 | Open-system Zeolites | |
| D02 | Closed Basin Zeolites | |
| D03 | Volcanic redbed copper | Basaltic Cu |
| D04 | Basal U | Sandstone U |
| D05* | Sandstone U | Roll front U, Tabular U |
| D06 | Volcanic-hosted U | "Epithermal U", Volcanogenic U |
| D07 | Iron oxide breccias and veins Cu-U-Au | Olympic Dam type Fe (Cu-U-Au), Kiruna type |
| **E - SEDIMENT-HOSTED** | | |
| E01* | Almaden Hg | |
| E02* | Kipushi Cu-Pb-Zn | Carbonate-hosted Cu-Pb-Zn |
| E03 | Carlin-type sediment-hosted Au-Ag | Carbonate-hosted Au-Ag |
| E04* | Sediment-hosted Cu | Sandstone Cu, Sediment-hosted stratiform Cu |
| E05 | Sandstone Pb | |
| E06 | Bentonite | Volcanic clay, Soap clay |
| E07* | Sedimentary kaolin | |

*Working Version 2.0*
** no draft of PROFILE completed*

| GLOBAL EXAMPLES<br>Deposit (Province, State or Country) | MINERAL DEPOSIT B.C. PROFILES | B.C. EXAMPLES |
|---|---|---|

[redacted]

| | |
|---|---|
| Ireland, Ontario, New Brunswick | Fraser Delta, North Coast |
| Estevan (Saskatchewan) | Skonun Point (Graham Island) |
| Highvale (Alberta), Powder River Basin (Wyoming) | Hat Creek, Princeton |
| Gregg River (Alberta), Sydney Coalfield (Nova Scotia) | Quintette, Bullmoose, Greenhills, Fording |
| Pennsylvannia Coalfields, Canmore (Alberta) | Mt Klappan |

[redacted]

| | |
|---|---|
| Glenravel (Ireland), Araxa (Brazil) | |
| Riddle (Oregon) | |
| Boddington, Mt. Gibson (Australia), Akaiwang (Guyana) | |
| Queensland, Pocos de Caldas (Brazil), Salem Hills (Oregon) | Florence (Sooke) |
| Germany, North Carolina, Idaho | Lang Bay, Sumas Mountain |
| Alabama, Georgia, Missouri | Sumas Mountain, Quinsam |
| Trois Riviéres (Québec) | Whipsaw Creek, Limonite Creek |
| Flodelle Creek (Washington) | Prairie Flats |
| Transvaal (Pb-Zn, South Africa), Sardinia (Pb-Zn), Jamaica (Al) | Villhalta (Fe) |
| Rio Tinto (Spain) | Villalta |
| | Cheam Lake (Chiliwack) |

[redacted]

| | |
|---|---|
| North Saskatchewan River (Saskatchewan), Nome (Alaska) | Fraser River, Quesnel River, Graham Island |
| Livingstone Creek (Yukon), Valdez Creek (Alaska) | Williams Creek, Otter Creek, Bullion mine |
| Australia (New South Wales, Queensland) | Middlebank (off north end of Vancouver Island) |
| Elliot Lake (Ontario), Wittwatersrand (South Africa) | Mulvehill |

[redacted]

| | |
|---|---|
| Death Valley (California), John Day Formation (Oregon) | Princeton Basin |
| Bowie (Arizona), Lake Magadi (Kenya) | |
| Keewenaw (Michigan), Coppermine (Northwest Territories) | Sustut |
| Sherwood (Washington) | Blizzard, Tyee |
| Colorado Plateau, Grants (New Mexico) | |
| Marysvale (Utah), Aurora (Oregon) | Rexspar, Bullion (Birch Island) |
| El Romero (Chile), Sue-Dianne (Northwest Territories) | Iron Range |

[redacted]

| | |
|---|---|
| Almaden (Spain), Santa Barbara (Peru) | |
| Tsumeb (Namibia), Kipushi (Zaire), Ruby Creek (Alaska) | |
| Carlin (Nevada), Getchell (Nevada), Cortez (Nevada) | |
| Kupferschiefer (Germany), White Pine (Michigan) | Sage Creek |
| Laisvall (Sweden), George Lake (Saskatchewan) | |
| Wyoming, Alberta, Rodalquilar (Spain) | Princeton, Quilchena |

| GLOBAL EXAMPLES<br>Deposit (Province, State or Country) | B.C. EXAMPLES |
|---|---|
| Treasure Mountain (Montana), Trimaous ( France), Henderson (Ontario) | Red Mountain, Silver Dollar |
| Eugui (Spain), Veitsch (Austria) | Mt. Brussilof, Driftwood Creek |
| Illinois - Kentucky, Italian Alps | Muncho Lake |
| Illinois - Kentucky, Italian Alps | Liard Fluorite |
| Viburnum Trend (Missouri), Pine Point & Polaris (Northwest Territories) | Robb Lake, Monarch |
| | Reeves MacDonald, H.B., Aspen, Duncan |
| Mount Isa (Australia), Faro, Grum (Yukon) | Sullivan, Cirque, Driftpile |
| Blackbird & Sheep Creek (Montana) | |
| Nick (Yukon), China | |
| Tea (Yukon), Magcobar (Ireland) | Kwadacha |

| | |
|---|---|
| Molongo (Mexico), Atasu (Kazakhstan), Kalahari (South Arica) | |
| Paris Basin (France), Appalachian Basins (USA) | Lussier River, Windermere |
| Texas, Louisiana, Poland, Coronation (Alberta) | Trutch area |
| Lake Enon (Nova Scotia), Mexico, Germany | Kitsault Lake |
| Metalline Falls, Washington | |
| Juntura and Otis Basins (Oregon), Lake Myvatn (Iceland) | |
| Phosphoria Formation (Idaho), Meskala (Morocco) | Fernie synclinorium |
| Athabaska Basin (Saskatchewan), Florida | |
| Mesabi Ranges (Minnesota), Minas Gervas (Brazil) | Falcon |

| | |
|---|---|
| Vermillion iron formation (Minnesota), Helen mine (Ontario) | |
| Olympic Mountains (Washington), Nicoya (Costa Rica) | |
| | Britannia, Falkland |
| Besshi (Japan), Greens Creek (Alaska) | Goldstream, Windy Craggy |
| Cyprus, Oman | Anyox, Chu Chua |
| Noranda (Québec), Kuroko (Japan) | Britannia, Kutcho Creek, Myra Falls |
| Osorezan (Japan) | Eskay Creek |

| | |
|---|---|
| Sulphur Bank (California), Steamboat Springs (Nevada) | Ucluelet? |
| McLaughlin (California), Round Mountain (Nevada) | Cinola |
| El Indio (Chile), Nansatsu (Japan) | Taseko property, Expo |
| Comstock (Nevada), Sado (Japan) | Lawyers, Blackdome, Silbak Premier |
| Talamantes (Mexico), Gloryana (New Mexico) | |
| Black Range (New Mexico), Potosi (Bolivia), Ashio (Japan) | D Zone (Cassiar) |
| Emperor (Fiji), Zortman-Landusky (Montana), Cripple Creek (Colorado) | |
| (Cornwall (England)?) | Monteith Bay, Pemberton Hills |

Table 2. B. C. Mineral Deposit Profiles Listed by Association cont.

| BC PROFILE # | DEPOSIT TYPE | SYNONYMS |
|---|---|---|
| **E - SEDIMENT-HOSTED cont.** | | |
| E08 | Carbonate-hosted talc | Dolomite-hosted talc |
| E09 | Sparry magnesite | Veitsch-type, carbonate-hosted magnesite |
| E10 | Mississippi Valley type barite | |
| E11 | Mississippi Valley type fluorite | |
| E12 | Mississippi Valley type Pb-Zn | Carbonate-hosted Pb-Zn, Appalachian Zn |
| E13 | Kootenay Arc type Pb-Zn | |
| E14 | Sedex Zn-Pb-Ag-S | Sullivan massive sulphide |
| E15 | Blackbird massive sulphide Cu-Co | Sediment-hosted Cu-Co massive sulphide |
| E16 | Sediment-hosted Ni | |
| E17 | Sediment-hosted barite | Bedded barite |
| **F - CHEMICAL SEDIMENT** | | |
| F01 | Sedimentary Mn | |
| F02 | Bedded gypsum/anhydrite | Marine evaporite gypsum |
| F03 | Gypsum-hosted sulphur | Frasch sulphur |
| F04* | Bedded celestite | |
| F05* | Palygorskite | Attapulgite |
| F06 | Lacustrine diatomite | Diatomaceous earth, Kieselguhr |
| F07 | Phosphate, upwelling type | |
| F08 | Phosphate, warm-current type | |
| F09* | Playas (hydromagnesite, sodium carbonate lake brines) | |
| F10* | Superior type iron formation | |
| **G - MARINE VOLCANIC ASSOCIATION** | | |
| G01* | Algoma Fe | |
| G02 | Volcanogenic Mn | |
| G03* | Volcanogenic anhydrite/gypsum | |
| G04 | Besshi massive sulphide Zn-Cu-Pb | Kieslager |
| G05 | Cyprus massive sulphide Cu | |
| G06 | Noranda/Kuroko massive sulphide Cu-Pb-Zn | Noranda Cu-Pb-Zn massive sulphide |
| G07 | Subaqueous hot spring Ag-Au | |
| **H - EPITHERMAL** | | |
| H01* | Travertine | Tufa |
| H02 | Hot spring Hg | |
| H03 | Hot spring Au-Ag | |
| H04 | Epithermal Au-Ag; high sulphidation | Acid-sulphate epithermal, Nansatsu-type |
| H05 | Epithermal Au-Ag; low sulphidation | Adularia-sericite epithermal |
| H06* | Epithermal Mn | |
| H07 | Sn-Ag veins | |
| H08* | Alkalic-hosted Au-Ag-Te-F veins | |
| H09* | Hydrothermal alteration clays-Al-Si | Kaolin, Alunite, Siliceous cap, Pyrophyllite |

## Table 2. B. C. Mineral Deposit Profiles Listed by Association cont.

| BC PROFILE # | DEPOSIT TYPE | SYNONYMS |
|---|---|---|
| **I - VEIN / BRECCIA** | | |
| I01 | Gold-quartz veins | Mesothermal, Motherlode, saddle reefs |
| I02 | Subvolcanic shear-hosted gold | |
| I03* | Turbidite-hosted gold veins | Meguma type |
| I04* | Iron formation-hosted gold | |
| I05 | Polymetallic veins Ag-Pb-Zn | |
| I06* | Cu-Ag quartz veins | |
| I07* | Silica veins | |
| I08 | Silica-Hg carbonate | |
| I09 | Stibnite veins and disseminations | Simple and disseminated Sb deposits |
| I10 | Vein barite | |
| I11 | Barite-fluorite veins | |
| I12* | W veins | Quartz-wolframite veins |
| I13* | *Sn veins and griesens* | |
| I14* | U-Th-REE veins | |
| I15* | Felsic plutonic U | |
| I16* | Unconformity U-Au-Ni | Vein-like type U |
| I17 | Magnesite veins and stockworks | Bone magnesite, Kraubath-type magnesite |
| **J - REPLACEMENT** | | |
| J01 | Polymetallic mantos Ag-Pb-Zn | Polymetallic replacement deposits |
| J02 | Sn mantos and stockworks | "Replacement Sn" |
| J03* | Mn veins and replacements | "Replacement Mn" |
| J04 | Sulphide manto Au | Au-Ag sulphide mantos |
| **K - SKARN** | | |
| K01 | Cu skarn | |
| K02 | Zn-Pb skarn | |
| K03 | *Fe skarn* | |
| K04 | Au skarn | |
| K05 | W skarn | |
| K06 | Sn skarn | |
| K07 | Mo skarn | |
| K08 | Garnet skarn | |
| K09 | Wollastonite skarn | |
| **L - PORPHYRY** | | |
| L01 | Subvolcanic Cu-Ag-Au (As-Sb) | Enargite Au, Transitional Au-Ag |
| L02 | Porphyry-related Au | Granitoid Au, Porphyry Au |
| L03 | Alkalic porphyry Cu-Au | |
| L04 | Porphyry Cu±Mo±Au | |
| L05 | Porphyry Mo | |
| L06 | Porphyry Sn | "Subvolcanic tin" |
| L07 | Porphyry W | |
| L08 | Climax-type Porphyry Mo | |

MINERAL DEPOSIT B.C. PROFILES

| GLOBAL EXAMPLES<br>Deposit (Province, State or Country) | B.C. EXAMPLES |
| --- | --- |
| | |
| Motherlode (California), Alaska-Juneau (Alaska), Red Lake (Ontario) | Bralorne, Erickson |
| | Scottie, Snip, Johnny Mountain, Iron Colt |
| Ballarat (Australia), Megurna (Nova Scotia) | Frasergold |
| Homestake (South Dakota) | |
| Keno Hill (Yukon) | Silver Queen, Beaverdell |
| Nikolai mine & Kathleen-Margaret (Alaska) | Davis-Keays?, Churchill Copper |
| | Gypo, Granby Point |
| Red Devil? (Alaska) | Pinchi, Bralorne Takla |
| Jerritt Canyon (Nevada), Bolivia | Minto, Congress, Snowbird |
| Del Rio district (Tennessee), Jebel Ighoud (Morocco) | Parson |
| Mongolian fluorite belt | Rock Candy, Eaglet |
| Pasto Bueno (Peru), Carrock Fell (England) | |
| *Cornwall (England), Lost River (Alaska)* | *Duncan Lake?* |
| Uranium City (Sakatchewan), Schwartzwalder (Colorado) | Little Gem? |
| Roy Creek & Bokan Mountain (Alaska), Massif Central (France) | Coryell intrusions, Surprise Lake |
| Key Lake (Saskatchewan), Jabiluka (Australia), Midnight (Washington) | |
| | |
| East Tintic (Utah), Fresnillo (Mexico), Sa Dena Hess (Yukon) | Bluebell, Midway |
| Renison Bell, Cleveland (Australia), Dachang district (China) | |
| Lake Valley (New Mexico), Phillipsburg (Montana) | |
| Ketza River (Yukon) | Mosquito Creek , Island Mountain |
| | |
| Mines Gaspé (Québec), Carr Fork (Yukon) | Craigmont, Phoenix |
| San Antonio (Mexico), Bari Ban (Australia) | Piedmont, Contact |
| Shinyama (Japan), Cornwall (Penn.) | Tasu, Jessie, Merry Widow, HPH |
| Fortitude (Nevada), Buckhorn Mountain (Washington) | Nickel Plate |
| Cantung & Mactung (Yukon), Pine Creek (California) | Emerald Tungsten, Dimac |
| Lost River (Alaska), JC (Yukon) | Daybreak |
| Little Boulder Creek (Idaho), Mt. Tennyson (Australia) | Coxey, Novelty |
| | Crystal Peak, Argonaut |
| Fox Knoll, Lewis (New York) | Sechelt |
| | |
| Lepanto (Philipines), Resck (Hungary), Kori Kollo (Bolivia) | Equity Silver, Thorn? |
| Marte/Lobo (Chile) | Snowfields? |
| Tai Parit (Philipines) | Afton, Copper Mountain, Galore Creek |
| Chuquicamata & La Escondida (Chile) | Highland Valley, Gibraltar |
| Quartz Hill (Alaska) | Endako, Kitsault, Glacier Gulch |
| Llallagua (Bolivia), Potato Hills (Yukon) | |
| Mount Pleasant (Nova Scotia), Logtung (Yukon) | Boya |
| Climax & Henderson (Colorado) | Lucky Ship? |

## Table 2. B. C. Mineral Deposit Profiles Listed by Association cont.

| BC PROFILE # | DEPOSIT TYPE | SYNONYMS |
| --- | --- | --- |
| **M - ULTRAMAFIC/MAFIC-HOSTED** | | |
| M01* | Basaltic subvolcanic Cu-Ni-PGE | |
| M02 | Gabbroid Ni-Cu-PGE | |
| M03 | Podiform chromite | |
| M04* | Anorthosite Ti-V | |
| M05 | Zoned ultramafic Fe-Ti-V/PGE/Cr/Cu-Ni | Alaskan type Fe-Ti-V/PGE/Cr/Cu-Ni |
| M06 | Asbestos | Serpentinite-hosted asbestos |
| M07 | Serpentinite-hosted magnesite-talc | |
| M08 | Vermiculite | |
| **N - ALKALIC ASSOCIATION** | | |
| N01 | Carbonatite-hosted deposits | |
| N02* | Kimberlite-hosted diamonds | Diamond pipes |
| N03* | Lamproite-hosted diamonds | |
| **O - PEGMATITE** | | |
| O01 | Rare element pegmatite - LCT family | Zoned pegmatite (Lithium-Cesium-Tantalum) |
| O02 | Rare element pegmatite - NYF family | Niobium-Ytrium-Fluorine pegmatite |
| O03 | Muscovite pegmatite | Mica-bearing pegmatite |
| O04* | Ceramic pegmatite | Barren pegmatite |
| **P - METAMORPHIC HOSTED** | | |
| P01 | Andalusite hornfels | |
| P02 | Kyanite family | |
| P03 | Microcrystalline graphite | "Amorphous" graphite |
| P04 | Crystalline flake graphite | |
| P05 | Vein graphite | "Lump and chip graphite" |
| P06 | Corundum in aluminous metasediments | |
| **Q - GEMS AND SEMI-PRECIOUS STONES** | | |
| Q01 | Jade | |
| Q02 | Rhodonite | |
| Q03* | Agate | |
| Q04* | Amethyst | |
| Q05* | Jasper | |
| Q06 | Columbia-type emerald | |
| Q07 | Schist-hosted emerald | |
| Q08 | Sediment-hosted opal | |
| Q09 | Gem corundum in contact zones | |
| Q10 | Gem corundum hosted by alkalic rocks | |
| Q11 | Volcanic-hosted opal | |

| GLOBAL EXAMPLES<br>Deposit (Province, State or Country) | B.C. EXAMPLES |
|---|---|
| [redacted] | |
| Noril'sk, Duluth | |
| Lynn Lake (Manitoba), Kluane (Yukon), Noril'sk-Talnakh (Russia) | Giant Mascot, Nickel Mountain |
| Josephine ophiolite (Oregon) | |
| Roseland (Virginia), Piuma Hidalgo (Mexico) | |
| Duke Island (Alaska) | Tulameen |
| Thetford (Québec) | Cassiar |
| Thetford & Magog (Québec), Deloro (Ontario) | Nahatlatch River, Atlin area |
| Enoree (USA), Palabora ( South Africa) | |
| [redacted] | |
| Palabora (South Africa), Oka (Québec), Mountain Pass (California) | Aley, Mount Grace tuff |
| Kimberley & Premier (South Africa) | Cross |
| Argyle (Australia) | |
| [redacted] | |
| Bikita Field (Zimbabwe), Blackhills (South Dakota) | |
| South Platte district (Colorado), Bancroft (Ontario) | |
| Rajahstan (India), Appalachian Province (USA) | |
| [redacted] | |
| Transval (South Africa), Brittany (France) | Leech River |
| Willis Mountain (Virginia), NARCO (Québec) | |
| Raton (New Mexico), Sonora (Mexico) | |
| Lac Knife (Québec) | AA |
| Calumet & Clot (Québec), Bogala (Sri Lanka) | |
| Gallatin & Madison Counties (Montana) | |
| [redacted] | |
| | Cry Lake, Ogden Mountain |
| | Hill 60, Arthur Point, Cassiar |
| Thunder Bay (Ontario) | |
| Chivor and Muzo districts (Columbia) | |
| Habachtal (Austria), Leysdsdorp (South Africa) | |
| Coober Pedy (Australia) | |
| Yogo Gulch (Montana) | |
| Querétaro State (Mexico) | |

Table 2. B. C. Mineral Deposit Profiles Listed by Association cont.

| BC PROFILE # | DEPOSIT TYPE | SYNONYMS |
|---|---|---|
| **R - INDUSTRIAL ROCKS** | | |
| R01 | Cement shale | |
| R02 | Expanding shale | |
| R03 | *Dimension stone - granite* | |
| R04 | Dimension stone - marble | |
| R05 | Dimension stone - andesite | |
| R06* | Dimension stone - sandstone | |
| R07 | Silica sandstone | High-silica quartzite |
| R08* | Flagstone | |
| R09 | Limestone | |
| R10* | Dolomite | |
| R11* | Volcanic ash - pumice | |
| R12* | Volcanic glass - perlite | |
| R13* | Nepheline syenite | |
| R14* | Alaskite | |
| R15* | Crushed rock | Road metal, Rip rap |

| GLOBAL EXAMPLES<br>Deposit (Province, State or Country) | B.C. EXAMPLES |
|---|---|
| | Dunsmuir shale, Sumas Mountain |
| Wabamun shales (Alberta) | Nanaimo shale, Saturna Island |
| Riviére a Pierre (Québec), Black Hills (South Dakota) | Nelson Island |
| Vermont, Alabama, Georgia | Marblehead, Texada Island, Anderson Bay |
| | Haddington Island |
| | Moberley |
| Southowram (England) | |
| | Texada Island, Saanich Inlet |
| | Meagher Mountain, Buse Lake |
| | Blackdome |
| Blue Mountain (Ontario) | Trident Mountain, Tuktakamin |
| Spruce Pine alaskite (North Carolina) | |

Table 3. B. C. Mineral Deposit Profiles Listed by Lithological Affinities (December 15, 1994)

| DEPOSIT TYPE | SYNONYMS | BC PROFILE # | U.S.G.S. MODEL # |
|---|---|---|---|
| **SURFICIAL DEPOSITS** | | | |
| Peat | | A01 | - - |
| Bog Fe, Mn, U, Cu, Au | | B07* | - - |
| Surficial U | "Calcrete U" | B08 | - - |
| **RESIDUAL** | | | |
| Laterite Fe | Gossan Fe | B01* | - - |
| Laterite Ni | | B02* | 38a |
| Laterite-Saprolite Au | Eluvial placers | B03* | 38g |
| Bauxite Al | Lateritic bauxite | B04* | 38b |
| Residual kaolin | Primary kaolin | B05 | 38h* |
| Fireclay | Refractory shale | B06 | 38i* |
| Karst-hosted Fe, Al, Pb-Zn | | B09* | - - |
| "Terra Rossa" Au-Ag | Residual Au; Precious metal gossans | B10 | - - |
| **ALLUVIUM** | | | |
| Sand and Gravel | | B12* | - - |
| Surficial placers | Placer U-Au-PGE-Sn-diamond-magnetite-garnet, gems | C01 | 39a |
| Buried-channel placers | | C02 | 39a |
| **SEDIMENTS** | | | |
| Marl | | B11* | - - |
| Marine placers | Off-shore heavy mineral sediments | C03* | 39f*? |
| **SEDIMENTARY ROCKS** | | | |
| **CHEMICAL SEDIMENTARY ROCKS** | | | |
| **Playa Evaporites** | | | |
| (Closed basin zeolites) | | D02 | 25ob |
| Playas (hydromagnesite, sodium carbonate lake brines) | | F09* | 35ba,bm(T) |
| **Marine Evaporites** | | | |
| Bedded gypsum/anhydrite | Marine evaporite gypsum | F02 | 35ae |
| Gypsum-hosted sulphur | Frasch sulphur | F03 | - - |
| Bedded celestite | | F04* | 35aa* |
| **Restricted Basin** | | | |
| (Sedex Zn-Pb-Ag-S) | Sullivan massive sulphide | E14 | 31a |
| (Sediment-hosted Ni) | | E16 | - - |
| (Sediment-hosted barite) | Bedded barite | E17 | 31b |
| (Sedimentary Mn) | | F01 | 34b |
| **Shelf** | | | |
| Sedimentary Mn | | F01 | 34b |
| Palygorskite | Attapulgite | F06* | 34e* |
| Phosphate, upwelling type | | F07 | 34c |
| Phosphate, warm-current type | | F08 | 34d |
| (Superior Type Iron formation) | | F10* | 34a |
| **Oceanic** | | | |
| Superior Type Iron Formation | | F10* | 34a |
| (Cyprus massive sulphide Cu) | | G05 | 24a |

## Table 3. B. C. Mineral Deposit Profiles Listed by Lithological Affinities cont.

| DEPOSIT TYPE | SYNONYMS | BC PROFILE # | U.S.G.S. MODEL # |
|---|---|---|---|
| **SEDIMENTARY ROCKS cont.** | | | |
| **CARBONATE ROCKS** | | | |
| **No Associated Igneous Rocks** | | | |
| Kipushi Cu-Pb-Zn | Carbonate-hosted Cu-Pb-Zn | E02* | 32c |
| (Carlin-type sediment-hosted Au-Ag) | Carbonate-hosted Au-Ag | E03 | 26a,19c |
| Sparry magnesite | Veitsch-type, carbonate-hosted magnesite | E09 | 18?l* |
| Mississippi Valley type barite | | E10 | - - |
| Mississippi Valley type fluorite | | E11 | 32d* |
| Mississippi Valley type Pb-Zn | Carbonate-hosted Pb-Zn, Appalachian Zn | E12 | 32a/32b |
| Kootenay Arc type Pb-Zn | | E13 | - - |
| (Sedex Zn-Pb-Ag-S) | Sullivan massive sulphide | E14 | 31a |
| Mn veins and replacements | "Replacement Mn" | J03* | 19b |
| Sulphide manto Au | Au-Ag sulphide mantos | J04 | - - |
| Limestone | | R09 | - - |
| Dolomite | | R10* | - - |
| Vein barite | | I10 | M27e |
| (Barite-fluorite veins) | | I11 | 26c* |
| **Associated Igneous Rocks** | | | |
| Carlin-type sediment-hosted Au-Ag | Carbonate-hosted Au-Ag | E03 | 26a,19c |
| (Polymetallic mantos Ag-Pb-Zn) | Polymetallic replacement deposits | J01 | 19a |
| (Sn mantos and stockworks) | "Replacement Sn" | J02 | 14c |
| (Mn veins and replacements) | "Replacement Mn" | J03* | 19b |
| (Sulphide manto Au) | Au-Ag sulphide mantos | J04 | - - |
| (Cu skarn) | | K01 | 18a,b |
| (Zn-Pb skarn) | | K02 | 18c |
| (Fe skarn ) | | K03 | 18d |
| (Au skarn) | | K04 | - - |
| (W skarn ) | | K05 | 14a |
| (Sn skarn ) | | K06 | 14b |
| (Garnet skarn) | | K08 | - - |
| (Wollastonite skarn) | | K09 | 18g |
| **CLASTIC SEDIMENTARY ROCKS** | | | |
| **Biogenic** | | | |
| Lacustrine diatomite | Diatomaceous earth, Kieselguhr | F06 | 31s |
| (Phosphate, upwelling type) | | F07 | 34c |
| (Phosphate, warm-current type) | | F08 | 34d |
| **Clays** | | | |
| (Bentonite) | Volcanic clay, Soap clay | E06 | 28e?* |
| Sedimentary kaolin | | E07* | 31k* |
| **Shale-Siltstone** | | | |
| (Lignitic coal) | "Brown coal" | A02 | - - |
| (Sub-bituminous coal) | Thermal coal, Black lignite | A03 | - - |
| (Bituminous coal) | Coking coal, Thermal coal | A04 | - - |
| (Anthracitic coal) | Stone coal | A05 | - - |
| (Volcanic redbed copper) | Basaltic Cu | D03 | 23 |
| (Carlin-type sediment-hosted Au-Ag) | Carbonate-hosted Au-Ag | E03 | 26a,19c |
| (Sediment-hosted Cu) | Sandstone Cu, Sediment-hosted stratiform Cu | E04* | 30b |
| Sedex Zn-Pb-Ag-S | Sullivan massive sulphide | E14 | 31a |
| (Blackbird massive sulphide Cu-Co) | Sediment-hosted Cu-Co massive sulphide | E15 | 24d |
| Sediment-hosted Ni | - | E16 | - - |

Table 3. B. C. Mineral Deposit Profiles Listed by Lithological Affinities cont.

| DEPOSIT TYPE | SYNONYMS | BC PROFILE # | U.S.G.S. MODEL # |
|---|---|---|---|
| **SEDIMENTARY ROCKS cont.** | | | |
| *Shale-Siltstone cont.* | | | |
| Sediment-hosted barite | Bedded barite | E17 | 31b |
| (Besshi massive sulphide Zn-Cu-Pb)+D260 | Kieslager | G04 | 24b |
| Columbia-type emerald deposits | | Q06 | 31c |
| Cement shale | | R01 | -- |
| Expanding shale | | R02 | -- |
| *Sandstone* | | | |
| Lignitic coal | "Brown coal" | A02 | -- |
| Sub-bituminous coal | Thermal coal, Black lignite | A03 | -- |
| Bituminous coal | Coking coal, Thermal coal | A04 | -- |
| Anthracitic coal | Stone coal | A05 | -- |
| Basal U | Sandstone U | D04 | -- |
| Sandstone U | Roll front U, Tabular U | D05* | 30c |
| (Iron oxide Cu-Au-U breccias and veins ) | Olympic Dam type Fe (Cu-U-Au), Kiruna type | D07 | 29b,25i |
| (Kipushi Cu-Pb-Zn) | Carbonate-hosted Cu-Pb-Zn | E02* | 32c |
| Sediment-hosted Cu | Sandstone Cu, Sediment-hosted stratiform Cu | E04* | 30b |
| Sandstone Pb | | E05 | 30a |
| Blackbird massive sulphide Cu-Co | Sediment-hosted Cu-Co massive sulphide | E15 | 24d |
| (Polymetallic veins Ag-Pb-Zn) | | I05 | 22c, 25b |
| Sediment-hosted opal | | Q08 | -- |
| Agate | | Q03* | -- |
| Dimension stone - sandstone | | R06* | 30d* |
| Silica sandstone | High-silica quartzite | R07 | 30e* |
| Flagstone | | R08* | -- |
| *Conglomerate and Sedimentary Breccia* | | | |
| Paleoplacer U-Au-PGE-Sn-diamond-Ti-mag-gar-zir | | C04* | 39c,d,e |
| (Volcanic redbed copper) | Basaltic Cu | D03 | 23 |
| (Sandstone U) | Roll front U, Tabular U | D05* | 30c |
| Jasper | | Q05* | -- |
| **VOLCANIC ROCKS - Felsic-Mafic** | | | |
| **SUBAERIAL VOLCANIC ROCKS** | | | |
| *Mainly Volcanic Host* | | | |
| Open-system zeolites | | D01 | 25oa |
| Closed basin zeolites | | D02 | 25ob |
| (Volcanic redbed copper) | Basaltic Cu | D03 | 23 |
| Volcanic-hosted U | "Epithermal U", Volcanogenic U | D06 | 25f |
| Iron oxide Cu-Au-U breccias and veins | Olympic Dam type Fe (Cu-U-Au), Kiruna type | D07 | 29b,25i |
| Travertine | Tufa | H01* | 35d* |
| Hot spring Au-Ag | | H03 | 25a |
| Epithermal Au-Ag; high sulphidation | Acid-sulphate epithermal, Nansatsu-type | H04 | 25d |
| Epithermal Au-Ag; low sulphidation | Adularia-sericite epithermal | H05 | 25c |
| Epithermal Mn | | H06* | 25g |
| Sn-Ag veins | | H07 | 25h, 20b |
| Hydrothermal alteration clays-Al-Si | Kaolin, Alunite, Siliceous cap, Pyrophyllite | H09* | 25lb* |
| (Subvolcanic shear-hosted gold) | | I02 | -- |
| Cu-Ag quartz veins | | I06* | ? |

| DEPOSIT TYPE | SYNONYMS | BC PROFILE # | U.S.G.S. MODEL # |
|---|---|---|---|
| **VOLCANIC ROCKS - Felsic-Mafic cont.** | | | |
| *Mainly Volcanic Host cont.* | | | |
| Silica veins | | I07* | -- |
| Volcanic-hosted opal | | Q11 | *-- |
| Dimension stone - andesite | | R05 | -- |
| Volcanic ash - pumice | | R11* | -- |
| Perlite | | R12* | -- |
| *Interbedded or Underlying Calcareous Rocks* | | | |
| (Carlin-type sediment-hosted Au-Ag) | Carbonate-hosted Au-Ag | E03 | 26a,19c |
| Barite-fluorite veins | | I11 | 26c* |
| *Interbedded or Underlying Clastic Rocks* | | | |
| Almaden Hg | | E01* | 27b |
| Hot spring Hg | | H02 | 27a |
| Silica-Hg carbonate | | I08 | 27c |
| Stibnite veins and disseminations | Simple and disseminated Sb deposits | I09 | 27d,27e |
| (Vein barite) | | I10 | IM27e |
| (Subvolcanic shear-hosted gold) | | I02 | -- |
| **SUBAQUEOUS VOLCANIC ROCKS** | | | |
| *Mainly Volcanic Host* | | | |
| Bentonite | Volcanic clay, Soap clay | E06 | 28e?* |
| (Volcanic-hosted U) | "Epithermal U", Volcanogenic U | D06 | 25f |
| Algoma Fe | | G01* | 28b |
| (Volcanogenic Mn) | | G02 | 24c |
| Volcanogenic anhydrite/gypsum | | G03* | -- |
| Besshi massive sulphide Zn-Cu-Pb | Kieslager | G04 | 24b |
| Cyprus massive sulphide Cu | | G05 | 24a |
| Noranda/Kuroko massive sulphide Cu-Pb-Zn | Noranda Cu-Pb-Zn massive sulphide | G06 | 28a |
| Subaqueous hot spring Ag-Au | | G07 | -- |
| *Subvolcanic shear-hosted gold* | | I02 | -- |
| Rhodonite | | Q02 | -- |
| (Jasper) | | Q05* | -- |
| (Lacustrine diatomite) | Diatomaceous earth, Kieselguhr | F06 | 31s |
| **VOLCANIC ROCKS - Mafic** | | | |
| **SUBAERIAL VOLCANIC ROCKS** | | | |
| Volcanic redbed copper | Basaltic Cu | D03 | 23 |
| **MARINE (including ophiolites)** | | | |
| (Blackbird massive sulphide Cu-Co) | Sediment-hosted Cu-Co massive sulphide | E15 | 24d |
| *(Besshi massive sulphide Zn-Cu-Pb)* | *Kieslager* | G04 | 24b |
| Cyprus massive sulphide Cu | | G05 | 24a |
| (Volcanogenic Mn) | | G02 | 24c |
| **VOLCANIC ROCKS - Alkalic** | | | |
| (Carbonatite-hosted deposits) | | N01 | 10 |
| (Gem corundum hosted by alkalic rocks) | | Q10 | -- |
| **GRANITIC INTRUSIONS** | | | |
| Felsic plutonic U | | I16* | -- |
| Rare element pegmatite - LCT family | Zoned pegmatite (Lithium-Cesium-Tantalum) | O01 | 13a*,b* |
| Rare element pegmatite - NYF family | Niobium-Yttrium-Fluorine pegmatite | O02 | -- |
| Muscovite pegmatite | Mica-bearing pegmatite | O03 | 13f* |

Table 3. B. C. Mineral Deposit Profiles Listed by Lithological Affinities cont.

| DEPOSIT TYPE | SYNONYMS | BC PROFILE # | U.S.G.S. MODEL # |
|---|---|---|---|
| **GRANITIC INTRUSIONS cont.** | | | |
| Ceramic pegmatite | Barren pegmatite | O04* | - - |
| Amethyst | | Q04* | - - |
| Dimension stone - granite | | R03 | - - |
| Alaskite | | R14* | - - |
| *Calcareous Wallrocks* | | | |
| Polymetallic mantos Ag-Pb-Zn | Polymetallic replacement deposits | J01 | 19a |
| Sn mantos and stockworks | "Replacement Sn" | J02 | 14c |
| (Mn veins and replacements) | "Replacement Mn" | J03* | 19b |
| W skarn | | K05 | 14a |
| Sn skarn | | K06 | 14b |
| *Calcareous Wallrocks cont.* | | | |
| (Garnet skarn) | | K08 | - - |
| (Wollastonite skarn) | | K09 | 18g |
| (Gem corundum in contact zones) | | Q09 | S4 |
| *Other Wallrocks* | | | |
| (Iron oxide Cu-Au-U breccias and veins ) | Olympic Dam type Fe (Cu-U-Au), Kiruna type | D07 | 29b,25i |
| (Gold-quartz veins) | Mesothermal, Motherlode, saddle reefs | I01 | 36a |
| W veins | Quartz-wolframite veins | I12* | 15a |
| Sn veins and griesens | | I13* | 15b, 15c |
| (Andalusite hornfels) | | P01 | - - |
| (Kyanite family) | | P02 | - - |
| Gem corundum in contact zones | | Q09 | S4 |
| **ANORTHOSITE INTRUSIONS** | | | |
| Anorthosite Ti-V | | M04* | 7b |
| *Calcareous Wallrocks* | | | |
| (Wollastonite skarn) | | K09 | 18g |
| **PORPHYRITIC INTRUSIONS PRESENT** | | | |
| **INTRUSIVE HOST** | | | |
| Alkalic porphyry Cu-Au | | L03 | - - |
| Porphyry Cu±Mo±Au | | L04 | 17,20,21a1 |
| Porphyry Mo | | L05 | 21b |
| Porphyry W | | L07 | 21c* |
| Climax-type Porphyry Mo | | L08 | 16 |
| **CALCAREOUS WALLROCKS** | | | |
| (Carbonate-hosted talc) | Dolomite-hosted talc | E08 | 18?I* |
| (Vein barite) | | I10 | IM27e |
| (Barite-fluorite veins) | | I11 | 26c* |
| (Polymetallic mantos Ag-Pb-Zn) | Polymetallic replacement deposits | J01 | 19a |
| (Mn veins and replacements) | "Replacement Mn" | J03* | 19b |
| Cu skarn | | K01 | 18a,b |
| Zn-Pb skarn | | K02 | 18c |
| Fe skarn | | K03 | 18d |
| Au skarn | | K04 | - - |
| (W skarn ) | | K05 | 14a |
| (Sn skarn ) | | K06 | 14b |
| Mo skarn | | K07 | - - |
| Garnet skarn | | K08 | - - |
| Wollastonite skarn | | K09 | 18g |
| (Microcrystalline graphite) | | P03 | - - |

Table 3. B. C. Mineral Deposit Profiles Listed by Lithological Affinities cont.

| Table 3. B. C. Mineral Deposit Profiles Listed by Lithological Affinities cont. | | | |
|---|---|---|---|
| DEPOSIT TYPE | SYNONYMS | BC PROFILE # | U.S.G.S. MODEL # |
| **PORPHYRITIC INTRUSIONS PRESENT cont.** | | | |
| **COEVAL VOLCANIC WALLROCKS** | | | |
| (Epithermal Mn) | | H06* | 25g |
| (Sn-Ag veins) | | H07 | 25h, 20b |
| (Alkalic porphyry Cu-Au) | | L03 | -- |
| Porphyry Cu±Mo±Au | | L04 | 17,20,21a1 |
| Porphyry Sn | "Subvolcanic tin" | L06 | 20a |
| **OTHER WALLROCKS** | | | |
| Sn-Ag veins | | H07 | 25h, 20b |
| Polymetallic veins Ag-Pb-Zn | | I05 | 22c, 25b |
| (Gold-quartz veins) | Mesothermal, Motherlode, saddle reefs | I01 | 36a |
| (Subvolcanic shear-hosted gold) | | I02 | -- |
| Subvolcanic Cu-Ag-Au (As-Sb) | Enargite Au, Transitional Au-Ag | L01 | 22a/25e |
| Porphyry-related Au | Granitoid Au, Porphyry Au | L02 | 20d |
| (Microcrystalline graphite) | "Amorphous" graphite | P03 | -- |
| **MAFIC AND ULTRAMAFIC INTRUSIONS** | | | |
| (Laterite Ni) | | B02* | 38a |
| (Surficial placers) | Placer U-Au-PGE-Sn-diamond-magnetite-garnet, gems | C01 | 39a |
| (Buried-channel placers) | | C02 | 39a |
| (Gold-quartz veins) | Mesothermal, Motherlode, saddle reefs | I01 | 36a |
| (Silica-Hg carbonate) | | I08 | 27c |
| Magnesite veins and stockworks | Bone magnesite, Kraubath-type magnesite | I17 | -- |
| Podiform chromite | | M03 | 8a/8b |
| Zoned ultramafic Fe-Ti-V/PGE/Cr/Cu-Ni | Alaskan type Fe-Ti-V/PGE/Cr/Cu-Ni | M05 | 9 |
| Asbestos | Serpentinite-hosted asbestos | M06 | 8d |
| Serpentinite-hosted magnesite-talc | | M07 | 8f* |
| (Andalusite hornfels) | | P01 | -- |
| (Jade) | | Q01 | -- |
| **COEVAL VOLCANIC ROCKS** | | | |
| Basaltic subvolcanic Cu-Ni-PGE | | M01* | 5a/5b |
| Gabbroid Ni-Cu-PGE | | M02 | 7a |
| **ALKALINE INTRUSIONS** | | | |
| Alkalic-hosted Au-Ag-Te-F veins | | H08* | 22b |
| Kimberlite-hosted diamonds | Diamond pipes | N02* | 12 |
| Lamproite-hosted diamonds | | N03* | 12 |
| (Gem corundum hosted by alkalic rocks) | | Q10 | -- |
| Nepheline syenite | | R13* | -- |
| **Carbonatites** | | | |
| Carbonatite-hosted deposits | | N01 | 10 |
| Vermiculite | | M08 | -- |

Table 3. B. C. Mineral Deposit Profiles Listed by Lithological Affinities cont.

| DEPOSIT TYPE | SYNONYMS | BC PROFILE # | U.S.G.S. MODEL # |
|---|---|---|---|
| **REGIONALLY METAMORPHOSED ROCKS** | | | |
| Carbonate-hosted talc | Dolomite-hosted talc | E08 | 18?l* |
| Gold-quartz veins | Mesothermal, Motherlode, saddle reefs | I01 | 36a |
| Turbidite-hosted gold veins | Meguma type | I03* | 36a |
| *Iron formation-hosted gold* | | *I04** | *36b* |
| Unconformity U-Au-Ni | Vein-like type U | I16* | 37a |
| U veins | | I14* | -- |
| (Wollastonite skarn) | | K09 | 18g |
| *(Asbestos)* | *Serpentinite-hosted asbestos* | *M06* | *8d* |
| (Rare element pegmatite - LCT family) | Zoned pegmatite (Lithium-Cesium-Tantalum) | O01 | 13a*,b* |
| (Rare element pegmatite - NYF family) | Niobium-Ytrium-Fluorine pegmatite | O02 | -- |
| *(Muscovite pegmatite)* | *Mica-bearing pegmatite* | O03 | *13f** |
| (Ceramic pegmatite) | Barren pegmatite | O04* | -- |
| Kyanite family | | P02 | -- |
| Microcrystalline graphite | "Amorphous" graphite | P03 | -- |
| Crystalline flake graphite | | P04 | -- |
| *Vein graphite* | *"Lump and chip graphite"* | *P05* | -- |
| Corundum in aluminous metasediments | | P06 | -- |
| Jade | | Q01 | -- |
| Schist-hosted emerald deposits | | Q07 | -- |
| Dimension stone - marble | | R04 | -- |