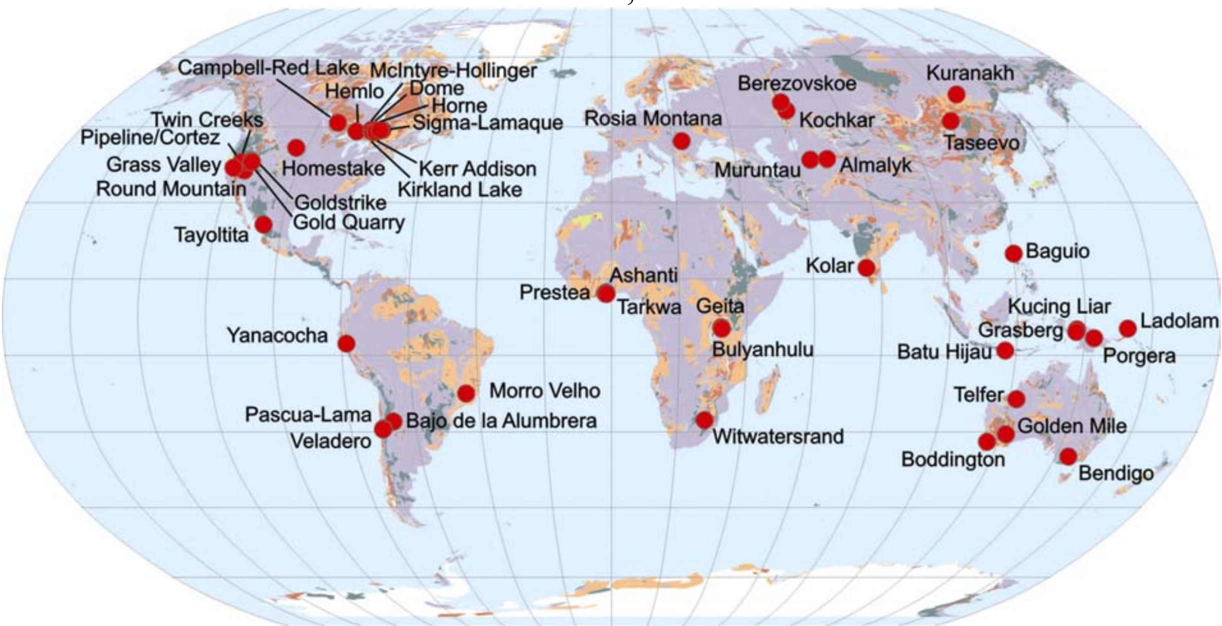
GEOLOGICAL SURVEY OF CANADA

OPEN FILE 4895

Gold deposits of the world: distribution, geological parameters and gold content

P. Gosselin, B. Dubé



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Foreword

This Open-File report is complemented by a poster-size geological map of the world, Open-File report 4893: Gold deposits and gold districts of the world, showing locations and sizes of all gold deposits and gold districts spread across the globe. It also displays enlargements of key gold-producing areas (such as the Abitibi Belt and Western Australia) and detailed economic figures current to at least the end of December 2002.

These products are companions to the Open-File report 4896: Gold deposits of Canada, a database comprising referenced and detailed geological, geographical and economical information on 128 gold deposits, and to the Open-File report 4894: Gold deposits and gold districts of Canada, a poster-size map of Canada showing the location and size of all important gold deposits, as well as enlargements of key gold districts.

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Resource and reserve figures are historical in nature. The Data source provided with each set of figures should be cited if the Data are re-reported.

1. Introduction

Gold deposits are an attractive and major target for many exploration and mining companies. Although the economics of gold itself has varied, the industry is especially productive in finding new gold deposits and new ways of exploiting them at minimal costs. However, gold deposits are one of the most difficult type of target as they are one of the most geologically complex type of mineral deposits. They can be hosted in a wide variety of rocks, and linked to a broad range of tectonic and geological settings. Thus, with the renewed interest in gold exploration from mineral exploration companies in the past 10 years, the need has risen for detailed geological information pertaining to gold deposits, which can be readily available on request.

To support this need, the Geological Survey of Canada has launched, with the help of sponsors from the industry, the World Minerals Geoscience Database Project (see the WMGDP website at http://www.nrcan.gc.ca/gsc/mrd/wmgdb/), managed by W.D. Sinclair. The aim of the WMGDP is to produce high-quality, well-organized geoscience data sets that can be used in conjunction with GIS (Geographic Information Systems) and database software to help understand the broad relationships between global tectonics and the regional settings of mineral deposits. The Canadian Gold Database (WGD) project started in 1998 and the database provided herein is an integral part of the WMGDP, and the end-result of research and compilation by the authors during this time. Companies and organizations that have financially supported the WMGDP are BHP World Exploration, Inc., Billiton International Metals B.V. (now merged with BHP World Exploration, Inc. as BHP Billiton Limited), Barrick Gold Corporation, Cominco Ltd., Cyprus Amax Minerals Company, Inco Limited, Metal Mining Agency of Japan, North Limited, Phelps Dodge Exploration Corporation, Placer Dome Exploration Inc., Randgold Resources, Rio Tinto Mining and Exploration Limited, Teck Corporation (now merged with Cominco Limited as Teck Cominco Limited), and WMC International Limited.

The World Gold Database (WGD) contains information about 452 gold deposits of all types located in 61 countries (see Appendix 1 for an alphabetical listing by countries) and covering all continents but Antartica. The term gold deposits in this report is restricted to bedrock (commonly "lode") gold deposits and as such does not include placer deposits. The goals of the World Gold Database are:

- to identify and locate large (≥1 Moz) gold deposits
- to give detailed and referenced geological information
- to give referenced economic (production and resources) figures
- to have the information in a database frame which can be queried and updated by a third party

This database is built on compilation of data from various sources: the available scientific literature, numerous databases from geological surveys or other geoscience agencies (OZMIN database from the Australian Geological Survey Organization, SAMINDABA database from the South African Council for Geoscience, MRDS database from the United States Geological Survey, Gold Resources of the Andes by David Shatwell pty Ltd.), GSC Open Files 3490, and GSC Bulletin 540 (Poulsen *et al.*, 2000), as well as personal observations made by the second author. Field notes and personal records of former GSC colleagues F. Robert and K.H. Poulsen were also consulted.

Deposits considered to be “gold deposits” in this report are those in which the value of contained gold exceeds that of co-commodities (see Poulsen *et al.*, 2000). To calculate this, the following equation was used:

$$\frac{Au(g/t)}{Cu(\%) + Pb(\%) + Zn(\%)} > 1$$

A cut-off factor of 1 million troy ounces was chosen for a number of reasons. As stated above, the economics of gold is a primary determinant in the decision of bringing a deposit into production or not. Although the price of gold is definitely one of the most important factor, certainly another very important factor is the size of the deposit (or total gold content). This helped also to confine our research to a certain number of important deposits.

It is to be noted that the 1 Moz factor represents the total gold content of a deposit. This is calculated by combining the past and current gold production with the latest available reserves figure (reserves means proven & probable reserves according to the Canadian Institute of Mining and Metallurgy Ad Hoc Committee on Ore Reserves, September 1996). Confidence in the reserves figures defined by closely spaced drilling and sampling is high enough that these numbers can be included in the total gold content of the deposit. As such, deposits entered in the database may or may not be actual producers. Past producers with known production exceeding 1 Moz Au are certainly included in the database. Current large producers still active are also included in the database. Finally, deposits which are sufficiently large but have not yet produced sufficient gold, or have not yet produced at all, may also be present in the database, providing their reserves are high enough.

2. Structure of the World Gold Database

The WGD is built on Global DB schema, incorporating the index-level data previously released in GSC Open File 3490 by Jenkins et al. (1997), with support from Inmet Mining Corporation. Every deposit from OF 3490 has been exported to the WGD, as was part of the data, now viewable/editable through the GShell program, the WMGDP's data-entry utility described below. Columns of data exported from OF 3490 were the Deposit Number, Name, Country, Near City, Geological Province, Geological Subprovince, District, Longitude & Latitude and Style of Mineralization.

This initial compilation was augmented with data collected by Howard K. Poulsen during his numerous years of service with the Geological Survey of Canada, who compiled a thorough list of deposits complete with some of their geological characteristics, and graciously allowed the use of his data.

Much of the conceptual design and content of the database is based on Poulsen et al. (2000) Geological Survey of Canada Bulletin 540: "Geological classification of Canadian gold deposits", which served as a basis for determining which features were to be compiled and presented in the database, and which features were necessary for classification of a deposit. This publication also served as a guiding tool to classify all gold deposits in the database, and is an essential companion to this database.

The data fields and tables used in the World Gold Database are based on the GlobalDB schema developed for the World Minerals Geoscience Database Project. This schema, and the data-entry and query utilities designed for use in conjunction with the database schema, are described in the accompanying documentation by R.M. Laramée. The following description of database entities and tables in the WGD is based on GShell, the application designed for entering and editing data using the GlobalDB schema.

The opening screen of the GShell program (Figure 1) allows the user to select one of 7 options. The 7 buttons open up 7 different forms listed as follows:

- **Deposit Group**: This entity is not used in the WGD.

- **Deposit**: This form is used to enter and store geographical and geological data for each deposit. Please note that the term "deposit" is not restricted to a single occurrence of metal and may in places apply to a district or an area with multiple genetically-related deposits, particularly for older production areas where production data is difficult to retrieve. It may then be applied to a cluster of mine exploiting the same mineralized structure or orebody, such as Hemlo for example.

- **Mine**: This form is used for associating a mine to a deposit, and enter ownership/operatorship data.

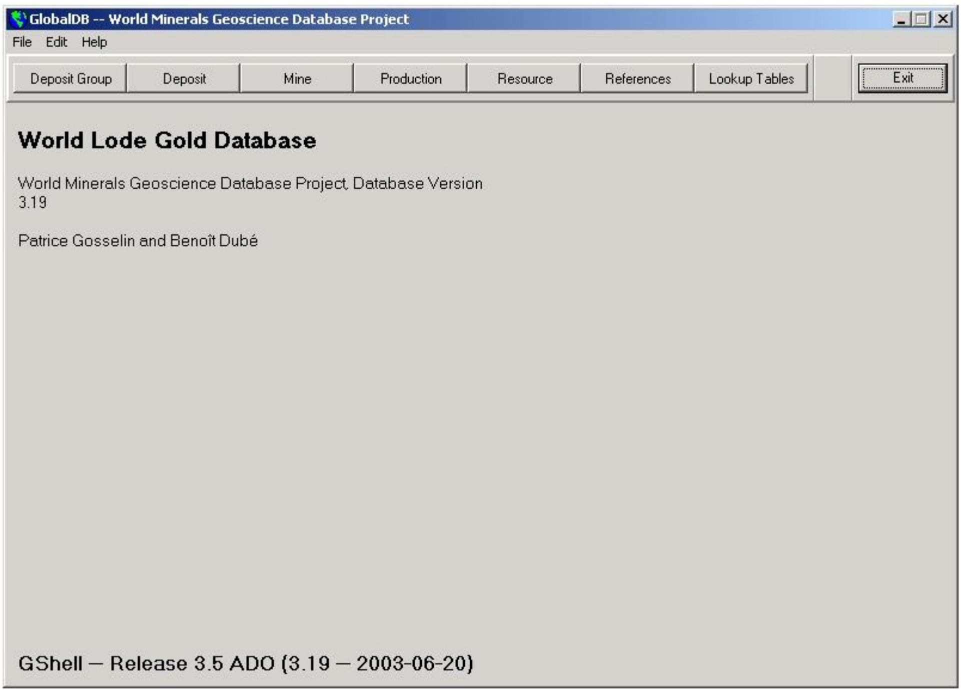

Figure 1: Opening window of the GShell program with WGD loaded

- **<u>Production</u>**: This form is used to enter production data by time period. A deposit may have one or more production record. Deposits with no production records are deposits which have never been in production, or the information is unavailable.

- **<u>Resource</u>**: This form is used to enter reserves and resources figures. In ideal cases, a deposit has one reserve record and one to two resource records, but this may vary. Deposits with no records mean that either the deposit is exhausted or the information is unavailable.

- **<u>References</u>**: This form is used to enter the complete data for a particular reference, which can later be used and linked to from other entities.

- **<u>Lookup Tables</u>**: This form is used to give and/or edit information available in the lookup tables in MS-Access. Entries in the Lookup tables are used as picklists in the **<u>Deposit</u>**, **<u>Mine</u>**, **<u>Production</u>** and **<u>Resources</u>** forms.

For a complete description of how the GShell program works, the reader should refer to the accompanying documentation by Robert Laramée. For reference to the MS-Access™ tables, the reader should refer to the Documentor program by Robert Laramée and accompanying documentation.

2.1. Deposit Form

A general part fills the upper half of the **Deposit Form** interface (Figure 2). It is static and used for every deposit. Most of the fields of the General part serves for positioning of the deposit both geologically and geographically. There are 11 fields in this part:

DepClan (Deposit Clan): The Deposit Clan is a broad way of classifying deposits on the basis of tectonic environments and crustal depth represented by the host rocks (epithermal, intrusion-related, greenstone and slate belt). These terms refer to a group of deposit types, possibly genetically related, that reflect a particular geological and metallogenic environment (Figure 3; see Poulsen et al., 2000).

DepType (Deposit Type): This field is grayed out, and the tabbed page *Deposit Type* is used to fill it in (see the *Deposit Type* section next page).

GeolProv (Geological Province): This field is used to enter the large-scale geotectonic environment in which the deposit is located (such as Superior Province, Cordillera, etc.).

GSubProv (Geological Sub-Province): Used to enter the large, regional-scale geotectonic environment in which the deposit is located (such as Abitibi belt, Uchi subprovince, etc.).

GDistrict (Geological District): This field is used to enter the name of the local mineral district the deposit is part of, and often bears either the name of the most important deposit in the area or the name of the area itself (such as Timmins or Val d'Or).

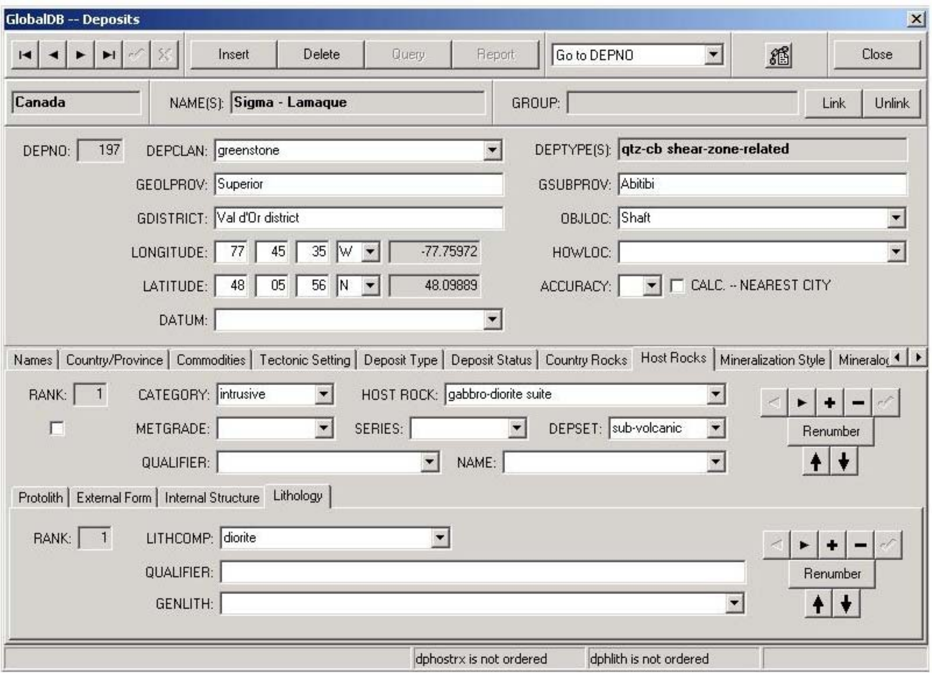

Figure 2: **Deposit Form** with *Host Rocks* tabbed page activated

ObjLoc (Object Located): Describes the corresponding object of which the position was measured and given in the **Longitude** and **Latitude** fields (such as a mine shaft).

Longitude: Longitude coordinates of the deposit or of the object specified in the **ObjLoc** field.

Latitude: Latitude coordinates of the deposit or of the object specified in the **ObjLoc** field.

HowLoc (How Located): Method used for derivation of the **Longitude** & **Latitude** coordinates.

Accuracy: Exactitude of the **Longitude** & **Latitude** coordinates relative to degree (D), minute (M) or second (S), this field is seldom used. Please note that data may not be accurate enough for plotting at large scale (1:100,000 and larger).

Calc. –Nearest City (Calculated from the nearest city): This checkbox indicates if the **Longitude** & **Latitude** coordinates are calculated using the coordinates of the nearest city to the deposit and the distance from this city to the deposit. This field is seldom used.

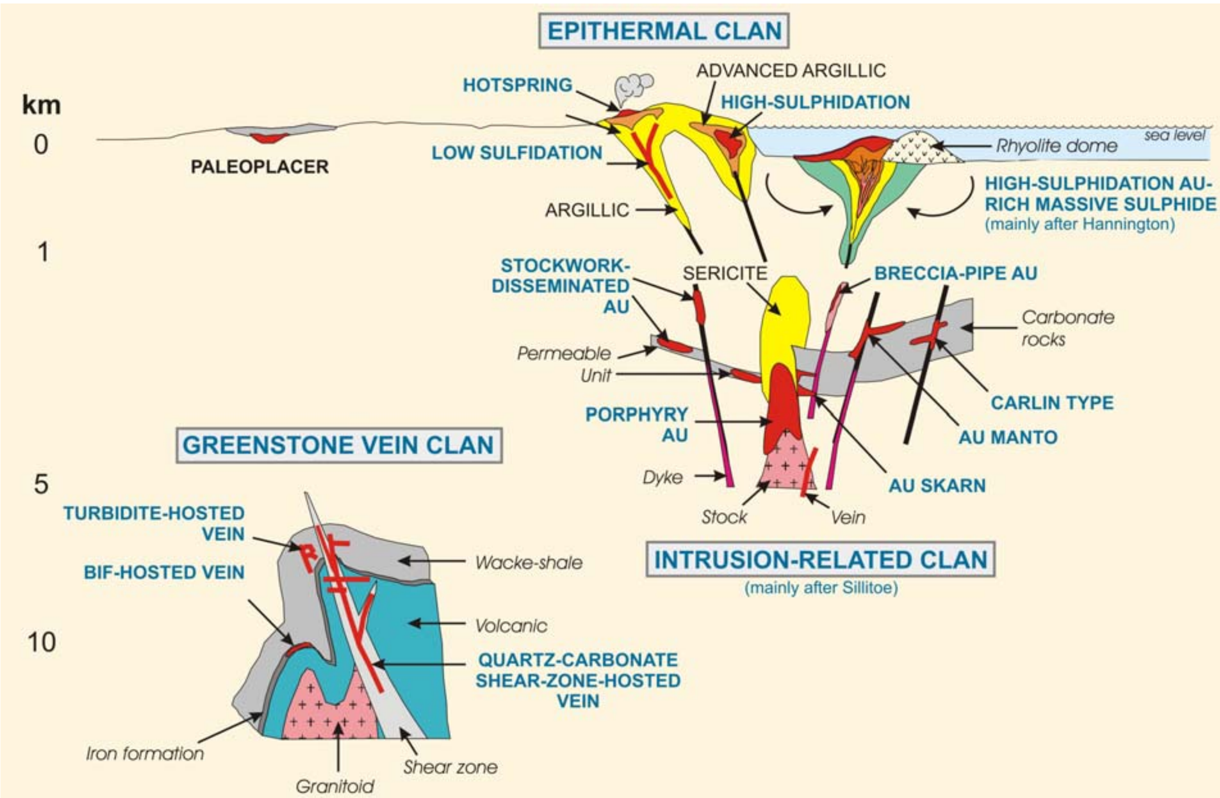

Figure 3: Inferred crustal levels of gold deposition, from Dubé et al. (2001), modified from Poulsen et al. (2000)

The lower half of the **Deposit Form** interface is separated into tabbed pages which can be navigated through using the arrows at the right end of the tab bar (Figure 2). The order in which these tabbed pages appear can be modified using the *Customize Tabs* option in the *Edit* menu of

Gshell. Each of the 18 tabs allows for precise description of a characteristic of the deposit, and are listed as follows:

Deposit Names: The first name entered in the **DepName** field is usually the name of the deposit most commonly used in recent literature. Additional entries are used to enter previous or alternative names that might have been in use in the past, or may represent different ways of writing the deposit name. Russian deposits often used the suffix "-skoye" at the end of a deposit name.

Country/Province: This page is used to further characterize the geographical location at **Country**, state/province (**ProvState** field) and district/county/subprovince scale (**SubProv** field). The last four fields are used to describe the distance (**HowFar** and **FarUnits** fields) and direction (**DirFrom**) of the deposit from the nearest and/or largest and/or most know city or landmark (**NearCity** field) in the area. Additional entries are sometimes used to give the user another city which is situated closer but less known, or to the contrary, to illustrate the distance from a well-known city.

Commodities: This page and the **Commodity** field detail which commodities or metals were exploited during the life of the deposit, though sometimes there are no corresponding production data. The most important commodity is ranked first, and following entries are usually by-products of lesser economic importance.

Tectonic Setting: This page is used to describe the tectonic setting (**TectObj** field) of formation of various geological elements (**SettingOf** field), i.e. of the host rocks, mineralization, alteration, country rocks and related magmatic rocks. This section was enhanced with 4 new fields **(Realm**, **DfRegime**, **TecQual** and **TectName**) during mid-summer 2000; deposits entered prior to this date usually have less data. The **Realm** field defines location of the setting in relation to the continental and oceanic plates. The **DfRegime** field (Deformation Regime) characterizes the deformation regime associated with the tectonic setting of the element's formation. The **TecQual** field (Tectonic Qualifier) further constrains, where necessary, the tectonic setting present in the **TectObj** field. The **TectName** field (Tectonic Name) specifies the name of the tectonic accident specified in the **TectObj** field.

Part of the most critical data to the WGD is the tectonic setting of the mineralization. This parameter however, may be different from the host rocks tectonic environment of formation. Whereas the latter is generally well-known, the tectonic environment of the mineralization is often ambiguous or poorly described, and may change according to various studies.

Deposit Type: The **DepType** (Deposit Type) field is based on sixteen well-established gold deposit types described by Poulsen *et al.* (2000). A summary description of each type, as well as the classification parametres used can be found in Poulsen *et al.* (2000). The decision tree used for classification is illustrated in Figure 4. As some deposits may present ambiguous characteristics, a short comment may be entered in the **Comments** field. Also, when more than one type of ore is present, additional entries may be added, though the initial entry is the one type of mineralization that is predominant in the deposit. This classification should be used with caution, as some deposits may be transitional between two types, atypical or intensively deformed and metamorphosed, and consequently difficult to classify. Terminology defining the “mesothermal lode gold” deposits, first used by Lindgren (1911, p. 600) and Hodgson, (1993), has been defined as “greenstone-hosted quartz-carbonate vein” in Poulsen *et al.* (2000), whereas Groves *et al.* (1998) favor the term “orogenic gold” deposits.

Deposit Status: This page and the **DepStat** (Deposit Status) field serves to qualify the operational status of the deposit according to the CIMM (Canadian Institue of Mining and Metallurgy) recommendations. The **Comment** and **EstSize** (Estimated Size) fields were added in January 2001, as such, deposits entered before this date have no data in those fields. The **Comment** field is used to enter useful data pertaining to operational history of the deposit/mine, or to help complement the production or resource data present in the other forms. The **EstSize** field, used mostly with Chinese deposits, represents the estimated total content of gold, or productivity, (production + reserves) in metric tonnes according to the following categories:

- Small: less than 7 metric tonnes Au
- Medium: 7 to 29 metric tonnes Au
- Large: 30 to 99 metric tonnes Au
- Super-large: 100 metric tonnes and over

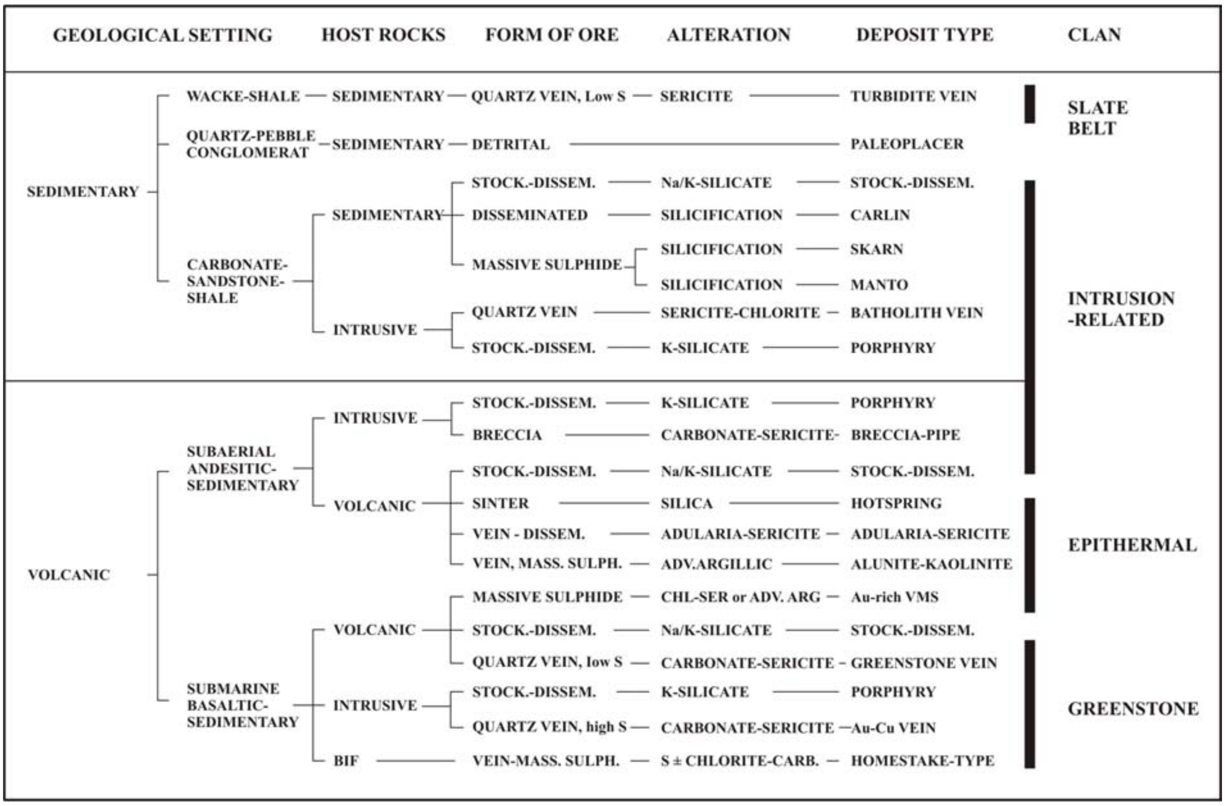

Figure 4: Decision tree showing how sixteen geological types of lode gold deposits can be distinguished from one another from selected geological parametres (adapted from Poulsen et al. (2000) and Robert et al. (1997)

Country Rocks: This page is used to describe the type of rocks around the deposit (on a local scale), or the mine stratigraphy. Only the **Country Rock** and **MetGrade** (Metamorphic Grade) fields are used on a constant basis even though other fields and sub-pages are available. For description of the other fields and pages, please refer to the *Host Rocks* page. The **Country Rock** field gives a list of the rocks present in the area of the deposit. The associated **MetGrade** field gives the metamorphic grade of the rocks associated in the **Country Rock** field. When this field is left blank, it means that no metamorphism is known or was found in the available literature by the compiler. However, metamorphism is at times implied in the literature, especially in greenstone belt settings where most, if not all rocks are of greenschist grade. Also, intrusive rocks in some cases have no accompanying metamorphic grade when all other rocks have one ascribed. This reflects the fact that it is difficult to establish clearly whether the intrusive rocks were pre-, syn-, or post-metamorphism.

A checkbox near the grayed-out **Rank** field indicates whether this entry has a corresponding radiometric age in the *Radiometric Age* page. No importance has been assigned to rank consideration in this category.

Host Rocks: The *Host Rocks* page (Figure 2) is used to give a detailed description of the rocks hosting the orebodies. It is separated in two parts, the first part providing more general information and the second part, with four sub-pages, giving more precise details. A checkbox near the grayed-out **Rank** field indicates whether this entry has a corresponding radiometric age in the *Radiometric Age* page. Please note that, usually, the first host rocks are the most important hosts, whereas the last ones listed host significantly less ore. The first part consists of 7 fields listed as follows:

- The **Category** field is the first step in classifying the host rocks, and uses a broad classification such as: intrusive, volcanic, sedimentary, etc.

- **Host Rock** field goes one step further in the classification of the host rocks using sedimentary assemblages, intrusive suites, mafic/felsic dominated, etc.

- **MetGrade** (Metamorphic Grade) gives the metamorphic grade of the rocks in the **Host Rock** field.

- The **Series** field is used primarily to constrain further intrusive and extrusive rock types with appropriate magmatic affinity (igneous-rock series).

- The **DepSet** (Depositional Setting) field is used to constrain the environment of formation of sedimentary rocks, and is also used to express the level (depth) of intrusive rocks within the crust.

- The **Qualifier** field uses descriptive terms such as calcareous, silty, etc. The **Qualifier** applies in whole or in part to the rocks appearing in the *Lithology* page (see below), and it may reflect lateral changes and variations within the rock formation.

- The **Name** field is used to give the proper stratigraphic or lithostratigraphic name used in the literature for a given rock formation.

The second part comprises 4 sub-pages, each with their own fields, and listed as follows:

- *Protolith*: The protolith page and **Protolith** field are used to give a protolith in the context of a severely metamorphosed or deformed rock. The field **Name** is rarely used as it is redundant with the same field in the first part. The field **Qualifier** is used to enter a short comment of interest.

- *External Form*: This page and the **Hform** (Host Rock Form) field are used to characterize the physical shape of the host rock (dyke, sill, etc.)

- *Internal Structure*: This page and the **HStruc** (Host Rock Structure) field are used to characterize the internal structure of the rock (layering, banding, etc.) and any other noteworthy specific characteristic related to the host rock.

- *Lithology*: This page and the **Lithology** field are used as the final classification step of the host rock and represents the rock itself. The **Qualifier** field is used to enter a short comment of interest.

Mineralization Style: This tabbed page and the **MinStyl** field are used to characterize the physical form or shape of the orebodies (veins, stockworks, breccias, etc.). The first style listed is usually the most important in a particular deposit, and the following styles are listed in order of importance.

Mineralogy: The **Category** field is used to select an element from which the mineralogy can be defined in the **Mineral** field. In most cases, minerals listed on this page are those of the gangue and ore. Mineralogy of the host rocks is rarely used, as it is mostly inferred from the type of rock shown in the **Lithology** field (see *Host Rocks*), and any specific mineralogical characteristic would be written down in the **Qualifier** field of the *Host Rocks* page. Mineralogy of the alteration is also rarely used here as it is generally well-constrained in the **AltSig** field of the *Alteration Signature* page. A checkbox near the grayed-out **Rank** field indicates whether this entry has a corresponding radiometric age in the *Radiometric Age* page.

The list of minerals by category is usually ranked by order of importance, i.e. the first (or the first few) ore mineral is a major ore constituent, and the last ones being minor to rare.

Coincident Feature: This tabbed page lists the structures which control the mineralization. The **CFeat** (Coincident feature) field is used to broadly categorize the type of structure that exerts some degree of control over the mineralization. The **Name** field gives that structure its formal name appearing in the literature. The **Qualifier** field is a free-text field used to enter a short description of the structure and the way it affects the orebody. A checkbox near the **Rank** field indicates whether this entry has a corresponding radiometric age in the *Radiometric Age* page. Structures are usually ranked in such a way that the most important ore-controlling structure is ranked first. Structures affecting only the geometry and localization of the orebody and not its emplacement or genesis (such as post-mineral faults) are ranked last. Ore-controlling structures can be linked to the mineralization style that they are controlling or affecting.

Tectonic Structures: This page is used for regional structures having a relation, if sometimes distant, with the deposit and its formation. The **TStruc** (Tectonic Structure) field serves as a broad classification of structure type. The **Name** field reports the name of the structure used in the literature. The **Qualifier** field is a free-text field used to enter a short description of the structure and the way it affects the deposit. Structures are usually ranked in such a way that the most important regional structure is ranked first.

Alteration signature: The **AltCat** (Alteration Category) field (Figure 5) serves as a broad alteration type classification with broad terms like propylitic alteration, and “mineralogic” terms such as carbonate alteration or sericite alteration. The **WhatAlt** (What is Altered) field is used to list the rock types affected by the alteration, the zonality of the alteration and any other short relevant comment. The **AltSig** (Alteration Signature) field serves to further characterize the alteration type mostly by specifying its mineralogy. A checkbox near the grayed-out **Rank** field indicates whether this entry has a corresponding radiometric age in the *Radiometric Age* page.

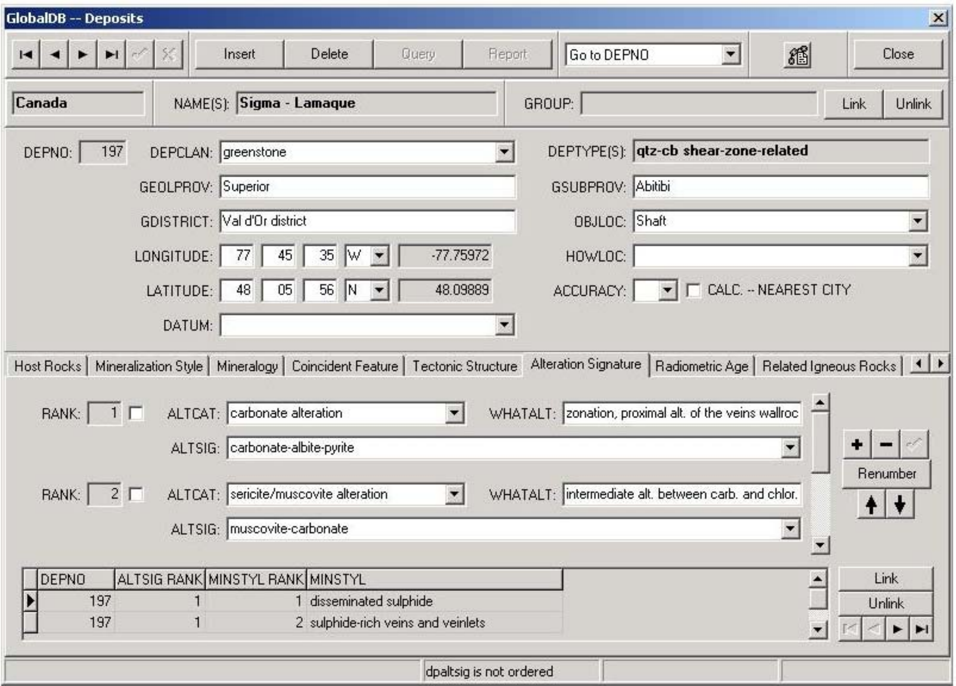

Figure 5: **<u>Deposit Form</u>** with *Alteration Signature* tabbed page activated

The link between a specific alteration and related mineralization style is often subjective at best. Where possible, the link was restricted to the exact mineralization which can be found in one specific altered zone. However most of the time, the link is more of a “genetic” kind, implying that the alteration and hydrothermalism are broadly related to the mineralization emplacement. For example, it is difficult (if not stated clearly in the reference) to say if any mineralization is found within the distal propylitic alteration of a deposit. As a rule of thumb, if all mineralization styles are attached to an alteration, it usually means the link is “genetic”.

Radiometric Age: This page (Figure 6) is used to enter radiometric age data for rocks and/or minerals which have a special meaning to the ore deposit and serve to constrain events in a given time frame. This page consists of 14 fields listed as follows:

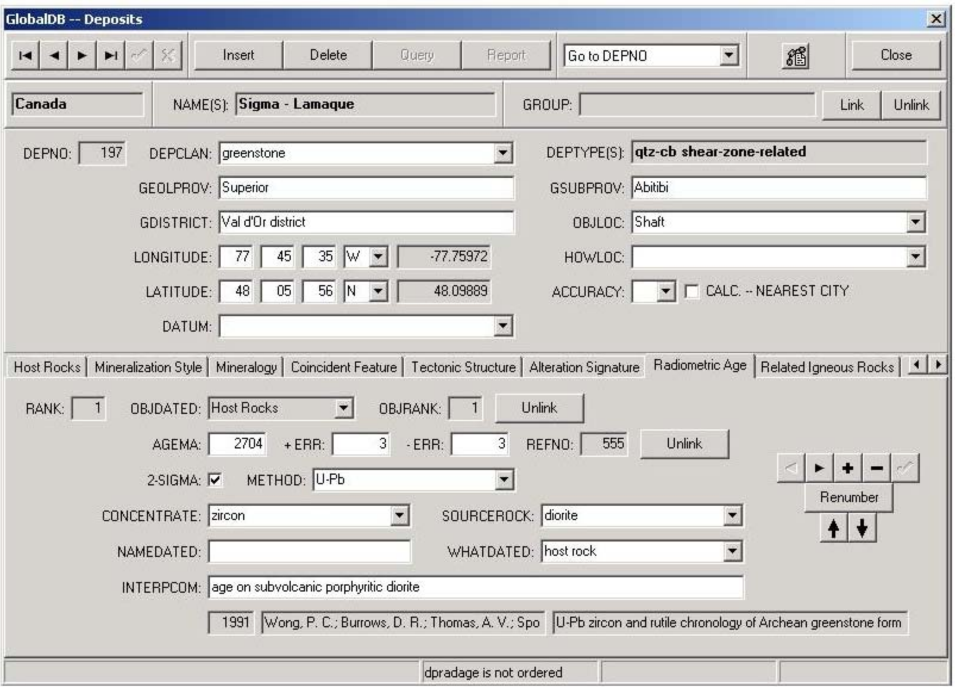

Figure 6: **Deposit Form** with *Radiometric Age* tabbed page activated

- The **ObjDated** (Object Dated) serves to illustrate to which element of the database the age applies to (host rock, alteration signature, etc.)
- The **Link** button is used to link the element chosen in the **Objdated** field to a specific item such as a rock, mineralization style, alteration signature, etc. The lack of linked item means that this degree of precision was unavailable.
- The **ObjRank** (Object Rank) field is used to select a more specific element of the database to which the age applies, i.e. a specific rock type from the country rocks listing.
- **AgeMa** (Age in Million Years) gives the radiometric age in Ma.
- The **+Err** field is used for the upper error limit.
- The **-Err** field is used for the lower error limit.
- The **RefNo** (Reference Number) field and **Link** button are used to assign a specific reference from which the age was taken. Efforts were made to assign the most specific reference where the date was used for the first time and not a paper where reference is made to such a date, however this was not always possible.
- The **2-Sigma** field is rarely used, as it is rarely mentioned if the error on the date is a 2-sigma error.
- The **Method** field states which method was used for dating.
- The **Concentrate** field is used to specify which mineral was dated.
- The **SourceRock** field specifies the rock from which the mineral fraction was extracted.

- The **NameDated** field is used to enter a stratigraphic or lithostratigraphic name for the source rock.
- The **WhatDated** field is used to express which element or event was dated and what is the element's or event's relationship to the mineralization.
- The **InterpCom** (Interpreter's Comment) is a free-text field used to specify any comment of interest pertaining to the determination of the age or source rock, etc.

It is to be noted that ages are also sometimes entered as a "bracket age" without method and concentrate. Such ages give the minimum and maximum ages and are often inferred from the radiometric ages of the rocks over- and underlying the specified element, or from the age of the lowermost and topmost members of a Formation, or from pre-ore and post-ore intrusions.

Related Igneous Rocks: This page (Figure 7) is used for entering intrusive rocks having a link to the deposit, wheter spatial or genetic. A checkbox near the grayed-out **Rank** field indicates whether this entry has a corresponding radiometric age in the *Radiometric Age* page. There are 6 fields and one sub-page with 2 fields, listed as follows:

- **The Category** field is the first step in classifying the related magmatic rocks, and uses a broad classification such as intrusive, volcanic, etc. In some cases, only intrusive rocks are entered in this field.
- The **RIgneous** field specifies the type of intrusive suite the rocks belong to (alkaline, tholeiitic, etc.)
- The **MSeries** (Magmatic Series) field is used to relate the intrusive rock to the appropriate magmatic affinity (igneous-rock series).
- The **DepSet** (Depositional Setting) is used to express the level (depth) of intrusive rocks within the crust (near surface, mid-level, etc.).
- The **Qualifier** field is a free-text field used for a short comment describing the relationship of the intrusive rocks to the deposit.
- The **Name** field is used to give the proper lithostratigraphic name used in the literature for the intrusive rocks.

The *Lithology* sub-page has 3 fields:

- The **LithComp** field is used as the final classification step of the intrusive rocks and gives a precise rock name.
- The **Qualifier** field is a free-text field used for entering a short comment about any specific characteristics (mineralogy, texture, etc.) of the intrusive rocks.
- The **Genlith** field is not used in the WGD.

General Shape: This tabbed page is not used in the WGD.

Geological Age: This page is used to give the geological or stratigraphic age of an element of the database. It is mostly used to give a stratigraphic age to the host rocks and to the mineralization. The first four fields (**StartAge**, **StartAge Qualifier**, **EndAge**, **EndAge Qualifier**) are grayed out and serves only to illustrate the values chosen in the following fields. The **CtryHost** field is used to determinate which element of the database the stratigraphic age refers to. The **StartAge** and **Endage** fields are used to assign an age to the chosen **CtryHost** element.

In some cases, only the **StartAge** or the **EndAge** are entered. This means that the age is unconstrained in one direction, and gives the maximum or the minimum age of the element.

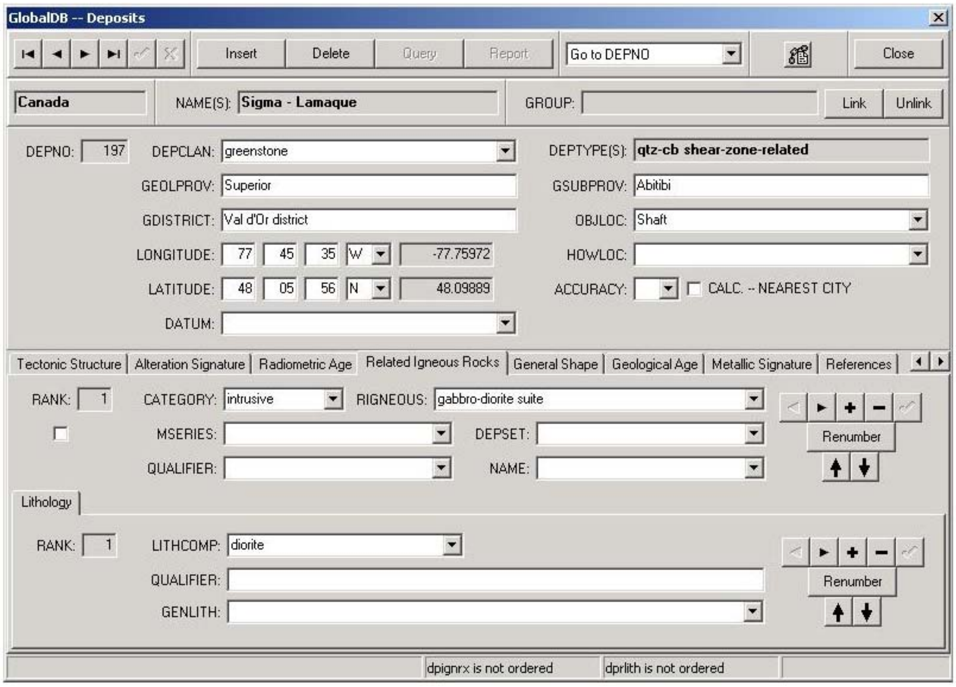

Figure 7: <u>**Deposit Form**</u> with *Related Igneous Rocks* tabbed page activated

Metallic Signature: This page and the **MetSig** (Metallic Signature) field describe the suite of metallic elements which can be found associated with the mineralization. A checkbox near the grayed-out **Rank** field indicates whether this entry has a corresponding radiometric age in the *Radiometric Age* page. Systematical ranking of the elements of a signature by decreasing order of abundance was attempted but proved difficult to do, as such the actual order of the elements should not be seen to reflect any importance of one element over another. When no geochemical data was available, the suite was inferred from the gangue and ore minerals. The metallic signature can be linked to the mineralization style with which they are associated.

References: References entered through the <u>**References Form**</u> can be linked (or unlinked) to a specific deposit with the use of the **Link Ref./Unlink Ref.** buttons (Figure 8). The references are not linked in order of importance. The + button allows the compiler to specify which information was taken from the selected reference, by giving access to a number of checkboxes. Note that if two different references have checkmarks in the same boxes, this means that either both references gave the same information or that, more likely, the data used is a combination of the two references. Also, for a listed reference that has no checkmarks in any boxes, this means that the reference was added as an additional reference of interest although no specific data was extracted from that reference. Additional information on the exact location of the data in a reference may be available from the **Chapter**, **StartPage** and **EndPage** fields, although these are rarely, if at all, used.

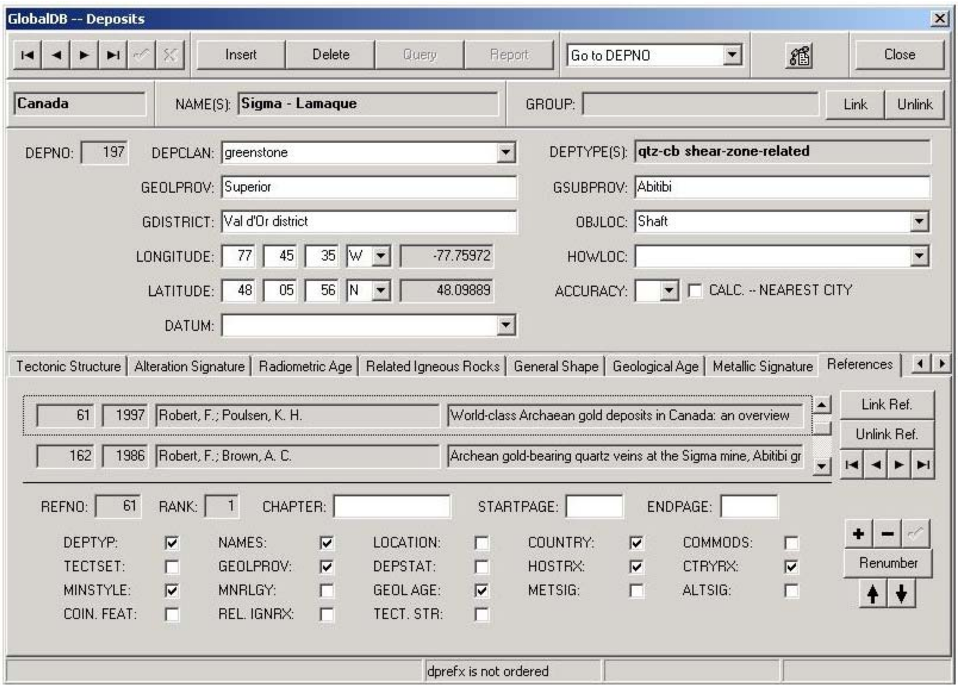

Figure 8: <u>**Deposit Form**</u> with *References* tabbed page activated

2.2. Mine Form

The **Mine Form** (Figure 9) describes ownership/operatorship and limited data on the years of operation of a mine. A deposit may have one or more mines, each mine with one or more shaft. A mine thus mainly refers to the "company" sense of the word describing an entity which exploits parts of, or the totality of an orebody, and most of the time has installations (grinding/milling/leaching circuits) to treat the ore extracted from that orebody. In a few cases, a deposit will be broken down into zones, each zones entered as a mine in the **Mine Form**.

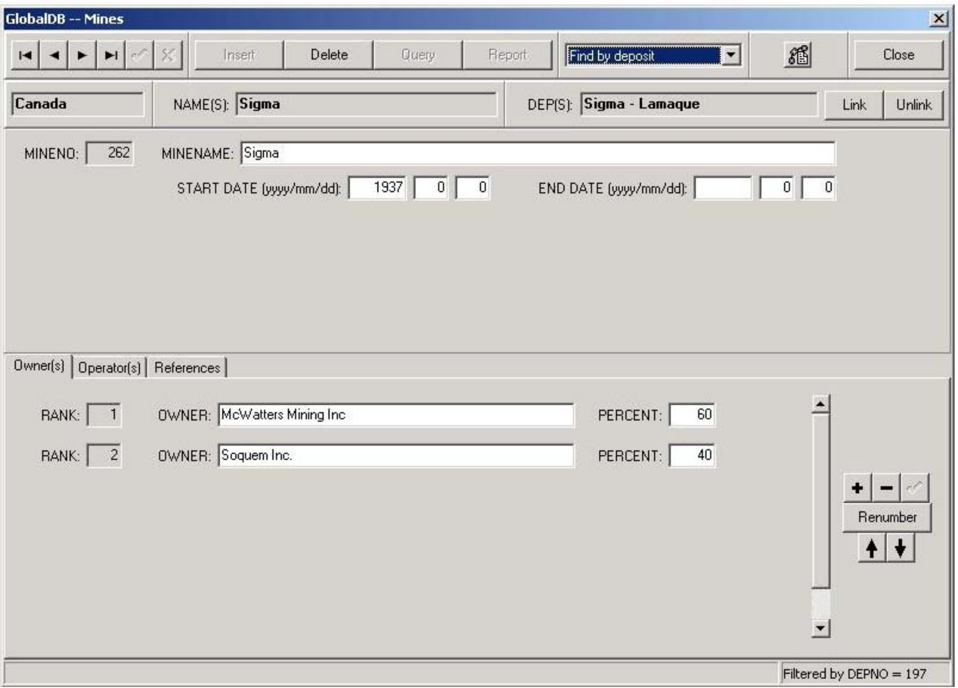

Figure 9: **Mine Form** with *Owner(s)* tabbed page activated

There are three general fields and 3 tabbed pages in the **Mine Form**:

The topmost buttons are the **Link** and **Unlink** buttons which allow the linking (or unlinking) of a mine and a deposit. Mines should not be linked to more than one deposit.

MineName: This field is used to enter the name of the mine. In (rare) special cases where historical production data of a deposit is particularly nebulous, an additional mine entry will be added (named "xxx-remaining") and will cover the leftover unaccounted for, or unreferenced, production. Difficulties to separate production figures between the mines, may also be solved by combining all mines into one record with all the names into the **MineName** field.

Start Date: This field is used to specify the date of first recorded production for a specific mine. A blank in the **Start Date** field means that either: 1) the data was not available, or 2) the mine has not come into production yet.

End Date: This field is used to specify the date of last recorded production for a specific mine. A blank in the **End Date** field means that the mine is still active and producing.

Owner(s): This page and the **Owner** field (Figure 9) are used to list the present owners of the mine. The **Percent** field represents the share of the listed owner in the mine. Three-digit numbers such as 38,5% in the **Percent** field were rounded to the nearest 2-digit numbers. Owners are listed in order of importance.

Operator(s): This page and the **Operator** field specify which company actually operates the mine.
References: This page is used to reference the data about the owners and operators of the mine. The dates of production can sometimes be found within this reference, but some other times not; in the latter case the user is referred to the *References* page of the **Production Form**. The **Chapter**, **StartPage** and **EndPage** fields can be used to further constrain the exact location of the data extracted from the reference.

2.3. Production Form

Production figures attributable to mines and deposits appear in this form. Wherever possible, production data is broken down into separate production periods (in the case of a deposit with multiple production periods) and each periods have their own production numbers and specific references. The **<u>Production Form</u>** has 7 general fields and 6 pages (Figure 10). The fields are listed as follows:

Start Date: This field is used to enter the start of a production period in the year/month/day format.

End Date: This field is used to enter the end of a production period in the year/month/day format.

Tonnage: The tonnage field serves to enter a number that is associated with the weight unit in the Tonnage Units field.

TonUnits (Tonnage Units): This field gives the unit associated with the tonnage figure entered in the Tonnage field.

Product: This field is used to specify the type of product (i.e. ore, concentrate, metal, tailings) to which the tonnage applies.

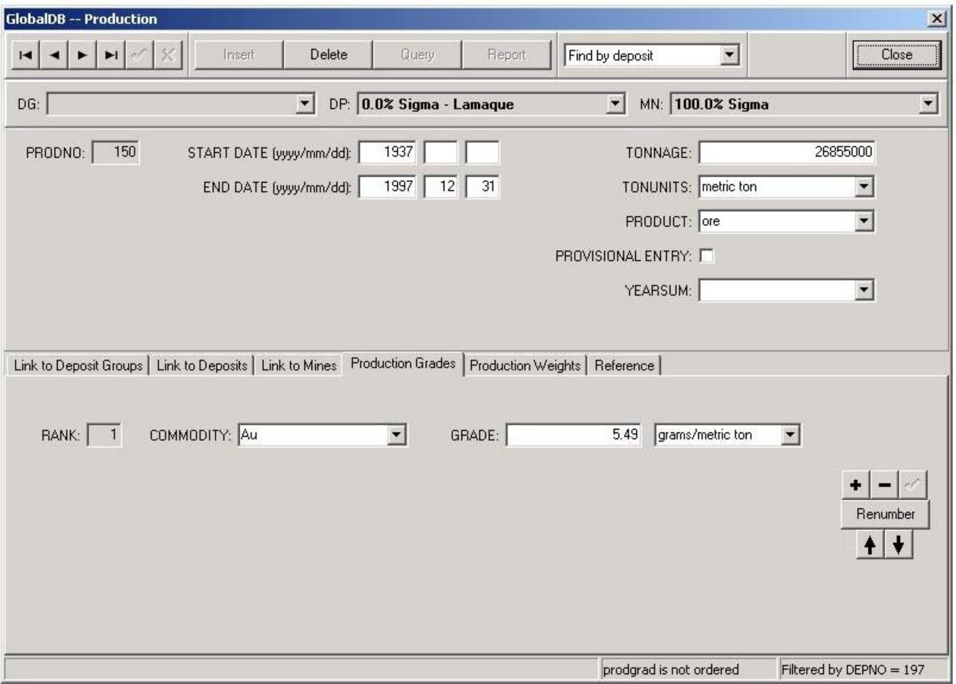

Figure 10: **<u>Production Form</u>** with *Production Grades* tabbed page activated

Provisional Entry: When a checkmark is present in the box, this means that the current production record is part of a another, larger production record (used in special cases only, e.g. production for the East Rand has one record as an overall figure covering up to year 2000, and several other records detailing production by mines up to year 2000 which are included in this overall figure).

YearSum (Yearly or Summary): This field is used to specify if the production data of the current record is estimated, in which case the sources or reasons of the estimation are explained in the **Deposit Form** under the *Deposit Status* page in the **Comment** field.

The six pages and their respective fields are listed as follows:

Link to Deposit Groups: As the **Deposit Groups Form** is not in use in the WGD, this field is blank.

Link to Deposits: This page and the **Link/Unlink** buttons allow a production record to be linked to a deposit. Production records should always be linked to one deposit, but never to more than one.

Link to Mines: This page and the **Link/Unlink** buttons allow a production record to be linked to a specific mine. A blank in this field means that the production figure applies to the whole deposit (i.e. represents the overall production figure). Mine specific data always have a link established in this field.

Production Grades: This page (Figure 10) is used to define the grade of the commodity exploited for the current production record. The **Commodity** field specifies to which commodity the grade applies to, the **Grade** field is the actual grade figure followed by the units in which the grade is reported. The most economically important commodity is usually ranked first.

Production Weights: This is used to define the weights of the commodity exploited for the current production record. The **Commodity** field specifies the commodity to which the weight applies, the **Weight** field is for the actual weight figure followed by the units in which the weight is reported. The most economically important commodity is usually ranked first.

Reference: This page is used to link (through the **Link** button) a specific reference to each figure entered for the current record. For a full description of the Reference page, the reader should refer tothe **Deposit Form** section above.

2.4. Resource Form

This form is used to store the latest reserves and resources figures available at the time of the compilation. The **Resource Form** consists of 9 general fields and 7 tabbed pages (Figure 11). The fields are listed as follows:

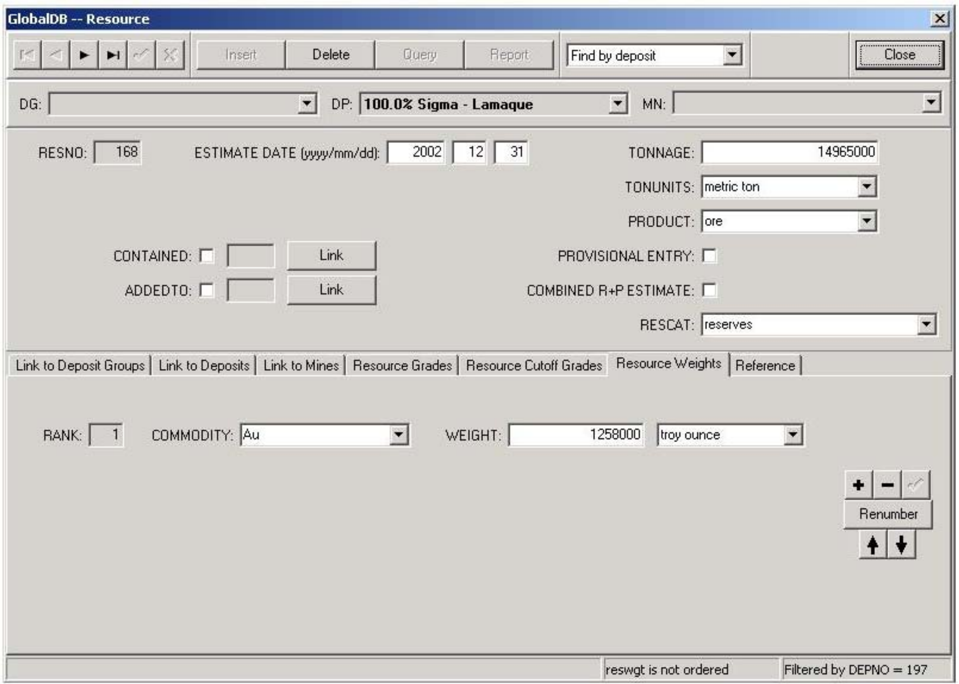

Figure 11: **Resource Form** with *Resource Weights* tabbed page activated

Estimate Date: This field gives the date (in year/month/day format) of the estimate.

Tonnage: The tonnage field serves to enter a number that is associated with the weight unit in the Tonnage Units field.

TonUnits (Tonnage Units): This field gives the unit associated with the tonnage figure entered in the Tonnage field.

Product: This field is used to specify the type of product (i.e. ore, concentrate, metal, tailings) to which the tonnage applies.

Provisional Entry: This checkbox is not used.

Combined R+P Estimate (Combined Resources and Production Estimate): This checkbox is not used in the WGD, but would signify that information entered for the current record is included in the corresponding production record.

ResCat (Resource Category): This field is used to indicate whether the data corresponds to reserves or resources. The term reserves includes proven and probable reserves, wheras the term resources covers measured and indicated resources (these 4 terms were defined by the Canadian Institute of Mining and Metallurgy Ad Hoc Committee on Ore Reserves, September 1996). Inferred resources are also routinely entered. Other resource terms and categories that are unclear or unfamiliar to the compiler were entered using the term used by the author of the paper, and are accordingly referenced.

Contained: A checkmark in this box means that the resource data entered for the current record are contained within another, larger resource figure and linked to it using the **Link** button.

Added To: This checkbox is not in use in the WGD.

The 7 tabbed pages and their respective fields are listed as follows:

Link to Deposit Groups: As the **Deposit Groups Form** is not in use in the WGD, this field is unused.

Link to Deposits: This page and the **Link/Unlink** buttons allow a resources record to be linked to a deposit. Resources records should always be linked to one deposit, but never to more than one.

Link to Mines: This page and the **Link/Unlink** buttons allow a production record to be linked to a specific mine. A blank in this field means that the resource figure represents an overall figure that applies to the whole deposit. Mine specific data always have a link established in this field.

Resource Grades: This page is used to define the grade of the commodity exploited for the current resources record. The **Commodity** field specifies the commodity to which the grade applies; the **Grade** field is for the actual grade figure followed by the units in which the grade is reported. The most economically important commodity is usually ranked first.

Resource Cutoff Grades: This page is used to indicate the cutoff grade used to calculate the corresponding resource figure. The **Commodity** field specifies the commodity to which cutoff grade applies; the **Grade** field is for the actual cutoff grade figure followed by the units in which the cutoff grade is reported. The most economically important commodity is usually ranked first.

Resource Weights: This is used to indicate the weight of the commodity exploited for the corresponding resources record. The **Commodity** field (Figure 7) specifies the commodity to which the weight applies; the **Weight** field is for the actual weight figure followed by the units in which the weight is reported. The most economically important commodity is usually ranked first

Reference: This page is used to link (through the **Link** button) a specific reference to each figure entered for the current record. For a full description of the Reference page, the reader should refer to the **Deposit Form** section above.

2.5. Reference Form

The **Reference Form** (Figure 12) is used to enter complete reference data that can be linked to the other forms. Most of the fields in this form are intuitive. The **Preview** field allows the compiler to select the type of reference (journal article, map, etc.), which will in turn bring up in the lower part of the form various sets of pre-determined fields.

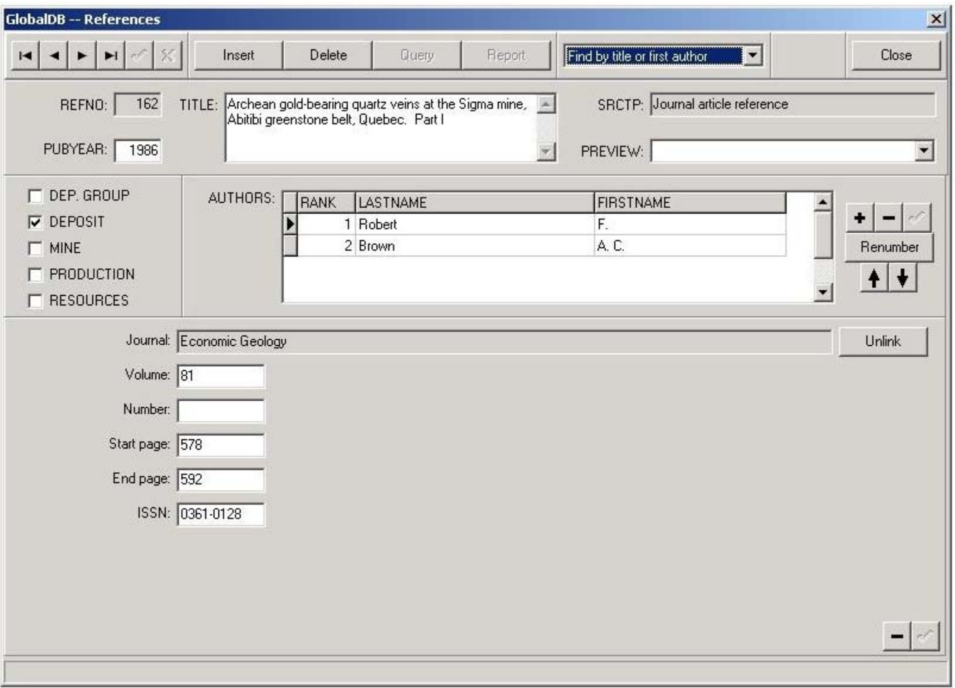

Figure 12: **Reference Form**

A note on deposits of the People's Republic of China

Dr. Lu and Guo provided much data for 45 Chinese deposits compiled in this database, hence many of the references in the chinese gold deposits refer to Dr. Lu and Guo database. As each geological elements are not specifically referenced to a single reference, papers and references used by Dr. Lu and Guo are included in the *References* pages, but the checkboxes are left blank.

2.6. Lookup Tables Form

This form is used to access the lookup tables that contain value selections (pick lists) for many fields throughout the database (Figure 13). The upper half of the interface allows for table selection, whereas the lower half presents the list of values available. A short description is associated with each value, along with the name of the person who entered or revised the value and the date of latest revision and release.

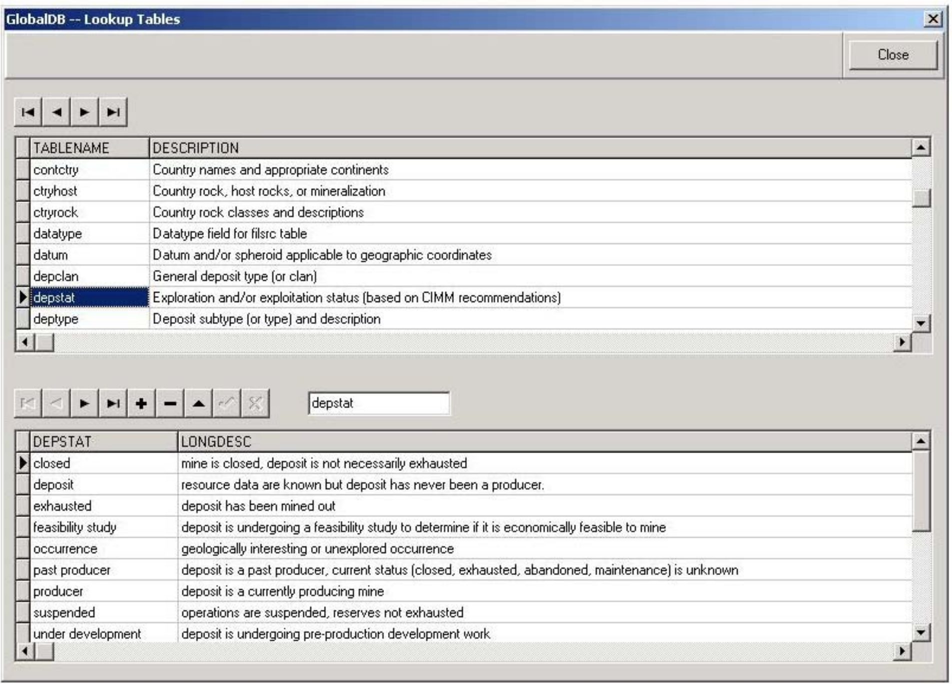

Figure 13: **Lookup Tables Form** with a look at the **DepStat field** (Deposit Status page) value list

3. Deposit Summaries

A short (non-queryable) paragraph providing a summary of the geological characteristics of each deposit is presented in Appendix 2, listed alphabetically by countries first, and by deposit numbers second. The purpose of these paragraphs is to provide the user with a concise description of the main characteristics of each deposit.

4. Reserve/Resource Terms Definitions

The following is a list of the terms used in the **ResCat** field of the **Resource Form** and their respective definitions. These definitions were established by the Canadian Institute of Mining and Metallurgy Ad Hoc Committee on Ore Reserves of September 1996.

Proven Reserve
Proven Reserve is the estimated quantity and grade of that part measured resource for which the size, grade, and distribution of values, together with technical and economic factors, are so well-established that there is the highest degree of confidence in the estimate. The term should be restricted to that part of a deposit being mined, or being developed and for which there is a mining plan.

Probable Reserve
Probable Reserve is the estimated quantity and grade of that part of an indicated resource for which the economic viability has been demonstrated by adequate information on engineering, operating, economic and legal factors, at a confidence level which will allow positive decisions on major expenditures.

Possible Reserve
Possible reserve is the estimated quantity and grade of that part of an inferred resource that are determined from limited sample data for which geology, grade continuity, and operating parameters are based, to a large extent, on reasonable extrapolations, assumptions, and interpretations. A possible reserve does not stand alone, and must be an extension or addition to probable or proven reserves. Also, a possible reserve may not be used in a economic analysis or feasibility study.

Measured Resource
Measured resource is the estimated quantity and grade of that part of a deposit for which the size, configuration, and grade have been very well-established by observation and sampling of outcrops, drill holes, trenches, and mine workings.

Indicated Resource
Indicated resource is the estimated quantity and grade of part of deposit for which the continuity of grade, together with the extent and shape, are so well-established that a reliable grade and tonnage estimate can be made.

Inferred Resource
Inferred resource is the estimated quantity and grade of a deposit, or a part thereof, that is determined on the basis of limited sampling, but for which there is sufficient geological information and a reasonable understanding of the continuity and distribution of metal values to outline a deposit of potential economic merit.

Mineral Resource
Mineral resource is a deposit or concentration of natural, solid, inorganic or fossilized organic substance in such quantity and at such grade or quality that extraction of the material at a profit is currently or potentially possible.

Geological Resource is a term of unknown origin believed to be similar to the *Mineral Resource* term.

5. Acknowledgments

Many people have contributed to this database on gold deposits of the world. Special thanks for financial, logistical and technical support, and many critical reviews of the data, go to the World Minerals Geoscience Database Project staff, particularly the project coordinator, W.D. Sinclair, GIS coordinator L.B. Chorlton, and database applications developer R.L. Laramée, along with B. Hillary and D. Power-Fardy for various logistic support. Financial support from the industry sponsors, as well as helpful comments for improvements of the database, are gratefully acknowledged. Helpful comments from former colleagues F. Robert, as well as critical reviews of part of the data by K.H. Poulsen, improved the database. The help of Dr. Huan-Zhang Lu of the Université du Québec à Chicoutimi (UQAC), and of Dr. Dijiang Guo, Dr. Lu's former Ph.D. student, for providing a database on gold deposits of the People's Republic of China, as well as help from Dr. Alexander S. Yakubchuk for providing essential data on gold deposits of the countries of the former Soviet Union, is also gratefully acknowleged. Thanks go to GSC-Québec staff, particularly K. Lauzière for her computing skills, and to the library staff S. Dupuis and A. Robitaille for their logistic support.

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Poulsen, K.H. (unpublished)

Report on the Gold Deposit Database for the Geological Survey of Canada World Map Project. Internal Report, 11 p.

Appendix 1: Deposit list

Appendix 1

Dep#	Deposit Name	Country	Deposit Type
4041	**Amesmessa**	**Algeria**	**qtz-cb shear-zone-related**
4042	Tirek	Algeria	
1504	**Bajo de la Alumbrera, La Alumbrera**	**Argentina**	**porphyry gold**
4115	Diablillos, Oculto zone	Argentina	
4116	**Cerro Vanguardia**	**Argentina**	**low-sulphidation**
4200	**Veladero**	**Argentina**	**high-sulphidation**
4209	**Zod**	**Armenia**	**low-sulphidation**
1	White Devil	Australia	
2	Comet	Australia	
3	Barbara-Surprise, Surprise	Australia	
4	Bardoc	Australia	
5	Bayleys, Bayleys-Lindsay	Australia	
6	Beasley Creek	Australia	
7	Bellevue, Sir Samuel	Australia	
8	**Big Bell**	**Australia**	**stockwork-disseminated**
9	Sandstone, Black Range, Oroya	Australia	
10	Blue Spec-Golden Spec	Australia	
11	Bluebird	Australia	
12	**Boddington**	**Australia**	**porphyry gold**
13	Bonnievale	Australia	
14	Bottle Creek	Australia	
15	Bundey	Australia	
16	Burbanks	Australia	
17	Cloncurry	Australia	
18	Copperhead, Bullfinch	Australia	
19	Corinthian, Hopes Hill	Australia	
20	Corktree Well	Australia	
21	**Coronation Hill**	**Australia**	**undetermined**
22	Cosmopolitan	Australia	
23	Cosmo Howley, Cosmopolitan Howley	Australia	
24	**Norseman**	**Australia**	**qtz-cb shear-zone-related**
26	Lady Shenton-Crusoe, Menzies?	Australia	
27	Cue, Main Line, Light of Asia, Golden Crown	Australia	
28	**Day Dawn**	**Australia**	**qtz-cb shear-zone-related**
29	Westonia, Edna May	Australia	
30	Edwards Find	Australia	
31	Emu	Australia	
32	Enterprise	Australia	
33	Fortnum	Australia	
34	Fraser	Australia	
35	Gabanintha	Australia	
36	Gandy's Hill	Australia	
37	Gibson	Australia	
38	Gidgee	Australia	qtz-cb shear-zone-related
39	Ora Banda, Gimlet, Slippery Gimlet	Australia	
40	Cometvale, Gladstone, Sand Queen	Australia	
41	**Golden Mile, Super Pit, Fimiston, Kalgoorlie**	**Australia**	**qtz-cb shear-zone-related**
42	Golden Ridge	Australia	
44	**Granny Smith**	**Australia**	**qtz-cb shear-zone-related**

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45	Great Eastern	Australia	
46	Great Victoria	Australia	
47	Hannans North	Australia	
48	Harbour Lights	Australia	
49	Horseshoe, Horseshoe Lights	Australia	
50	Ida H.	Australia	
51	Jasper Hill, Fish	Australia	
52	Jubilee	Australia	
53	**Junction**	**Australia**	**qtz-cb shear-zone-related**
55	Karonie	Australia	
56	Lady Bountiful	Australia	
57	**Lancefield**	**Australia**	**qtz-cb shear-zone-related**
58	Marvel Loch	Australia	
59	Mertondale	Australia	
60	Moline, Moline Dam	Australia	
61	**Morning Star-Evening Star Mining Complex**	**Australia**	**qtz-cb shear-zone-related**
62	**Mount Charlotte**	**Australia**	**qtz-cb shear-zone-related**
63	Mount Percy	Australia	
64	Mount Pleasant, Black Flag	Australia	
65	Matilda, Mount Wilkinson	Australia	
66	**Hill 50, Mount Magnet**	**Australia**	**Homestake (BIF-hosted)**
67	Mt. Morgans, Westralia	Australia	
68	Mt. Palmer, Palmers Find	Australia	
69	Nevoria	Australia	
70	**New Celebration**	**Australia**	**qtz-cb shear-zone-related**
71	**Nobles Nob**	**Australia**	**undetermined**
74	**Paddington**	**Australia**	**qtz-cb shear-zone-related**
75	**Meekatharra, Paddy's Flat**	**Australia**	**qtz-cb shear-zone-related**
76	Peak Hill (WA)	Australia	
77	Porphyry	Australia	
78	Princess May	Australia	
79	Redeemer, Redeemer-Deliverer	Australia	
80	Reedys	Australia	
81	**Royal**	**Australia**	**qtz-cb shear-zone-related**
82	Scotia	Australia	
83	Selwyn, Starra	Australia	
84	**Sons of Gwalia, Gwalia**	**Australia**	**qtz-cb shear-zone-related**
85	**Telfer**	**Australia**	**stockwork-disseminated**
86	Juno	Australia	
87	**The Granites**	**Australia**	**Homestake (BIF-hosted)**
88	Mount Ida, Timoni	Australia	
89	Tindals	Australia	
90	Union Reefs	Australia	
91	**Victory-Defiance**	**Australia**	**qtz-cb shear-zone-related**
92	**Warrego**	**Australia**	**undetermined**
93	Saint George	Australia	
94	Kanowna Belle, White Feather	Australia	
95	Wiluna	Australia	qtz-cb shear-zone-related
96	Woolwonga	Australia	
97	Youanmi	Australia	
385	Stuart Town	Australia	

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386	Cassilis	Australia	
387	Kilkivan	Australia	
388	Blackwood	Australia	
390	Lefroy	Australia	
391	Browns Creek	Australia	
392	Eidsvold	Australia	
393	Rocky River;Uralla	Australia	
394	Drake	Australia	
396	Peak Hill (NSW)	Australia	
397	Glen Wills	Australia	
398	Mitchells Creek, Bodangora	Australia	
401	Yandan	Australia	
402	Sheahan-Grants, Junction Reefs	Australia	
404	Hodgkinson	Australia	
405	Hargraves	Australia	
406	Mathinna	Australia	
407	Adelong	Australia	
408	Wirralie	Australia	
411	Canbelego	Australia	
412	Wyalong	Australia	
413	Mount Coolon	Australia	
415	Scarsdale	Australia	
416	Gidginbung, Temora	Australia	
417	Mount Adrah	Australia	
418	Orange;Cargo	Australia	
419	Daylesford	Australia	
420	**Pajingo, Vera-Nancy, Scott lode, Cindy**	**Australia**	**low-sulphidation**
421	Hillgrove, Metz	Australia	
422	Etheridge	Australia	
423	**Mount Leyshon**	**Australia**	**breccia pipe**
424	Red Dome, Mungana	Australia	
426	Morning Star	Australia	
427	Golden Plateau, Cracow	Australia	
428	Ravenswood	Australia	
429	The Peak	Australia	
430	Port Phillip	Australia	
431	**Cobar**	**Australia**	**turbidite-hosted vein**
433	**Hill End**	**Australia**	**turbidite-hosted vein**
434	**Maldon Gold Field, Union Hill**	**Australia**	**turbidite-hosted vein**
436	**Stawell**	**Australia**	**turbidite-hosted vein**
437	**Kidston**	**Australia**	**breccia pipe**
438	**Gympie**	**Australia**	**turbidite-hosted vein**
439	**Charters Towers**	**Australia**	**batholith-associated vein**
440	**Bendigo Goldfield**	**Australia**	**turbidite-hosted vein**
521	Three Mile Hill	Australia	
525	Labouchere	Australia	
527	Tom's Gully	Australia	
528	Goodall	Australia	
529	Jabiluka	Australia	
534	**Tasmania, Beaconsfield**	**Australia**	**turbidite-hosted vein**
536	**Ballarat East**	**Australia**	**turbidite-hosted vein**

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537	Wattle Gully	Australia	
538	Cohen's Reef, Walhalla, Long Tunnel	Australia	turbidite-hosted vein
540	Horn Island	Australia	
541	Far Fanning	Australia	
542	**Mount Morgan**	**Australia**	**gold-rich VMS**
543	**Mount Rawdon**	**Australia**	**breccia pipe**
544	Caledonian	Australia	
545	Kurara	Australia	
547	Tower Hill	Australia	
548	Grants Patch, Orban	Australia	
549	Mount Martin	Australia	
551	A1	Australia	
552	Poverty	Australia	
553	Lord Nelson	Australia	
554	Ajax	Australia	
555	Jubilee	Australia	
4057	**Bronzewing**	**Australia**	**qtz-cb shear-zone-related**
4058	**Jundee**	**Australia**	**qtz-cb shear-zone-related**
4090	**Mount Todd, Batman, Yimuyn Manjerr**	**Australia**	**turbidite-hosted vein**
4091	Rustlers Roost	Australia	
4092	**Plutonic**	**Australia**	**qtz-cb shear-zone-related**
4093	**Lake Cowal, Cowal, E42**	**Australia**	**low-sulphidation**
4140	**Cadia Hill**	**Australia**	**porphyry gold**
4212	**Wallaby**	**Australia**	**qtz-cb shear-zone-related**
4217	**Tarmoola, King of the Hills**	**Australia**	**qtz-cb shear-zone-related**
4218	**Carosue Dam**	**Australia**	**undetermined**
4263	**Sunrise Dam, Cleo**	**Australia**	**qtz-cb shear-zone-related**
8003	Darlot	Australia	qtz-cb shear-zone-related
1771	**Kori Kollo**	**Bolivia**	**undetermined**
4145	Don Mario	Bolivia	
98	**Crixas, Serra Grande, Mina III**	**Brazil**	**undetermined**
99	Gongo Socco	Brazil	
100	Morro Velho	Brazil	Homestake (BIF-hosted)
101	**Passagem de Mariana, Passagem**	**Brazil**	**qtz-cb shear-zone-related**
102	**Raposos**	**Brazil**	**Homestake (BIF-hosted)**
556	**Sao Bento**	**Brazil**	**Homestake (BIF-hosted)**
557	**Brasilia, Morro do Ouro, Paracatu**	**Brazil**	**turbidite-hosted vein**
558	**Fazenda Brasileiro**	**Brazil**	**qtz-cb shear-zone-related**
559	Fazenda Maria Preta	Brazil	
560	Cachoeira	Brazil	
561	Posse	Brazil	
562	Ouro Fino	Brazil	
563	Passa Tres Granite	Brazil	
564	**Cuiaba**	**Brazil**	**Homestake (BIF-hosted)**
565	Cabacal	Brazil	
566	**Igarape Bahia**	**Brazil**	**undetermined**
567	**Jacobina**	**Brazil**	**paleoplacer**
569	Novo Astro	Brazil	
1648	Sao Vicente	Brazil	
1709	Princeza;Princeza Izabel	Brazil	
1787	**Chelopech**	**Bulgaria**	**high-sulphidation**

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319	**Poura**	**Burkina Faso**	**qtz-cb shear-zone-related**
103	**Buffalo Ankerite, Ankerite**	**Canada**	**qtz-cb shear-zone-related**
104	Arcadia, Coronation Gulf	Canada	
105	Astoria, Yorbeau	Canada	
106	Athona	Canada	
107	**Aunor, Pamour No. 3**	**Canada**	**qtz-cb shear-zone-related**
108	Bachelor Lake, Quebec Sturgeon	Canada	
109	Bakos, Contact Lake	Canada	
110	Bankfield - Magnet Consolidated	Canada	
111	**Beattie - Donchester, Duparquet-01, Duparquet-02**	**Canada**	**stockwork-disseminated**
112	Beauchastel, Wasamac no. 1	Canada	stockwork-disseminated
113	Bell Creek, North Zone, Marlhill	Canada	
114	Belleterre, Guillet-05	Canada	qtz-cb shear-zone-related
115	Berens River, Golsil	Canada	
116	Bevcon - Buffadison - Lencourt	Canada	qtz-cb shear-zone-related
117	Bidgood, Bidgood Kirkland	Canada	
118	Black Cliff, Vinray, Gold Cliff	Canada	
120	**Bousquet No. 1, Thompson-Bousquet**	**Canada**	**gold-rich VMS**
121	Box	Canada	
122	Brookbank	Canada	
125	Callahan	Canada	
126	Cameron Lake, Nuinsco	Canada	qtz-cb shear-zone-related
127	**Camflo - Malartic Hygrade**	**Canada**	**qtz-cb shear-zone-related**
128	**Campbell-Red Lake**	**Canada**	**qtz-cb shear-zone-related**
129	Cedar Island Extension, Cedar Island, Cornucopia	Canada	
130	Central Manitoba, Wadhope	Canada	
131	Central Patricia	Canada	Homestake (BIF-hosted)
132	Chadbourne	Canada	
133	Chesterville	Canada	
135	Chimo	Canada	
136	Clavos	Canada	
137	**Cochenour Willans**	**Canada**	**qtz-cb shear-zone-related**
138	Colomac, Hydra	Canada	qtz-cb shear-zone-related
139	Consolidated Professor, Duport, Cameron Island	Canada	
140	Cooke	Canada	
141	Cullaton Lake B Zone	Canada	
142	**Delnite**	**Canada**	**qtz-cb shear-zone-related**
143	DeSantis	Canada	
144	Destor, Thurbois, Yvan Vezina	Canada	
145	**Detour Lake**	**Canada**	**qtz-cb shear-zone-related**
146	**Discovery**	**Canada**	**qtz-cb shear-zone-related**
147	**Dome**	**Canada**	**qtz-cb shear-zone-related**
148	Dona Lake	Canada	
149	Donalda, Kerralda Deka	Canada	
150	Dot Lake	Canada	
151	Douay (Main, West, 531), Zone 52	Canada	
152	**Doyon, Silverstack**	**Canada**	**Au-Cu sulphide-rich vein**
153	Duquesne	Canada	
154	Duvay-Obalski	Canada	

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155	**Agnico-Eagle, Telbel**	**Canada**	**gold-rich VMS**
156	Eagle River	Canada	qtz-cb shear-zone-related
157	**East Malartic-Barnat-Sladen-Canadian Malartic**	**Canada**	**stockwork-disseminated**
158	Eastmain	Canada	
159	Edwards	Canada	
160	El Coco;Russian Kid	Canada	
161	Elder, Peel-Elder, Aunore	Canada	qtz-cb shear-zone-related
162	Farley	Canada	
163	**Tundra, FAT**	**Canada**	**qtz-cb shear-zone-related**
164	Ferderber, Belmoral	Canada	qtz-cb shear-zone-related
165	Francoeur - Wasamac No. 2	Canada	stockwork-disseminated
166	**Troilus, Lac Troilus**	**Canada**	**porphyry gold**
168	**George Lake, Goose Lake**	**Canada**	**Homestake (BIF-hosted)**
169	**Giant-Lolor-Supercrest**	**Canada**	**qtz-cb shear-zone-related**
170	Glimmer, NO.1, NO.2 Zone	Canada	
171	God's Lake	Canada	
172	Gold Hawk, Lakefield	Canada	
173	Golden Patricia, Meen Lake	Canada	
174	**Casa Berardi, Golden Pond**	**Canada**	**qtz-cb shear-zone-related**
175	**Goldex**	**Canada**	**qtz-cb shear-zone-related**
176	Goldlund, Newlund	Canada	
177	Gunnar	Canada	
179	**Hard Rock - McLeod-Cockshutt - Mosher**	**Canada**	**qtz-cb shear-zone-related**
180	**Hemlo**	**Canada**	**stockwork-disseminated**
181	Hislop East, New Kelore, Goldpost	Canada	
182	Howey - Hasaga	Canada	qtz-cb shear-zone-related
183	**Pamour**	**Canada**	**qtz-cb shear-zone-related**
184	Kim	Canada	
187	Jasper, Forks Lake, Transom	Canada	
188	Jerome	Canada	
189	**Joe Mann, Chibex**	**Canada**	**qtz-cb shear-zone-related**
190	Jolu, Rod, Mahogan, Decade	Canada	
191	**Kerr Addison**	**Canada**	**qtz-cb shear-zone-related**
192	**Kiena**	**Canada**	**stockwork-disseminated**
193	**Kirkland Lake**	**Canada**	**qtz-cb shear-zone-related**
194	Komis, Partridge	Canada	
195	**Donald J. La Ronde 1 - Bousquet 2, Dumagami**	**Canada**	**gold-rich VMS**
197	**Sigma - Lamaque**	**Canada**	**qtz-cb shear-zone-related**
198	Laurel Lake	Canada	
199	Leitch	Canada	qtz-cb shear-zone-related
200	**Holt-McDermott**	**Canada**	**stockwork-disseminated**
201	Lingman Lake	Canada	
202	Little Long Lac	Canada	qtz-cb shear-zone-related
203	**Lupin**	**Canada**	**Homestake (BIF-hosted)**
204	Mac, Southwin, Cache Zone	Canada	
205	MacKenzie Red Lake	Canada	qtz-cb shear-zone-related
206	**Madsen**	**Canada**	**stockwork-disseminated**
207	Magino	Canada	
208	Magnacon, Michibishu Lake	Canada	

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210	**Malartic Gold Fields, Goldstack**	**Canada**	**qtz-cb shear-zone-related**
211	Marban	Canada	
212	Matachewan Consolidated	Canada	
214	McBean, Queenston	Canada	
215	McFinley Red Lake	Canada	
216	**McIntyre - Hollinger - Coniaurum**	**Canada**	**qtz-cb shear-zone-related**
217	MacLellan	Canada	
218	McMillan, House Lake	Canada	
219	McWatters	Canada	
220	Mic Mac, Goldhurst	Canada	
221	Moneta Porcupine, Moneta	Canada	
222	Montauban, Muscocho	Canada	
223	Moss Lake	Canada	
224	Mouska	Canada	
225	Naybob, Hayden, Kenilworth	Canada	
226	**Negus - Nerco Con, NERCO Con**	**Canada**	**qtz-cb shear-zone-related**
227	New Jason, Argosy, Casey Summit	Canada	
228	New Pascalis, Lucien C. Beliveau	Canada	
229	Newfield, JP Zone	Canada	
230	Nicholas Lake	Canada	
231	Nighthawk Lake, Porcupine Peninsular	Canada	
232	**New Brittannia, Nor-Acme**	**Canada**	**qtz-cb shear-zone-related**
233	Norbeau, Mckenzie-07	Canada	
234	Norlartic - First Canadian	Canada	
235	North Lake, Radcliffe	Canada	
236	Northern Empire, Beardmore	Canada	
237	O'Brien, Darius	Canada	qtz-cb shear-zone-related
238	Omega	Canada	
239	**Musselwhite, Opapimiskan Lake**	**Canada**	**Homestake (BIF-hosted)**
240	Orenada Zone 4	Canada	
241	Orofino	Canada	
242	Owl Creek	Canada	
244	Pandora, Wood, Central	Canada	
245	Pap SW, Preview Project	Canada	
246	**Paymaster**	**Canada**	**qtz-cb shear-zone-related**
247	Pelletier Lake	Canada	
248	**Perron - Beaufort, North Pascalis**	**Canada**	**qtz-cb shear-zone-related**
249	**Pickle Crow**	**Canada**	**Homestake (BIF-hosted)**
250	Pierre Beauchemin, Eldrich	Canada	
251	Porcupine Reef	Canada	
252	Powell Rouyn	Canada	
253	**Preston, Preston East Dome**	**Canada**	**qtz-cb shear-zone-related**
254	Puffy Lake	Canada	
255	Pusticamica Lake	Canada	
256	Remnor	Canada	
257	**Renabie**	**Canada**	**qtz-cb shear-zone-related**
258	**Ross**	**Canada**	**qtz-cb shear-zone-related**
259	Royado, Cathroy Larder	Canada	
260	Rusty Point	Canada	
261	Salmita, Taurcanis	Canada	
262	**San Antonio, Bissett**	**Canada**	**qtz-cb shear-zone-related**
263	**Seabee, Laonil Lake**	**Canada**	**qtz-cb shear-zone-related**

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264	Seeber, Twin Lakes, Monument Bay	Canada	qtz-cb shear-zone-related
265	Senator Rouyn	Canada	
266	Shear Lake, Cullaton Lake South	Canada	
267	Shortt Lake, Gand	Canada	
268	Sigma-2, Vicour	Canada	
269	Silidor	Canada	qtz-cb shear-zone-related
270	Simkar, Louvicourt Goldfields	Canada	
271	Siscoe	Canada	qtz-cb shear-zone-related
272	Sleeping Giant, Gééant Dormant	Canada	
273	Snoppy Lake	Canada	
274	Springpole Lake	Canada	low-sulphidation
275	St Anthony	Canada	
276	St. Andrew Goldfields, Stock Tp	Canada	
277	Stadacona	Canada	
278	Starratt - Olsen	Canada	
279	**Sullivan, Sullivan Consolidated**	**Canada**	**qtz-cb shear-zone-related**
280	Sunbeam-Kirkland, Waverley	Canada	
281	Surluga, Jubilee, Minto, Citadel	Canada	
282	Tartan Lake	Canada	
283	Tower East	Canada	
284	Turquetil	Canada	
285	Tyranite, Hedlund	Canada	
286	Uchi, Jalda, Hanalda, Grassett	Canada	
287	Upper Beaver, Beaverhouse Lake, Argonaut	Canada	
288	**Upper Canada**	**Canada**	**qtz-cb shear-zone-related**
289	Vedron, Cincinnati-Porcupine	Canada	
290	Vezza	Canada	
291	Vipond-Crown, Mace	Canada	qtz-cb shear-zone-related
292	Wedge Lake	Canada	
293	Weedy Lake, Keewatin, Golden Heart	Canada	
294	Wesdome, Western Quebec	Canada	
295	**Young-Davidson**	**Canada**	**porphyry gold**
441	Stog'er Tight	Canada	
442	Hammer Down, Rendell-Jackman	Canada	
443	Tangier	Canada	
444	Pine Cove, Lightning Zone	Canada	
445	Goldenville, Sherbrooke	Canada	
446	Cochrane Hill	Canada	
447	Forest Hill	Canada	
448	Nugget Pond	Canada	
449	Beaver Dam	Canada	
450	Cape Ray, Main Shear	Canada	
451	Caribou, Herman Hall	Canada	
452	Hope Brook, Chetwynd	Canada	high-sulphidation
453	**Phoenix**	**Canada**	**skarn**
454	Ymir	Canada	
455	Sheep Creek	Canada	turbidite-hosted vein
456	Dome Mountain	Canada	
458	Spectrum	Canada	
459	SIB, Silver Butte	Canada	
460	Scottie, Salmon Gold	Canada	

461	Mount Skukum	Canada	
462	QR, Dome, Quesnel River	Canada	
463	Blackdome, Blackdome No. 2	Canada	
464	Ketza River, Boom	Canada	
465	Mount Nansen, Webber, Huestis	Canada	
466	Skukum Creek, Mt. Reid, Berney	Canada	
467	Elk, Siwash North (Ward?)	Canada	
468	Grew Creek	Canada	
469	Big Missouri, Province	Canada	
470	Ladner Creek, Carolin, Aurum, Idaho Zone	Canada	
472	Goldwedge	Canada	
473	Erickson Creek, Jennie, Erickson Gold	Canada	
474	Golden Bear, Muddy Lake, Bear-Totem	Canada	
475	Warman, Brandywine, Northair, Willa	Canada	
476	Josie, Le Roi No.2	Canada	
478	Privateer, Zeballos	Canada	
479	Banks, Banker, Tel, Yellow Giant	Canada	
480	Tillicum	Canada	
481	Lawyers	Canada	
482	Surf Inlet, Pugsley	Canada	
483	**Cariboo, Aurum**	**Canada**	**qtz-cb shear-zone-related**
484	Johnny Mountain, Stonehouse	Canada	Au-Cu sulphide-rich vein
485	Equity Silver, Sam Goosly	Canada	high-sulphidation
486	Hedley	Canada	
487	**Snip, Twin Zone**	**Canada**	**Au-Cu sulphide-rich vein**
489	Red Mountain, Marc Zone	Canada	Au-Cu sulphide-rich vein
490	Polaris-Taku, Whitewater, New Polaris	Canada	qtz-cb shear-zone-related
492	**Nickel Plate**	**Canada**	**skarn**
493	**Cinola, Harmony, Specogna, Babe**	**Canada**	**low-sulphidation**
494	**Silbak Premier, Premier, Bush, Silbak**	**Canada**	**low-sulphidation**
495	**Centre Star Group**	**Canada**	**Au-Cu sulphide-rich vein**
496	**Bralorne-Pioneer**	**Canada**	**qtz-cb shear-zone-related**
2165	Motherlode	Canada	
2166	Table Mountain, Cusac, Cordoba	Canada	
2167	Taurus	Canada	
2169	Tundra	Canada	
2182	BT, Burnt Timber	Canada	
2184	Ellison	Canada	
2185	Dumont, Bras d'Or, Payore	Canada	
2204	Brucejack Lake, Sulphuret, West Zone	Canada	
2205	**Eskay Creek, Iskut River**	**Canada**	**gold-rich VMS**
4059	**Meadowbank**	**Canada**	**Homestake (BIF-hosted)**
4060	Boston	Canada	
4061	Meliadine Discovery, Meliadine East-(Aquarius)	Canada	
4062	**Meliadine West, Wesmeg, Tikiuniak**	**Canada**	**Homestake (BIF-hosted)**
4063	Victoria Creek	Canada	qtz-cb shear-zone-related
4064	East Amphi	Canada	stockwork-disseminated
4122	**Hoyle Pond**	**Canada**	**qtz-cb shear-zone-related**
4123	**Dublin Gulch, Eagle Zone**	**Canada**	**porphyry gold**
4124	Brewery Creek	Canada	stockwork-disseminated
4173	**Horne**	**Canada**	**gold-rich VMS**

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4211	**Hope Bay**	**Canada**	**qtz-cb shear-zone-related**
4215	**Kemess**	**Canada**	**porphyry gold**
4223	**Copper Rand**	**Canada**	**Au-Cu sulphide-rich vein**
4258	**Donald J. La Ronde 3, Penna Shaft, LaRonde**	**Canada**	**gold-rich VMS**
4259	**Holloway, Lightning Zone**	**Canada**	**stockwork-disseminated**
4272	Sturgeon River	Canada	qtz-cb shear-zone-related
8001	**Quéémont**	**Canada**	**gold-rich VMS**
581	**Andacollo**	**Chile**	**stockwork-disseminated**
1446	San Cristobal	Chile	
1448	**El Guanaco**	**Chile**	**high-sulphidation**
1464	El Bronce	Chile	
1754	Choquelimpie	Chile	
1755	Faride	Chile	
1756	El Hueso	Chile	
1758	**Marte**	**Chile**	**porphyry gold**
1759	**Lobo**	**Chile**	**porphyry gold**
1760	La Pepa	Chile	
1761	**Refugio**	**Chile**	**porphyry gold**
1762	Sancarron	Chile	
1763	**El Indio**	**Chile**	**high-sulphidation**
1765	Los Mantos de Punitaqui	Chile	
1766	Fachinal	Chile	
1767	Esperanza	Chile	
1773	**Pascua-Lama, Nevada**	**Chile**	**high-sulphidation**
1774	**Aldebaran, Cerro Casale**	**Chile**	**porphyry gold**
4119	**La Coipa**	**Chile**	**high-sulphidation**
4121	**Tambo**	**Chile**	**high-sulphidation**
4146	**El Penon**	**Chile**	**low-sulphidation**
2000	**Jiapigou**	**China**	**qtz-cb shear-zone-related**
2001	Bianmiaozi	China	
2002	Sandaocha	China	
2003	Bajiazi	China	
2004	Erdaogou	China	
2005	Miaoling	China	
2007	Xiaobeigou	China	
2008	Caichangzi	China	
2009	Laoniugou	China	
2010	Daxiangou	China	
2011	Haigou	China	
2012	Jinchanggou	China	
2013	Erdaodianzi	China	
2014	Jinchang	China	
2015	Taodaochuan	China	
2016	Xiangluwanzi	China	
2017	**Wulong**	**China**	**batholith-associated vein**
2018	**Sidaogou**	**China**	**stockwork-disseminated**
2019	**Weizi**	**China**	**batholith-associated vein**
2020	Sunjiagou	China	
2021	**Xiaoyinpan**	**China**	**batholith-associated vein**
2022	Zhangguanzhuang	China	
2023	Honghuagou	China	

2024	Changgao	China	
2025	**Jinchanggoulian**	**China**	**Au-Cu sulphide-rich vein**
2026	Xioachanggao	China	
2027	Erdaogou	China	
2028	Shajingou	China	
2029	**Jinchangyu**	**China**	**batholith-associated vein**
2031	Malanyu	China	
2033	Sanjia	China	
2034	Miaozhangzi	China	
2035	Luojiagou	China	
2036	**Yu 'Erya**	**China**	**porphyry gold**
2037	Maojiadian	China	
2040	Yixingzhai	China	
2041	Tainashui	China	
2042	Santiaoling	China	
2043	Daomaguan	China	
2044	Sanliwan	China	
2045	Laoyacha	China	
2046	Jindongcha	China	
2047	Dongchuang	China	
2048	**Wenyu**	**China**	**qtz-cb shear-zone-related**
2049	Tongyu	China	
2050	**Sanshandao**	**China**	**batholith-associated vein**
2051	**Jiaojia**	**China**	**batholith-associated vein**
2052	Xincheng	China	batholith-associated vein
2053	Hedong	China	
2054	Wan 'Ershan	China	
2055	Xianchen	China	
2056	Lingshangou	China	
2057	Xishan	China	
2058	Jinchiling	China	
2059	**Linglong, Dakaitou**	**China**	**batholith-associated vein**
2060	**Jiuqu**	**China**	**batholith-associated vein**
2061	Dongfeng	China	
2062	Luoshan	China	
2063	Huajian	China	
2064	Shuangding	China	
2065	**Yingezhuang**	**China**	**batholith-associated vein**
2066	Denggezhuang	China	
2067	Dongzhuang	China	
2069	Tongjiashan	China	
2070	Tangjiagou	China	
2071	Yata	China	
2072	Banqi	China	
2073	Ceyang	China	
2074	Sanchahe	China	
2075	**Getang**	**China**	**Carlin type**
2076	Dongyaozhuang	China	
2077	**Maoling**	**China**	**stockwork-disseminated**
2078	**Paishanlou, Peishanlou**	**China**	**qtz-cb shear-zone-related**
2079	**Changken, Changkeng**	**China**	**Carlin type**
2080	Huijiagou	China	

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2081	**Jinya**	**China**	**Carlin type**
2082	Mingshan	China	
2083	**Dongbeizhai**	**China**	**Carlin type**
2084	**Zhimudang**	**China**	**Carlin type**
2085	**Lannigou**	**China**	**Carlin type**
2086	**Laowangzhai**	**China**	**undetermined**
2087	Jinba	China	
2088	Machangqing	China	
2089	Xinguan	China	
2092	Miaoshan	China	
2093	Oujiakuang	China	
2094	Potouqin	China	
2095	Jinliushan	China	
4178	**Axi, Axier**	**China**	**low-sulphidation**
4179	**Baguamiao**	**China**	**qtz-cb shear-zone-related**
4180	**Erjia**	**China**	**qtz-cb shear-zone-related**
4181	**Qiyiqiu No. 1, Qiqiu 1, Hatu**	**China**	**qtz-cb shear-zone-related**
4182	**Lingnan, Taishang**	**China**	**batholith-associated vein**
4183	**Baiyun**	**China**	**batholith-associated vein**
4184	**Dongfengshan**	**China**	**Homestake (BIF-hosted)**
4185	**Hougou**	**China**	**porphyry gold**
4186	**Dongping**	**China**	**porphyry gold**
4187	**Hadamengou**	**China**	**batholith-associated vein**
4188	**Hetai**	**China**	**qtz-cb shear-zone-related**
4189	**Shuangwang**	**China**	**manto**
4190	**Jiguanzui**	**China**	**skarn**
4191	**Jilongshan**	**China**	**skarn**
4192	**Shanggong**	**China**	**qtz-cb shear-zone-related**
4193	**Tuanjiegou**	**China**	**porphyry gold**
4194	**Woxi**	**China**	**turbidite-hosted vein**
4195	**Wulashan**	**China**	**batholith-associated vein**
4196	**Xinqiao**	**China**	**manto**
4197	**Zijinshan**	**China**	**high-sulphidation**
4198	**Duolanasayi**	**China**	**qtz-cb shear-zone-related**
4199	**Zhuanshanzi**	**China**	**Au-Cu sulphide-rich vein**
4266	**Liba**	**China**	**Carlin type**
4267	**Jinlongshan**	**China**	**Carlin type**
4268	**Gaojiaao**	**China**	**Carlin type**
4270	**Ertaizi**	**China**	**Carlin type**
4271	**Cangshang**	**China**	**batholith-associated vein**
8006	**Sawuyaerdun**	**China**	**turbidite-hosted vein**
583	**Frontino, El Silencio**	**Colombia**	**batholith-associated vein**
2112	San Martin	Costa Rica	
4049	Miramar	Costa Rica	
4050	Abangares;Juntes de Abangares	Costa Rica	
4051	Santa Clara	Costa Rica	
4053	El Recio	Costa Rica	
4054	**Bellavista, Montezuma**	**Costa Rica**	**low-sulphidation**
4055	**Cerro Crucitas**	**Costa Rica**	**low-sulphidation**
312	Ity, Flotouo	Côôte d'Ivoire	
327	Yaouréé	Côôte d'Ivoire	
2101	Afema, Somiaf, Aniuri, Grid-X	Côôte d'Ivoire	

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297	**Delita**	**Cuba**	**low-sulphidation**
2113	La Zona Barita	Cuba	
1795	Vacikov-Petrackova Hora	Czech Republic	
2096	**Mokrsko**	**Czech Republic**	**porphyry gold**
2126	Jilove	Czech Republic	
2127	Celina	Czech Republic	
2128	Kasperske Hory	Czech Republic	
2129	Roudny	Czech Republic	
2122	**Pueblo Viejo**	**Dominican Republic**	**high-sulphidation**
1768	**Portovelo**	**Equador**	**low-sulphidation**
1769	**Nambija**	**Equador**	**skarn**
2103	**Lega Dembi**	**Ethiopia**	**qtz-cb shear-zone-related**
2180	**Emperor, Vatukoula**	**Fiji**	**low-sulphidation**
4214	**Suurikuusikko**	**Finland**	**qtz-cb shear-zone-related**
1783	**Salsigne**	**France**	**stockwork-disseminated**
1794	Le Chatelet	France	
309	**Ashanti, Obuasi**	**Ghana**	**turbidite-hosted vein**
310	**Bibiani**	**Ghana**	**qtz-cb shear-zone-related**
311	**Iduapriem**	**Ghana**	**paleoplacer**
314	**Konongo**	**Ghana**	**turbidite-hosted vein**
318	**Marlu, Bogoso**	**Ghana**	**turbidite-hosted vein**
320	**Prestea**	**Ghana**	**turbidite-hosted vein**
324	Old Tarkwa, Abosso	Ghana	
325	**Tarkwa, Tarkwa Goldfield**	**Ghana**	**paleoplacer**
326	Teberebie	Ghana	
4264	**Damang, Abosso**	**Ghana**	**turbidite-hosted vein**
8005	Ahafo	Ghana	
4204	**Olympias**	**Greece**	**manto**
4205	**Skouries**	**Greece**	**porphyry gold**
2102	Jean-Gobele	Guinea	
4261	**Siguiri**	**Guinea**	**turbidite-hosted vein**
8007	Dinguiraye, Lero	Guinea	turbidite-hosted vein
298	**Omai**	**Guyana**	**qtz-cb shear-zone-related**
1772	Marudi	Guyana	
4129	**Lahoca**	**Hungary**	**high-sulphidation**
300	**Kolar**	**India**	**qtz-cb shear-zone-related**
1784	**Hutti**	**India**	**qtz-cb shear-zone-related**
3223	Ramagiri	India	
2143	**Cabang Kiri East**	**Indonesia**	**porphyry gold**
2144	Bulagidun	Indonesia	
2145	**Grasberg**	**Indonesia**	**porphyry gold**
2146	**Kelian**	**Indonesia**	**low-sulphidation**
2147	**Mount Muro**	**Indonesia**	**low-sulphidation**
2148	Marsupa Ria	Indonesia	
2149	Mirah	Indonesia	
2150	Sungai Keruh	Indonesia	
2151	Timburu	Indonesia	
2152	**Mesel, Minahasa, Ratatotok**	**Indonesia**	**Carlin type**
2153	**Gunung Pani**	**Indonesia**	**low-sulphidation**
2154	Doup	Indonesia	
2155	Lanut	Indonesia	
2156	Bawone	Indonesia	

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2157	Awak Mas	Indonesia	
2158	Mangani	Indonesia	
2159	Bukit Tembang	Indonesia	
2160	**Lebong Tandai**	**Indonesia**	**low-sulphidation**
2161	**Lebong Donok**	**Indonesia**	**low-sulphidation**
2162	**Gunung Pongkor, Pongkor**	**Indonesia**	**low-sulphidation**
2163	Cikondang	Indonesia	
2164	Wetar	Indonesia	
4065	Cirotan;Cikotok	Indonesia	
4142	**Kucing Liar**	**Indonesia**	**skarn**
4151	Kali Kuning	Indonesia	
4152	Lebong Sulit	Indonesia	
4154	Mintu	Indonesia	
4155	Salida	Indonesia	
4156	Palaleh	Indonesia	
4202	**Batu Hijau**	**Indonesia**	**porphyry gold**
1786	Muteh	Iran	
3225	Akeshi;Nansatsu	Japan	
3226	Iwato;Nansatsu	Japan	
3227	Kasuga;Nansatsu	Japan	
3228	**Hishikari**	**Japan**	**low-sulphidation**
4001	**Stepnyak, Stepniak**	**Kazakhstan**	**qtz-cb shear-zone-related**
4002	**Vasilievskoe, Vasilkovskoye**	**Kazakhstan**	**porphyry gold**
4003	**Aksu, Aqsu, Kvartsytovye Gorki**	**Kazakhstan**	**qtz-cb shear-zone-related**
4004	**Bestobe, Bestube, Bestyube**	**Kazakhstan**	**qtz-cb shear-zone-related**
4005	**Zholymbet, Jolymbet, Dzhelambet**	**Kazakhstan**	**qtz-cb shear-zone-related**
4006	**Abyz**	**Kazakhstan**	**gold-rich VMS**
4007	Boko	Kazakhstan	
4008	**Baqyrchik, Bakyrchik, Miyaly, Glubokiy Log**	**Kazakhstan**	**stockwork-disseminated**
4009	Jubilenoye	Kazakhstan	
4010	**Akbakay, Karriernoje**	**Kazakhstan**	**qtz-cb shear-zone-related**
4011	**Arharli, Archarly, Arkharly**	**Kazakhstan**	**low-sulphidation**
4249	**Suzdal**	**Kazakhstan**	**stockwork-disseminated**
4253	**Akbastau-Kosmurun**	**Kazakhstan**	**gold-rich VMS**
4254	**Sayak**	**Kazakhstan**	**skarn**
2183	**Kumtor**	**Kyrgyzstan**	**stockwork-disseminated**
4012	**Jerooy, Djerui**	**Kyrgyzstan**	**stockwork-disseminated**
4244	**Taldybulak Levoberezhnyi**	**Kyrgyzstan**	**Au-Cu sulphide-rich vein**
4245	**Makmal**	**Kyrgyzstan**	**skarn**
4250	**Taldybulak**	**Kyrgyzstan**	**breccia pipe**
4256	**Soltan-Sary, Altyntor, Buchuk**	**Kyrgyzstan**	**stockwork-disseminated**
4135	Bau, Tai Parit	Malaysia	
313	**Kalana**	**Mali**	**turbidite-hosted vein**
315	**Loulo**	**Mali**	**turbidite-hosted vein**
322	**Sadiola, Sadiola Hill**	**Mali**	**skarn**
323	**Syama**	**Mali**	**qtz-cb shear-zone-related**
4219	**Morila**	**Mali**	**turbidite-hosted vein**
4260	**Yatela**	**Mali**	**qtz-cb shear-zone-related**
585	**Tayoltita**	**Mexico**	**low-sulphidation**
944	Guadalupe	Mexico	
2120	**Metates**	**Mexico**	**Au-Cu sulphide-rich vein**

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2207	**Bermejal, Mezcala**	**Mexico**	**skarn**
3218	**Guanajuato**	**Mexico**	**low-sulphidation**
3219	**Pachuca, Real del Monte**	**Mexico**	**low-sulphidation**
3220	**La Natividad**	**Mexico**	**low-sulphidation**
3224	La Reyna	Mexico	
4125	**El Oro district, Rafael, Verde**	**Mexico**	**low-sulphidation**
4126	San Francisco	Mexico	
4127	**La Colorada, Creston, Minas Prietas**	**Mexico**	**low-sulphidation**
4128	**Mulatos, Escondida**	**Mexico**	**high-sulphidation**
4147	Santa Gertrudis	Mexico	
4203	**La Herradura**	**Mexico**	**qtz-cb shear-zone-related**
4221	**Dolores**	**Mexico**	**low-sulphidation**
2099	Bumbat Gold Fields	Mongolia	
4265	**Boroo**	**Mongolia**	**batholith-associated vein**
4117	Tiouit	Morocco	
4118	Iourien, Akka	Morocco	
4040	Phayaung Taung	Myanmar	
4269	**Navachab**	**Namibia**	**skarn**
3195	Macraes, Round Hill	New Zealand	
3196	**Waihi**	**New Zealand**	**low-sulphidation**
3198	**Thames**	**New Zealand**	**low-sulphidation**
3199	Karangahake	New Zealand	
4159	Komata	New Zealand	
1146	La Libertad	Nicaragua	
4044	El Limon, Talavera	Nicaragua	
4045	**La India**	**Nicaragua**	**low-sulphidation**
4046	**Bonanza**	**Nicaragua**	**low-sulphidation**
4047	La Reina, Matagalpa	Nicaragua	
4048	**La Luz, Siuna**	**Nicaragua**	**skarn**
2109	Koma Bangou	Niger	
2110	Sefa Nangue	Niger	
4141	**Samira**	**Niger**	**stockwork-disseminated**
3229	Bidjovagge	Norway	
2124	Santa Rosa	Panama	
4056	Santa Rosa	Panama	
2130	**Porgera**	**Papua New Guinea**	**low-sulphidation**
2131	Kulumadau	Papua New Guinea	
2132	Busai	Papua New Guinea	
2133	**Misima**	**Papua New Guinea**	**low-sulphidation**
2134	Wau	Papua New Guinea	
2135	**Kerimenge**	**Papua New Guinea**	**low-sulphidation**
2136	**Hidden Valley**	**Papua New Guinea**	**low-sulphidation**
2137	Tolukuma	Papua New Guinea	
2138	Wapolu	Papua New Guinea	
2139	**Ladolam, Lihir**	**Papua New Guinea**	**undetermined**
4160	Nena;Frieda River	Papua New Guinea	
4162	Wafi River	Papua New Guinea	
4216	OK Tedi;Mount Fubilan	Papua New Guinea	porphyry gold
1501	Orcopampa	Peru	
4136	**Yanacocha**	**Peru**	**high-sulphidation**
4201	**Pierina**	**Peru**	**high-sulphidation**
4213	**Tambo Grande**	**Peru**	**gold-rich VMS**

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8008	Alto Chicama	Peru	high-sulphidation
4138	**Lepanto, Enargite, Far South East, Victoria**	**Philippines**	**high-sulphidation**
4139	**Baguio, Kelly, Baco, Antamok, Acupan**	**Philippines**	**low-sulphidation**
4165	Co-o	Philippines	
4166	Hijo	Philippines	
4167	Marian	Philippines	
4168	Masara	Philippines	
4169	Nalesbitan	Philippines	
4170	Paracale	Philippines	
4171	Placer	Philippines	
4172	Siana	Philippines	
8009	Dinkidi	Philippines	porphyry gold
2176	Medden	Republic of Yemen	
2140	**Rosia Montana, Verespatak**	**Romania**	**low-sulphidation**
2141	**Baia Sprie**	**Romania**	**low-sulphidation**
2142	Sasar	Romania	
1777	**Mutnovsky, Mutnovskoe**	**Russia**	**low-sulphidation**
1778	**Asacha, Asachinsky, Asachinskoe**	**Russia**	**low-sulphidation**
1779	**Dukat**	**Russia**	**low-sulphidation**
1780	Svetloye	Russia	
1781	**Natalka, Matrosov, Omchak, Pavlik**	**Russia**	**turbidite-hosted vein**
1782	**Karamken**	**Russia**	**low-sulphidation**
2097	**Taseevo, Taseevskoe, Balei**	**Russia**	**low-sulphidation**
3210	**Ametistovoye**	**Russia**	**low-sulphidation**
4027	**Zun-Holba, Zun-Kholba**	**Russia**	**qtz-cb shear-zone-related**
4028	**Kubaka**	**Russia**	**low-sulphidation**
4029	**Rodnikovy, Rodnikovoe**	**Russia**	**low-sulphidation**
4030	**Pokrovskoye, Pokrovskiy**	**Russia**	**low-sulphidation**
4031	**Berezovskoe, Beresovsk, Berezovka**	**Russia**	**qtz-cb shear-zone-related**
4032	**Vorontsovkoe**	**Russia**	**Carlin type**
4033	**Kochkar, Uspensky**	**Russia**	**qtz-cb shear-zone-related**
4034	**Darasun**	**Russia**	**qtz-cb shear-zone-related**
4035	Kariisk	Russia	
4036	Shirokaya	Russia	
4206	**Julietta, Dzhul'etta**	**Russia**	**low-sulphidation**
4207	**Nezhdaninskoye**	**Russia**	**stockwork-disseminated**
4208	**Aginskoe, Aginskaya**	**Russia**	**low-sulphidation**
4224	**Olimpiada, Olimpiadninskoe**	**Russia**	**turbidite-hosted vein**
4225	**Sukhoi Log**	**Russia**	**turbidite-hosted vein**
4226	**Verninskoe**	**Russia**	**turbidite-hosted vein**
4227	**Golets Vysochaishiy, Vysochaishee**	**Russia**	**turbidite-hosted vein**
4228	**Chertovo Koryto**	**Russia**	**turbidite-hosted vein**
4229	**Maiskoe, Mayskoye**	**Russia**	**turbidite-hosted vein**
4230	**Karalveem**	**Russia**	**qtz-cb shear-zone-related**
4231	**Kyuchus**	**Russia**	**turbidite-hosted vein**
4232	**Shkolnoe**	**Russia**	**qtz-cb shear-zone-related**
4233	**Khakandzha, Khakandzhinskoe**	**Russia**	**low-sulphidation**
4234	**Tas-Yuryakh**	**Russia**	**Carlin type**
4235	**Tokur, Tokurskoe**	**Russia**	**stockwork-disseminated**
4236	**Mnogovershinnoe**	**Russia**	**low-sulphidation**

4237	**Ozernovskoe**	**Russia**	**low-sulphidation**
4238	**Klyuchevskoe, Klyuchi**	**Russia**	**batholith-associated vein**
4239	**Ukoninskoe**	**Russia**	**low-sulphidation**
4240	**Sovetskoe**	**Russia**	**turbidite-hosted vein**
4241	**Lunnoe, Arylakh, Lunny**	**Russia**	**low-sulphidation**
4242	**Kommunarovskoe**	**Russia**	**qtz-cb shear-zone-related**
4243	**Saralinskoe**	**Russia**	**qtz-cb shear-zone-related**
4246	**Svetlinskoe**	**Russia**	**qtz-cb shear-zone-related**
4247	**Evenskoe**	**Russia**	**low-sulphidation**
4248	**Konstantinovskoe, Olkhovskoe, Medvezhie**	**Russia**	**batholith-associated vein**
4257	**Kuranakh**	**Russia**	**Carlin type**
2177	Ash Shakhtaliah	Saudi Arabia	
2178	Sukhaybarat	Saudi Arabia	
2179	**Mahd Adh Dhahab**	**Saudi Arabia**	**low-sulphidation**
2181	Al Hajar	Saudi Arabia	
2100	Cononish	Scotland	
321	Sabodala	Senegal	
4130	**Kremnica**	**Slovakia**	**low-sulphidation**
2186	**Sheba**	**South Africa**	**qtz-cb shear-zone-related**
2187	**Fairview**	**South Africa**	**qtz-cb shear-zone-related**
2188	**New Consort**	**South Africa**	**qtz-cb shear-zone-related**
2189	Agnes	South Africa	
2192	Fortuna	South Africa	
2193	Pioneer	South Africa	
2195	**Welkom, Orange Free State**	**South Africa**	**paleoplacer**
2196	**Klerksdorp**	**South Africa**	**paleoplacer**
2197	**Carletonville, West Wits Line**	**South Africa**	**paleoplacer**
2198	**West Rand**	**South Africa**	**paleoplacer**
2199	**Central Rand**	**South Africa**	**paleoplacer**
2200	**East Rand**	**South Africa**	**paleoplacer**
2201	**Evander, Far East Rand**	**South Africa**	**paleoplacer**
3230	Barberton	South Africa	qtz-cb shear-zone-related
4137	Suian	South Korea	
1797	**El Valle, Boinas**	**Spain**	**skarn**
1798	Boinas	Spain	
1799	Filon Sur	Spain	
4144	Carles	Spain	
3201	Kamoeb	Sudan	
3202	**Hassai**	**Sudan**	**gold-rich VMS**
4222	**Gross Rosebel**	**Suriname**	**qtz-cb shear-zone-related**
2194	Pigg's Peak	Swaziland	
3197	**Boliden**	**Sweden**	**gold-rich VMS**
3204	Bjorkdal	Sweden	
3205	Akerberg	Sweden	
3221	Zuifang	Taiwan	
3222	**Chinkuashih**	**Taiwan**	**high-sulphidation**
2098	Aprelevka	Tajikistan	
4018	Burgunda	Tajikistan	
4019	**Jilau, Zeravshan**	**Tajikistan**	**stockwork-disseminated**
4020	**Taror, Zeravshan**	**Tajikistan**	**skarn**
4021	Chore, Zeravshan	Tajikistan	

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4131	Lupa	Tanzania	
4132	**Bulyanhulu**	**Tanzania**	**qtz-cb shear-zone-related**
4133	**Geita, Nyankanga, Lone Cone, Ridge 8**	**Tanzania**	**Homestake (BIF-hosted)**
8002	North Mara, Nyabirama	Tanzania	
4220	**Kisladag**	**Turkey**	**porphyry gold**
4022	**May, Mayskoye, Maiske**	**Ukraine**	**qtz-cb shear-zone-related**
4023	Klintzov	Ukraine	
4024	Rakhov, Saulyak	Ukraine	
4025	Beregovo, Mushievo, Kuklyan	Ukraine	
4026	Chertomlykh shear zone, Balka Shirokaya	Ukraine	
307	Ropes	United States	
2202	**Alaska-Juneau**	**United States**	**qtz-cb shear-zone-related**
2203	**Treadwell**	**United States**	**qtz-cb shear-zone-related**
3005	American Girl, Cargo Muchaco	United States	
3008	Aurora	United States	
3011	**Bald Mountain**	**United States**	**Carlin type**
3013	Barite Hill	United States	
3014	Barneys Canyon	United States	
3016	**Fortitude-Surprise, Battle Mountain Complex**	**United States**	**skarn**
3017	Beal Mountain	United States	
3018	**Beartrack**	**United States**	**porphyry gold**
3020	Belmont	United States	
3021	Big Springs ;Sammy Creek	United States	
3023	Black Pine	United States	
3024	Blackfoot;Big Blackfoot	United States	
3027	Brewer	United States	
3030	**Bullfrog**	**United States**	**low-sulphidation**
3031	Cactus	United States	
3033	**Cannon Mine**	**United States**	**low-sulphidation**
3039	**Castle Mountain**	**United States**	**low-sulphidation**
3042	Colosseum	United States	
3043	Comstock District	United States	
3045	Congress	United States	
3046	Copperstone	United States	
3047	Cortez	United States	
3048	**Cripple Creek District**	**United States**	**breccia pipe**
3049	**Crofoot/Lewis, Hycroft**	**United States**	**hot spring (low-sulphid.)**
3052	**Dee, Storm, Rossi**	**United States**	**Carlin type**
3053	**DeLamar**	**United States**	**low-sulphidation**
3056	Dixie Comstock	United States	
3059	Elk City Deposits	United States	
3060	**Florida Canyon**	**United States**	**low-sulphidation**
3062	**Wharf Mine**	**United States**	**manto**
3065	**Genesis/Blue Star**	**United States**	**Carlin type**
3066	**Getchell**	**United States**	**Carlin type**
3067	**Gilt Edge, Dakota Maid**	**United States**	**porphyry gold**
3068	Gold Bar	United States	
3070	**Gold Quarry, Maggie Creek**	**United States**	**Carlin type**
3071	Golden Reward, Double Standard	United States	
3072	**Golden Sunlight**	**United States**	**breccia pipe**

3074	Goldstrike (Utah)	United States	
3075	**Goldstrike (Nevada)**	**United States**	**Carlin type**
3080	**Greens Creek**	**United States**	**gold-rich VMS**
3081	Grouse Creek	United States	
3082	Haile	United States	
3083	**Hayden Hill**	**United States**	**low-sulphidation**
3084	Western Hog Ranch	United States	
3085	**Homestake**	**United States**	**Homestake (BIF-hosted)**
3087	**Ivanhoe-Hollister**	**United States**	**hot spring (low-sulphid.)**
3088	**Jamestown**	**United States**	**qtz-cb shear-zone-related**
3090	**Jerritt Canyon**	**United States**	**Carlin type**
3091	Kendall	United States	
3095	Leadville	United States	
3097	**Lone Tree Total, Stonehouse**	**United States**	**low-sulphidation**
3102	**Marigold**	**United States**	**Carlin type**
3105	**McCoy-Cove**	**United States**	**skarn**
3106	**McLaughlin**	**United States**	**hot spring (low-sulphid.)**
3107	**Meikle, Purple Vein**	**United States**	**Carlin type**
3108	**Mercur**	**United States**	**Carlin type**
3109	**Mesquite**	**United States**	**low-sulphidation**
3110	Mineral Hill	United States	
3111	Montana Tunnels	United States	
3114	Mount Hamilton	United States	
3116	**Carlin, Hardie Footwall**	**United States**	**Carlin type**
3118	North Star, Star Light	United States	
3119	**Ortiz, Cunningham Hill**	**United States**	**breccia pipe**
3121	**Paradise Peak**	**United States**	**high-sulphidation**
3122	Pete	United States	
3123	Picacho	United States	
3125	Pine Tree	United States	
3126	**Pinson-Preble**	**United States**	**Carlin type**
3128	Plumas	United States	
3131	**Quartz Mountain**	**United States**	**hot spring (low-sulphid.)**
3132	**Twin Creeks**	**United States**	**Carlin type**
3133	Rain	United States	
3134	**Randsburg**	**United States**	**low-sulphidation**
3135	**Denton-Rawhide**	**United States**	**low-sulphidation**
3137	Republic, Knob Hill, Golden Province	United States	
3138	Richmond Hill	United States	
3139	**Ridgeway**	**United States**	**stockwork-disseminated**
3142	Rochester	United States	
3144	**Round Mountain, Smoky Valley**	**United States**	**low-sulphidation**
3145	Royal Mountain King	United States	
3147	Ruby	United States	
3149	San Luis	United States	
3151	Santa Fe	United States	
3156	**Sleeper**	**United States**	**low-sulphidation**
3160	Stibnite	United States	
3169	Tusc	United States	
3171	United Western	United States	
3176	Willard	United States	
3177	Wind Mountain	United States	

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3178	Winrock	United States	
3180	Yankee	United States	
3181	Yarnell	United States	
3187	**Zortman-Landusky**	**United States**	**low-sulphidation**
3190	Mammoth	United States	
3191	Eureka Standard	United States	
3192	North Lily	United States	
3193	Trixie	United States	
3194	**Crown Jewel, Buckhorn Mountain**	**United States**	**skarn**
3203	**Grass Valley District**	**United States**	**qtz-cb shear-zone-related**
3206	**Mother Lode System**	**United States**	**qtz-cb shear-zone-related**
3207	Willow Creek;Independence;Gold Cord	United States	
3208	Cleary Hill, Gold Summit, Newsboy, Cleary Summit	United States	
3209	Chichagof Island	United States	
3211	**True North, Hindenburg East zone**	**United States**	**stockwork-disseminated**
3212	Ryan Lode, Ester dome	United States	
3213	**Fort Knox**	**United States**	**porphyry gold**
3214	**Kensington**	**United States**	**qtz-cb shear-zone-related**
3215	Illinois Creek	United States	
3216	Nixon Fork	United States	
3217	**Alleghany District**	**United States**	**qtz-cb shear-zone-related**
4066	**Ken Snyder, Midas, Rex Grande**	**United States**	**low-sulphidation**
4067	Sterling	United States	
4068	Northumberland	United States	
4069	Windfall	United States	
4070	**Tonkin Springs, Oxide zone**	**United States**	**Carlin type**
4071	Horse Canyon	United States	
4072	Buckhorn	United States	
4073	**Bootstrap, Capstone, Tara**	**United States**	**Carlin type**
4074	**Pipeline, Cortez Joint Venture**	**United States**	**Carlin type**
4075	Gold Acres	United States	
4076	Robertson, Tenabo, Gold Quartz	United States	
4077	Relief Canyon	United States	
4078	**Coeur Rochester, Nenzel Hill**	**United States**	**low-sulphidation**
4079	Talapoosa, Main Zone, Bear Creek Zone	United States	
4080	**Comstock**	**United States**	**low-sulphidation**
4082	Mount Hamilton, Seligman, Centennial	United States	
4083	**Archimedes, Ruby Hill**	**United States**	**Carlin type**
4084	Alligator Ridge, Vantage, Casino, Winrock	United States	
4085	**Tonopah**	**United States**	**low-sulphidation**
4086	Daisy, Mother Lode	United States	
4087	**Aurora, Chesco**	**United States**	**low-sulphidation**
4088	**Goldfield**	**United States**	**high-sulphidation**
4089	Star Pointer	United States	
4094	**Bodie**	**United States**	**hot spring (low-sulphid.)**
4095	Creede	United States	
4096	Summitville	United States	
4097	Lake City	United States	
4098	Bonanza	United States	
4099	Sunnyside	United States	

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4100	**Idarado**	**United States**	**low-sulphidation**
4101	**Camp Bird**	**United States**	**low-sulphidation**
4102	Shenandoah-Dives	United States	
4103	Kearsarge;Virginia City	United States	
4104	**Donlin Creek, Carolyn, Snow, Queen, Rochelieu**	**United States**	**low-sulphidation**
4105	Chicken Mountain	United States	
4106	Vindsdale Mountain, Central Zone	United States	
4107	Melco	United States	
4108	Padre y Madre	United States	
4110	Platoro	United States	
4111	Atlanta	United States	
4112	Cresson, Globe Hill, Ironclad Hill	United States	
4113	Carissa	United States	
4114	**New World, Homestake**	**United States**	**skarn**
4174	**Ruby Hill, Fad Shaft**	**United States**	**manto**
4210	**Pogo**	**United States**	**porphyry gold**
4262	**Goldbug, Rodeo**	**United States**	**Carlin type**
8004	Kettle River	United States	
1775	**Muruntau, Myutenbai**	**Uzbekistan**	**stockwork-disseminated**
4015	**Daugyztau, Vysokovoltnoe**	**Uzbekistan**	**turbidite-hosted vein**
4016	**Amantaitau**	**Uzbekistan**	**turbidite-hosted vein**
4017	**Zarmitan**	**Uzbekistan**	**qtz-cb shear-zone-related**
4251	**Kokpatas**	**Uzbekistan**	**gold-rich VMS**
4252	**Almalkyk**	**Uzbekistan**	**porphyry gold**
4255	**Angren, Kochbulak, Kairagach**	**Uzbekistan**	**low-sulphidation**
308	**Las Cristinas**	**Venezuela**	**stockwork-disseminated**
570	Botanamo	Venezuela	
571	La Camorra	Venezuela	
572	Laguna	Venezuela	
573	Mina Colombia	Venezuela	
575	Mocupia	Venezuela	
576	Peru	Venezuela	
577	Sosa Mendez	Venezuela	
580	**El Callao**	**Venezuela**	**qtz-cb shear-zone-related**
2114	Albino	Venezuela	
4037	**Pac Lang**	**Viet Nam**	**turbidite-hosted vein**
4038	**Bong Mieu, Nui Kem**	**Viet Nam**	**batholith-associated vein**
4039	Na Pai	Viet Nam	
296	**Kilo-Moto**	**Zaire**	**qtz-cb shear-zone-related**
328	Antelope	Zimbabwe	
329	**Arcturus**	**Zimbabwe**	**stockwork-disseminated**
330	Ayrshire, Last Shot	Zimbabwe	
331	B and S, Motapa	Zimbabwe	
332	Bell-Riverlea	Zimbabwe	
333	Big Ben	Zimbabwe	
334	Brompton	Zimbabwe	
335	Bushtick	Zimbabwe	
336	**Cam, Motor**	**Zimbabwe**	**qtz-cb shear-zone-related**
337	Camperdown	Zimbabwe	
338	Commoner, Welcome Back	Zimbabwe	
339	Connemara	Zimbabwe	

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340	**Dalny**	**Zimbabwe**	**qtz-cb shear-zone-related**
341	Eiffel Blue	Zimbabwe	
342	Eldorado	Zimbabwe	
343	Falcon	Zimbabwe	
344	Fred	Zimbabwe	
345	Freda	Zimbabwe	
346	**Freda-Rebecca**	**Zimbabwe**	**porphyry gold**
347	Gaika	Zimbabwe	
348	Geelong	Zimbabwe	
349	Giant	Zimbabwe	
350	**Globe and Phoenix**	**Zimbabwe**	**qtz-cb shear-zone-related**
351	**Golden Valley**	**Zimbabwe**	**qtz-cb shear-zone-related**
352	How	Zimbabwe	
353	Inez	Zimbabwe	
354	Invincible	Zimbabwe	
355	Jena	Zimbabwe	
356	Jessie	Zimbabwe	
357	Kanyemba	Zimbabwe	
358	Prince of Wales, Phoenix Prince	Zimbabwe	
359	**Lonely**	**Zimbabwe**	**qtz-cb shear-zone-related**
360	Marvel	Zimbabwe	
361	**Mazoe, Mazowe**	**Zimbabwe**	**qtz-cb shear-zone-related**
362	Muriel	Zimbabwe	
363	Old Nic	Zimbabwe	
364	Owl	Zimbabwe	
365	Pickstone	Zimbabwe	
366	Piper Moss	Zimbabwe	
367	Queens Group	Zimbabwe	
368	Renco	Zimbabwe	
369	Rezende	Zimbabwe	
370	**Shamva**	**Zimbabwe**	**qtz-cb shear-zone-related**
371	Sherwood Starr	Zimbabwe	
372	Sunace	Zimbabwe	
373	Surprise	Zimbabwe	
374	Tafuna Hill Group	Zimbabwe	
375	Tebekwe	Zimbabwe	
376	Teutonic	Zimbabwe	
377	Thistle Etna	Zimbabwe	
378	True Blue	Zimbabwe	
379	Turk	Zimbabwe	
380	Vubachikwe	Zimbabwe	
381	**Wanderer**	**Zimbabwe**	**Homestake (BIF-hosted)**
382	What Cheer	Zimbabwe	
2105	**Blanket**	**Zimbabwe**	**qtz-cb shear-zone-related**

Deposits in **bold script** have been described in the database and have a corresponding summary (see Appendix 2).

Appendix 2: Deposit Summaries

Appendix 2

ALGERIA

4041 Amesmessa is a Late Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with 34 metric tons of gold in resources. It is located in the Amesmessa mining district within the Pharusian Belt, Touareg Shield, Hoggar Shield, Algeria. The Hoggar shear zone, a NS-trending crustal-scale, ductile dextral strike-slip fault-shear zone of Late Pan African age and is the major regional tectonic structure in the area. The shear zone is located at the contact between the Archean In Ouzzal block and Proterozoic gneisses and diorites. Quartz vein mineralization is hosted by upper greenschist grade ultramylonite and mylonites of the Hoggar shear zone, which are thought to represent tectonized felsic dykes and rocks. Gangue mineralogy of the veins consists mainly of quartz, with minor sericite, Ti-oxides and Fe-hydroxides. Ore mineralogy is dominated by pyrite, with minor galena, chalcopyrite and sphalerite. There are two types of veins, high-grade laminated N-S veins and late, lower-grade banded E-W veins. The N-S veins are controlled by NS-trending dextral strike-slip shear zones, splays of the Hoggar shear zone. The E-W veins are found in EW-trending extension fractures compatible with the development of the N-S shears. Hydrothermal alteration is zoned around the veins, with an intense carbonatization represented by a carbonate-sericite-albite-quartz-pyrite assemblage in which Mg/Fe increases sharply toward the vein. Minor sericitization of the mylonitic rocks reflected by a sericite-pyrite assemblage is associated with the E-W veins. The metallic signature of the bulk of the ore is Au-Ag-Ba-Pb-Bi-Cu-Zn-Co-Ni-Cr- Th, a weak Li-Sn-W-Sb-Hg signatures suggests a possible genetic relationships with felsic rocks.

ARGENTINA

1504 Bajo de la Alumbrera is a Late Miocene, intrusion-related porphyry Au-Cu deposit with a total gold content of 302 metric tons. It is located in the Sierra Pampeanas, Andean Cordillera, northwest Argentina. Two NE-trending, regional right-lateral lineaments, the Hualfin and Aconquija Lineaments, may have localized volcanism and mineralization in tensional fractures between them. Quartz vein, stockwork and disseminated sulphide mineralization is hosted mainly by altered andesite flows and breccias of the Late Miocene Farallon Negro volcanic complex and within probably comagmatic porphyritic tonalite. Quartz and anhydrite are the main gangue minerals. Ore mineralogy is made up of pyrite, chalcopyrite and magnetite. NE-trending shears locally controlled the distribution of early-stage alteration and mineralization. Hydrothermal alteration is concentrically zoned, with an inner core of intense silicification characterized by pervasive quartz and magnetite. The silicified zone is surrounded by a potassic alteration zone with quartz-orthoclase-biotite selvages in the tonalite and massive biotite-anhydrite-orthoclase in the andesites. The gold mineralization is proportional to the intensity of the potassic alteration. An outer halo of propylitic alteration of chlorite-epidote-calcite surrounds the potassic alteration. Phyllic alteration (quartz-sericite-pyrite) overprints and surrounds the potassic alteration zone. The metallic signature of the bulk of the ore is not available.

4116 Cerro Vanguardia is a Late Jurassic to Early Cretaceous, low-sulphidation epithermal Au-Ag deposit with a total gold content of 100 metric tons. It is located in the Cerro Vanguardia district of the Deseado Massif, Andean Cordillera, Patagonia, Argentina. NW- and NE-trending faults of the Tranquilo and Bajo Grande Systems are the dominant regional tectonic structures in the area. The deposit is on the border of a circular feature seen on satellite images, which suggest a possible relationship to caldera-bounding structures. A large system of colloform, banded and crustiform quartz vein and stockwork mineralization is hosted by Late Jurassic rhyolite and ignimbrite of the Chon Aike Formation. Flat-lying replacement mineralization, most probably corresponding to sinter zones, is hosted within felsic agglomerates of the La Matilde Formation. Gangue mineralogy is dominated by quartz and chalcedony, with minor adularia, amethyst, barite, rhodocrosite and siderite. Electrum and argentite are the dominant ore minerals, with minor copper sulphosalts, pyrite, arsenopyrite and galena. Structural control on the veins is exerted by WNW- to NW-trending and NE-trending, steeply-dipping faults related to the two regional systems. Argillic alteration (kaolinite-montmorillonite-illite), sericitization and propylitic alteration extends up to a few tens of metres adjacent to quartz veins. Silicification is pervasive in the replacement orebodies. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Pb-Ba-Mn.

4200 Veladero is a Middle(?) Miocene, high-sulphidation epithermal Au-Ag deposit with a total gold content of 345 metric tons. It is located in the El Indio mining district, El Indio precious metal Belt, Andean Cordillera, Argentina. The major regional tectonic structure in the area is the Banos del Toro Fault, a N-S trending, high-angle reverse fault active about 15 Ma ago at the boundary between the granitoid basement and a Tertiary graben. Quartz vein, hydrothermal breccia and disseminated sulphide mineralization is hosted by diatreme breccias, ignimbrites and andesites of the Late Oligocene to Early Miocene Dona Ana Formation. A strong structural control is present over the orebodies and related alterations. NW-striking fractures such as the Fractura Tagua and their intersections with the Tambo-Veladero Sur and Veladero Norte fracturas which are NNE-striking faults are the most important structural sites for ore localization. Hydrothermal alteration is zoned and consists of an inner massive silicic alteration core of vuggy silica, surrounded by an advanced argillic alteration zone of silica-alunite-pyrophyllite-dickite, which in turn is surrounded by an argillic alteration halo of kaolinite. The metallic signature of the bulk of the ore is not available.

<u>ARMENIA</u>

4209 Zod is an Oligocene to Early Miocene, deep low-sulphidation epithermal gold deposit with a total gold content of 20 metric tons. It is located in the Zod-Agduzdag ore field within the western end of the Kel'badzhar trough, Sevan-Akerinskaya zone, Lesser Caucasus, eastern Armenia. The deposit is located at the intersection of WNW- to NW-trending, deep fault delineating an ophiolite belt with NS-trending large regional faults. Quartz-carbonate veins and related disseminated sulphides are hosted by prehnite-pumpellyite grade, altered Late Cretaceous gabbronorite and ultramafic rocks (harzburgite, dunite, serpentinite), and within Late Eocene to Oligocene subvolcanic granite and granodiorite plutons and intersecting quartz diorite dykes. Gangue mineralogy is dominated by quartz, with lesser calcite, rhodochrosite and siderite. Ore mineralogy is dominated by pyrite and arsenopyrite with abundant loellingite, pyrrhotite, sphalerite, chalcopyrite, tetrahedrite, tennantite, boulangerite, bournonite, galena and tellurides (krennerite, sylvanite, nagyagite, altaite, melonite, calaverite, hessite, petzite), lesser tellurobismuthite, jamesonite, tetradymite, bismuthinite and stibnite, and minor geocronite, cinnabar, polydimite, cobaltite, millerite, rammelsbergite and stannite. Mineralization is structurally controlled by WNW- to NW-trending faults which also controlled emplacement of mafic-ultramafic rocks, and by NS-trending faults which controlled the emplacement of granitoid dykes and plutons. Intrusive contacts between the gabbroic and ultramafic rocks, and the contacts along the quartz diorite dykes intruded in gabbro also controlled the distribution of the mineralization, with the former often being preferentially mineralized. Hydrothermal alteration consists of vein haloes of liswenite (carbonate) alteration (quartz-carbonate-talc-sericite-montmorillonite-pyrophyllite-phengite) in the ultramafics, and of argillic kaolinite-dickite-montmorillonite-illite-sericite-chlorite alteration in the gabbroic, volcanic and granitoid rocks. Sulphidation represented by pyrite-arsenopyrite is closely associated with both alteration types. Late sericite-illite alteration is superimposed on argillic alteration along vein margins. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Pb-Te-Bi-Cu-Zn-Ni-Co-Hg. The Zod deposit represents a deeper equivalent to epithermal low-sulphidation deposits transitional between epithermal and deeper systems near the mesothermal-epithermal boundary (Smirnov, 1977).

AUSTRALIA

8 Big Bell is a controversial deposit interpreted as a Late Archean, intrusion-related, non-carbonate stockwork-disseminated Au-Ag deposit with a total gold content of 106metric tons. It is located in the Cue-Big Bell area of a narrow part of the Meekatharra-Wydgee greenstone belt, Murchison province, Yilgarn Block, Western Australia. The deposit lies within a locally overturned part of the west limb of a north-plunging D_2 regional anticline, which is the dominant tectonic structure in the area. Replacement disseminated sulphide mineralization at Big Bell is hosted by middle greenschist grade quartz-muscovite, K-feldspar and biotite schists derived from mafic and undiscriminated tuffs and mafic volcanics. Pegmatite dykes also host some mineralization. Pyrite is the dominant sulphide with lesser pyrrhotite and minor sphalerite, chalcopyrite, molybdenite, stibnite, berthierite, arsenopyrite and tetrahedrite. No major ore-related structures are evident, but late NW-trending, shallow dipping brittle faults which offset the stratigraphy have had a minor influence. Sulphidation of the schists is directly responsible for the formation of the mineralization. Pervasive sericitic alteration related to the mineralization is mostly present in K-felspar schists. Sericitic alteration in the biotite schists is also present but in restricted zones around the mineralized lenses. The muscovite and K-felspar schists also host an aluminous alteration zone with andalusite and sillimanite. This aluminous zone was attributed to metamorphism by Wilkins (1993). The pegmatite dykes have sodium metasomatism zones adjacent to their borders. The metallic signature of the bulk of the ore is Au-Ag-Cu-Ti-Zn-Mo-Sb-Ni-As-W-Sn-Cr. The genesis and timing of the Big Bell deposit relative to the metamorphism event is controversial, but U-Pb dating by Mueller *et al*. (1996) indicates that mineralization and alteration post-date peak metamorphism (80 Ma younger).

12 Boddington is a Late Archean, quartz-carbonate shear zone-hosted Au-Cu vein deposit of uncertain affinity with a total gold content of 482 metric tons. It is located in the Saddleback greenstone belt within the Western Gneiss Terrain of the Yilgarn Block, Western Australia. The Donnybrook-Bridgetown shear zone is an important regional structure and is part of a larger NW-trending lineament. Quartz veins and sulphide-rich veins and veinlets are hosted by Archean andesites, dacites and intermediate volcaniclastic rocks of the Wells Formation, fault-intruded pyroxenite dykes and a 40-meter-thick laterite cover. The early type of mineralized veins are quartz-dominant with quartz-albite-pyrite-molybdenite±clinozoisite±chalcopyrite. The second, main stage of mineralization vein type is made up of biotite-clinozoisite-actinolite-quartz-albite with pyrrhotite, chalcopyrite, galena, molybdenite and scheelite. Three phases of ductile deformation and regional metamorphism occurred prior to the mineralization and related D_4 deformation. Early veins are found in NW-trending D_1 and D_2 steeply inclined ductile dip-slip shear zones. The D_4 faults are WNW- and NW-striking, moderately- to steeply-dipping, late brittle sinistral-reverse faults intruded by synchronous pyroxenite dykes. The sulphide-rich and high-grade biotite-clinozoisite veins occur mainly within the pyroxenite dykes and adjacent altered rocks, whereas the lower-grade quartz veins are hosted mainly by volcanic and intrusive rocks and have orientations compatible with transpressive deformation along the D_4 faults. Massive actinolite alteration is restricted to the pyroxenite dykes; however locally intense actinolite veins continuous with the actinolite alteration of the dykes are locally abundant. Biotitic alteration characterized by biotite-clinozoisite±actinolite is found in wallrocks adjacent to the pyroxenite dykes and D_4 faults. It is thought to represent contact metamorphism with associated hot fluids tightly focused along the faults. The metallic signature of the bulk of the ore is Au-Cu-Ag-Mo-Bi-Te-Pb-W-Cr-Nb-Sn-Th-V. The exact classification of deposit type for Boddington is controversial. Previous authors have classified Boddington as a porphyry-related deposit genetically linked with subvolcanic 2714 to 2696 Ma intrusions, which is consistent with the metallic signature. This is however inconsistent with the structural relationships and timing of mineralization which is 30 to 80 Ma younger than the emplacement of such intrusions. Late 2611 Ma granitoids are largely unaltered and their composition incompatible with the hydrothermal fluid. Allibone *et al*. (1998) proposed that these granitoids were synchronous to post-mineralization and could have provided the thermal energy that drove the hydrothermal system. McCuaig et al. (2001) proposed an intrusion-related porphyry Au-Cu deposit type, formed by two overprinting magmatic-hydrothermal systems where the bulk of the mineralization is associated with a K-rich post-tectonic magmatic suite (such as the Wourahming monzogranite) of around 2612 Ma.

21 Coronation Hill is an undetermined type of Au-Pt-Pd±U deposit of Proterozoic age with a total gold content of 4 metric tons. It is located in the Southern Alligator Valley Mineral Field of the Central Domain, Pine Creek Inlier (Geosyncline), Northern Territory, Australia. NW-trending, upright, tight to isoclinal D_2 folds are the dominant regional structure in the area, along with NW-trending dextral strike-slip faults of the Rockhole-El Sherana-Palette fault system which postdates the D_2 folds. Au-PGE ore is made up of quartz-carbonate veins and associated disseminated sulphides hosted by Early Proterozoic quartz-feldspar porphyry intrusion, quartz diorite, tuffaceous siltstone and siliceous dolomite. U-Au-PGE ore consists of sulphide disseminations and sporadic lenses found within Early Proterozoic sedimentary breccias, shale and alteration zones around quartz-feldspar porphyry intrusions. Gangue minerals are quartz, ferroan dolomite, hematite and chlorite. Ore mineralogy is mainly pyrite with stibiopalladinite, sudburyite, Pt/Pd selenides, clausthalite, tiemannite, Ni-Co selenides, pitchblende, florencite and coffinite. Marcasite, pyrrhotite, sphalerite, chalcopyrite and galena are present in trace amounts. Mineralization is spatially associated with NNW-trending, subvertical, strike-slip shear zones and faults and their intersections. E-trending, moderately- to steeply-dipping reverse faults brought quartz-feldspar porphyry, volcaniclastic sediments and quartz diorite into contact with sedimentary breccias and carbonaceous shales. The Kombolgie unconformity also played a key role in focusing fluids. Late, ENE-striking (dextral strike-slip?) faults dislocated the orebodies. Early hydrothermal alteration of the quartz diorite and volcaniclastics resulted in chloritic alteration characterized by the assemblage of quartz-chlorite-sericite-sphene-leucoxene-pyrite.

Early alteration of the quartz-feldspar porphyry resulted in sericitization represented by the assemblage of quartz-sericite-pyrite-chlorite-carbonate-dumortierite-sphene. The chloritic and sericitic alteration was followed by pervasive hematitic alteration with development of fine-grained hematite over pyrite, except in zones of pervasive silicification related to regional cleavage formation. The oxidation phase is related to weathering and predated mineralization. Some mineralized veins developed a chloritic alteration border in U-rich zones. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Pt-Pd-U-Bi-Sb-Se-Pb-Ni-Co. Mernahg *et al.* (1994) proposed that the elements of interest were transported in a highly oxidized, low-pH and calcium-rich brine. Au-PGE ore precipitated in response to acid neutralization and moderate reduction resulting from the interactions of ore-bearing fluids with feldspathic host rocks. U-Au-PGE ore will precipitate in regions containing higher amounts of reductant, such as carbonaceous-rich units below the Kombolgie unconformity. Coronation Hill may be comparable to the"Unconformity U-Au" type of deposits found in the Athabaska Basin, Saskatchewan (Canada), where ore precipitation was related to a moving reducing front (Mernagh *et al.*, 1994.)

24 The Norseman district, foremost of which are the Crown and Mararoa reefs, are Late Archean, quartz-carbonate shear-zone-related gold deposits (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 118 metric tons. The Norseman district is located in the Norseman-Wiluna greenstone belt, Yilgarn Block, Western Australia. The Penneshaw Regional Anticline and a major NNW-trending fault corridor are the main regional tectonic structures in the area. Laminated quartz veins and associated disseminated sulphides are hosted by upper greenschist grade, tholeiitic pillowed basalt flows of the Woolyeenyer Group (the major district host) and within lesser gabbro, pyroxenite and quartz-feldspar porphyry intrusions. Quartz is the dominant gangue material, with lesser carbonate, chlorite, biotite, fuchsite, tremolite and plagioclase. Ore mineralogy is dominated by pyrite with lesser galena, sphalerite, chalcopyrite, marcasite, pyrrhotite, arsenopyrite, millerite, hessite, altaite and sylvanite. Mineralization is structurally controlled by N- to NE-striking, steep ductile or brittle-ductile reverse shears, linked by dilational zones (also hosting ore zones) related to shear propagation. Localization and propagation of the shears is constrained by heterogeneities and competency contrasts in the stratigraphic sequence such as mafic-ultramafic dykes and basalt contacts. Hydrothermally-altered rocks host high-grade ore in places but alteration is generally restricted to a few metres around the veins and shears. The type of alteration depends on the composition of the host rock. Biotitic alteration (biotite-quartz-calcite-plagioclase) is the dominant alteration of the basaltic rocks. Chloritic alteration (chlorite-calcite-quartz) is typical of ultramafic and gabbro dykes but also locally forms a narrow outer halo around the biotitic alteration. Quartz-feldspar porphyry dykes show a sericitic alteration (quartz-sericite and minor calcite). The metallic signature of the bulk of the ore is Au-Ag-As-Cu-Te-Bi.

28 The Day Dawn gold district, mined mainly from the late 1890s to the 1920s, consists of Archean, quartz-carbonate shear-zone-related gold deposits (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 50 metric tons. It is located in the Cue area of the Meekatharra-Wydgee greenstone belt, Murchison province, Yilgarn Block, Western Australia. A N-plunging synform is the main regional structure in the area. Quartz vein “reefs” and associated disseminated sulphides are hosted by the Archean Great Fingall dolerite, a low to mid-greenschist grade, poorly differentiated dolerite sill. Quartz is the dominant gangue mineral, with lesser chlorite and sericite. Ore mineralogy is dominated by arsenopyrite, pyrrhotite and pyrite, with accessory galena, sphalerite, chalcopyrite, marcasite, pyrargyrite, proustite and stephanite. The reef follows a SE-striking sinistral reverse shear zone and rarely extends beyond the borders of the dolerite sill in the surrounding sediments and mafic volcanics. Biotitic, carbonate, chlorite alteration and sulphidation accompanied the development of the reef and shearing. Some local silicification is also present. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Pb-Zn.

41 Golden Mile includes a number of deposits with a total gold content of 1821 metric tons exploited since the early 1890s. The only current producing mine is the Super Pit (which encompasses many deposits previously mined individually). Archean, quartz-carbonate shear-zone-related gold deposits (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) of the Golden Mile are located in the Kalgoorlie goldfield of the Norseman-Wiluna belt, Yilgarn Craton, Western Australia. The Golden Mile is situated along the regionally extensive NW-trending Boulder-Lefroy Fault zone near the doubly-plunging Kalgoorlie Anticline-Syncline. The NNW-trending Golden Mile fault is a dextral-reverse dip-slip D_1 fault subparallel to the western limb of the Kalgoorlie Syncline and is a splay of the Boulder-Lefroy Fault zone. Three broad types of mineralization are found in the Golden Mile. The first type and the most important volumetrically consists of quartz veins and disseminated sulphides in ductile shear zones forming sub-tabular lode zones within the Late Archean Golden Mile Dolerite and tholeiitic Paringa Basalts. The second type are telluride ores in the Paringa basalts which may be a late remobilization of the first type of ore. The last type, which accounts for about 10% of the ore, consists of a quartz stockwork in the granophyric zone of the Golden Mile Dolerite (Mount Charlotte-type of mineralization). Quartz and ankerite are the main gangue minerals in the veins, with lesser carbonates, chlorite, sericite, apatite and rutile. Ore mineralogy is mainly sulphides such as pyrite, chalcopyrite and arsenopyrite, and tellurides such as coloradoite, calaverite and krennerite. Gold mineralization is controlled primarily by four sets of ductile to brittle-ductile dextral oblique D_2 shear zones with the majority trending SSE and dipping steeply to the SW. This large and complex shear zone system is confined between the Adelaide and Golden Pike faults, which are major N- to NNW-trending dextral oblique faults. The Mount Charlotte fault set is a N- to NE-trending, steeply-dipping dextral-oblique fault set that cuts the Golden Mile fault, and hosts the economically significant “cross lodes”. The granophyric part of the Golden Mile Dolerite acted as a near-homogeneous competent unit which localized ductile deformation in shear zones, thus controlling the distribution of the mineralization. Carbonaceous sedimentary interflows within the Paringa Basalts are the main control for the telluride ore, acting as a reducing agent and an impermeable cap, thus constraining fluid pathways. Alteration is zoned around the veins, with a proximal sericitization-pyritization zone that extends up to 5 metres away and grades into a carbonate alteration zone of ankerite-quartz-muscovite-albite-siderite-pyrite up to 100 metres thick, the latter occurs mainly in the granophyric layers of the dolerite. This grades outward to a chloritic alteration zone of chlorite-calcite-ankerite-albite-paragonite-quartz-magnetite-siderite-pyrite which then fades into the regional metamorphic assemblage. Intense silicification with hematisation is also present as proximal alteration within shears and dilational breccias. The metallic signature of the bulk of the ore is Au-Ag-Cu(?)-Te-As.

44 Granny Smith is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 101 metric tons. It is located in the Laverton-Leonora area of the Laverton greenstone belt, Eastern Goldfields Province, Yilgarn Block, Western Australia. The major regional structure in the area is the Laverton Lineament, a N-trending structural corridor of parallel oblique faults. Quartz-carbonate veins and associated disseminated sulphides are hosted by the Archean Granny Smith Granodiorite, a zoned and composite diorite-granodiorite intrusion within greenschist grade greywacke and iron formation units. Composition of the Granny Smith Granodiorite ranges from quartz diorite through tonalite and granodiorite to adamellite. Ore is also hosted by quartz-feldspar porphyry dykes that crosscut quartz diorite intrusion. Ankerite and quartz are the dominant gangue minerals, with lesser albite, chlorite and sericite. Pyrite is the dominant ore mineral, with minor galena, sphalerite, chalcopyrite, pyrrhotite, molybdenite, arsenopyrite and rare tellurides. Quartz veins are found within structurally-controlled dilatant sites related to the brittle phase of NNW-trending, moderately- to steeply-dipping, ductile-brittle reverse (with a small sinistral slip component) shears localized at the granitoid/sediment contact. Early hydrothermal alteration of the intrusive rocks consists of biotitic alteration of the ferromagnesian minerals. Directly associated with the mineralized shear is a sodium metasomatic alteration of the intrusive rocks represented by the assemblage albite-sericite-hematite-ankerite-quartz-pyrite. This alteration grades into sericite-carbonate alteration (sericite-calcite/ankerite-biotite-chlorite). An underlying, leucocratic intrusion displays chlorite alteration after biotite. Quartz-rich sediments are altered to a chloritic assemblage consisting of chlorite-sericite-biotite-leucoxene, whereas feldspar-rich sediments are altered to chloritic alteration assemblage of zoisite-chlorite-sericite±pyrrhotite/pyrite. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Mo-Pb-Zn-Cu-Mo-Te.

53 Junction is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 209 metric tons. It is located in the Kambalda-St Ives area of the Norseman-Wiluna greenstone belt, Yilgarn Block, Western Australia. The major tectonic structure in the area, the Boulder-Leroy Fault System, is a regional sinistral strike-slip fault system with a dextral component. Quartz veins, associated disseminated sulphides and hydrothermal breccias are hosted by the upper greenschist grade, differentiated Junction Dolerite of Archean age, a stratigraphic equivalent of the Golden Mile Dolerite. Quartz is the dominant gangue mineral. Ore mineralogy is mainly pyrrhotite and pyrite, with lesser molybdenite, chalcopyrite, sphalerite and scheelite. The main ore controlling structure at Junction is a post-peak metamorphism, NNW-trending, low-angle, brittle-ductile thrust fault with a dextral component. Dilatant zones are best developed where a mylonite zone splays from the main fault. Hydrothermal alteration consists of an inner albitic zone of albite-ankerite/dolomite-quartz-pyrrhotite which grades outward to a thick intermediate zone of chloritic alteration (chlorite-dolomite-albite-pyrrhotite-actinolite). The biotitic zone characteristic of other Kambalda-St Ives gold deposits in the area is absent or poorly developed. The outer alteration zone consists of less intense chlorite-dolomite alteration. The metallic signature of the bulk of the ore is Au-Ag-Mo-Cu-Zn-W.

57 Lancefield is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 44 metric tons. It is located in the Margaret sector of the Laverton greenstone belt, Eastern Goldfields, Yilgarn Block, Western Australia. The Laverton Lineament, a N-trending structural corridor of parallel oblique faults and the Celia tectonic Lineament bounds the greenstone belt in the area, where the rocks are also affected by the Margaret anticline, a broad regional fold. Disseminated sulphides and quartz veins are hosted by middle greenschist grade, Archean laminated and pyritic chert and black shale beds, and to a lesser degree within pillowed flows of basalts and komatiitic basalts and some undiscriminated ultramafic volcanics of olivine peridotite to dunite composition. Disseminated sulphides are mainly pyrite and pyrrhotite with lesser arsenopyrite, occurring in wispy or anastomosing aggregates subparallel to, but not conformable with bedding. Veins and cherty units consist of pyrite, pyrrhotite, arsenopyrite, scheelite, chalcopyrite and sphalerite in a gangue of quartz, chlorite, dolomite, calcite and graphite. The Footwall Contact fault is a N-trending, moderately-dipping, dextral shear zone at the contact of the ultramafic volcanics and the komatiitic basalt sequence, and constitutes a prominent fluid channelway. The quartz veins are transposed with the foliation, indicating post-ore deformation and making it difficult to differentiate between veins and silicified sediments. Silicification and sulphidation have affected the sediments. Intense talc-chlorite-carbonate alteration is found along the Footwall Contact fault and in the basaltic rocks. The metallic signature of the bulk of the ore is Au-Ag-As±W.

61 Morning Star/Evening Star mining complex is an Archean(?) quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 35 metric tons. It is located in the Mount Magnet district of the Mount Magnet greenstone belt, Murchison province, Yilgarn Block, Western Australia. The N-trending Mount Magnet-Reedy's Line Shear Zone and the Boogardie Synform are the main regional tectonic structures in the area. Quartz and quartz-carbonate veins and associated disseminated sulphides are hosted by Archean, greenschist grade tholeiithic basalts, felsic volcanic rocks and schists (from volcanic rocks). Quartz and carbonate (ankerite) are the dominant gangue minerals, with subordinate tourmaline and sericite. Ore mineralogy is dominated by pyrite, with subordinate molybdenite, stibnite and pyrrhotite, and with minor (in no particular order) altaite, arsenopyrite, boulangerite, bournonite, chalcopyrite, coloradoite, galena, gersdorfitte, hessite, marcasite, melonite, petzite, scheelite, sphalerite and tetrahedrite. The deposit lies on the western limb of the steeply S-plunging F_2 Morning Star antiform. Mineralized veins are structurally controlled by the NNE-trending, dextral strike-slip Golden Stream fault, part of the NNE-trending fault set informally called the “Boogardie breaks”. Quartz-carbonate veins are also controlled by NW-trending faults and shears and occur within the shears, or in close relation to them. The mineralized veins are characteristically folded and deformed extension veins (tension gashes) parallel to the F_2 foliation, and were formed either early during D_2 deformation (crustiform carbonate-quartz-scheelite viens), or syn-D_3 (quartz-carbonate-molybdenite-pyrite-scheelite-minor sulphides and tellurides veins). Hydrothermal alteration consists of regional carbonatization affecting mainly the volcanic rocks. Ore-related alteration consists of a proximal, 0.2 m-wide sericitization (sericite-pyrite) of the veins selvages. In other places, alteration is represented by a sericitic sericite-pyrite-carbonate±epidote alteration assemblage extending to 1 m from the veins. Supergene argillic alteration (sericite-kaolinite) affects the schist zones down to 80 meters depth. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Mo-Sb-B-Te-As-Pb-Cu-Zn.

62 Mount Charlotte is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 125 metric tons. It is located in the Kalgoorlie gold field within the Norseman-Wiluna greenstone belt, Yilgarn Block, Western Australia. The Kalgoorlie Syncline is a doubly-plunging anticline-syncline pair and a dominant regional tectonic structure. The deposit is situated along the Golden Mile fault, a nearby dextral strike-slip splay fault of the regional Boulder-Lefroy Fault Zone. Mineralization occurs within the Golden Mile Dolerite, a layered and differentiated tholeiitic dolerite sill of middle greenschist facies. The granophyric unit (i.e. the most differentiated unit) of the dolerite sill hosts most of the ore. Some steeply-dipping felsic porphyry dykes crosscut the dolerite sill and are also mineralized. Orebodies consist of stockworks of quartz veins with associated disseminated sulphides in the selvages. Quartz is the dominant gangue mineral, with lesser calcite, ankerite, sericite and chlorite. Ore mineralogy consists mainly of pyrite and pyrrhotite, with lesser tellurides, sphalerite, galena, chalcopyrite, scheelite and molybdenite. Two vein orientations within the stockworks are apparent, a steep NW-dipping set and a flat, shallow NW- to N-dipping set. The orebodies are located within fault-bounded blocks delimitated by the Charlotte fault set and the Flanagan fault set which consists of N-S-trending, steeply-dipping to vertical, oblique-dextral strike-slip faults and W- to SW-dipping, brittle-ductile reverse shears and faults, respectively. These structures were active prior to the mineralizing event and reactivated afterward but were not significant channelways for the mineralizing fluids. Rare, NE-dipping shear zones were, however, active during mineralization and evident channelways. Ore fluid movement was dominantly along extension or extensional-shear hydraulic fractures related to the stress regime induced by the reactivation of the faults within the more brittle granophyric unit. Alteration is zoned around the veins with an inner bleached zone of sericitic alteration (quartz-sericite-albite-ankerite-leucoxene-pyrite-pyrrhotite) and an outer, almost regional carbonatization characterized by a chlorite-calcite-albite-quartz-magnetite assemblage. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Te-W-Mo-Zn-Pb-Cu.

66 Hill 50 is an Early Proterozoic iron formation-hosted vein and disseminated (Homestake type) Au deposit with a total gold content of 127 metric tons. It is located in the Mount Magnet district of the Mount Magnet greenstone belt, Murchison province, Yilgarn Block, Western Australia. The Mount Magnet-Reedy's Line Shear Zone, a regional shear zone, and the Boogardie Synform are the main regional tectonic structures in the area. Mineralization is hosted by rocks of the Archean Sirdar Formation; BIF replacement zones are found in greenschist grade banded and brecciated oxide and carbonate facies iron formation, quartz-carbonate veins are hosted by greenschist grade iron formation and extend into enclosing tholeiitic basalts and ultramafic volcanics. Where they intersect iron formation, quartz-feldspar porphyry dykes contain auriferous disseminated sulphide mineralization. Ore zones at the Hill 50 mine consists mainly of pyrrhotite replacement of magnetite facies iron formation, with minor pyrite and accessory chalcopyrite, arsenopyrite, altaite and ilmenite. Marcasite and pyrite occur in supergene enrichment zones. Veins consist of quartz and ankerite with lesser chlorite and sericite. The Boogardie Break is a semi-regional brittle fault set composed of multiple NE-trending, dextral faults which are the main ore control. Mineralization is found as replacement zones extending laterally away from the breaks, and within quartz-carbonate veins found inside the breaks. Quartz-feldspar porphyry dykes intruded along the breaks hosts disseminated sulphides where they intersect iron formation. A crosscutting fracture set, consisting of subhorizontal mineralized fractures postdating but broadly contemporaneous with the Boogardie

Breaks, is another major controlling structure. A strong host rock control on the mineralization is exerted by the iron formations, the more carbonate-rich layers (and less magnetite-rich) being preferentially replaced by pyrrhotite and over a greater distance away from the breaks. Sulphidation of the iron formation is the result of the mineralizing process. Carbonate alteration of the iron formation is also noted. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Te-Pb.

70 New Celebration is a Late Archean(?), quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 58 metric tons. It is located in the Kalgoorlie-St. Ives greenstone belt, which is part of the Norseman-Wiluna greenstone belt, Yilgarn Block, Western Australia. The NW- to NNW-trending Boulder-Lefroy dextral shear zone and the Ringneck-Wildcatter shear system are the dominant regional tectonic structures in the area. Quartz vein stockworks and associated disseminated sulphides at the Hampton Boulder, Mutooroo, Villers Bretonneux, and Celebration mines are hosted mainly by the Late Archean, greenschist grade Hampton Boulder porphyry (a steeply-dipping quartz-feldspar porphyry dyke) and by schistose mafic-ultramafic volcanic rocks that are equivalents to the Paringa Basalt and Hannans Lake Serpentinite units in the Kalgoorlie-rich phase of the Pernatty differentiated gabbro, by the quartz dolerite phase of the Triumph Gabbro at the Triumph mine, and by greywacke (Black Flag Group), magnesian basalt and dolerite at the Ghost Crab and Mt. Marion mines. Quartz is the dominant gangue mineral. Ore mineralogy is dominantly pyrite, with lesser pyrrhotite at Ghost Crab, and rare chalcopyrite and galena in the other deposits. Lithological units in the area are folded along a tight, steeply N-plunging anticline (New Celebration anticline), which has been truncated by the Boulder-Lefroy Shear Zone. Mineralization at Hampton Boulder and in the area is structurally controlled by the host QFP which acted as a brittle unit due to its competency contrast with the enclosing schistose mafic and ultramafic volcanic rocks, and developped a quartz stockwork in its endocontacts. Lithological contacts between the varying units localized shearing and deformation. NE-trending faults with limited displacement (less than 100 metres) are also important structures. At the Pernatty deposit, inside the Pernatty gabbro, the W- to SW-trending, moderately- to steeply-dipping Pernatty shear, W-trending tensional zones related to the shear and their intersections control the distribution of the mineralization. At Ghost Crab and Mt. Marion, quartz veins are controlled by the N-trending Karramindie Shear Zone which follows a mafic-ultramafic contact. Hydrothermal alteration consists of proximal pervasive sericitization and silicification associated with ore zones in the QFP, with carbonate alteration (represented by an ankerite-quartz-pyrite assemblage) in the footwall ultramafic rocks. Talc-calcite carbonatization is widespread in the ultramafic-mafic rocks but is unrelated to mineralization. Hydrothermal alteration in the Pernatty Gabbro and of the greywacke at Ghost Crab/Mt. Marion consists of proximal potassic alteration (represented by a K-feldspar-biotite-silica-pyrite assemblage) grading to a distal propylitic alteration of calcite-epidote. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb.

71 Nobles Nob is a Late Proterozoic, intrusion-related gold deposit undetermined type (similar to the Warrego deposit) with a total gold content of 35 metric tons. It is located in the Tennant Creek Mineral Field of the Tennant Creek Block, Tennant Creek Inlier, Northern Territory, Australia. The Navigator fault system is a major NNW-trending tectonic structure in the area. The Mary Lane Shear is a WNW-striking ductile dip-slip reverse shear zone merging in the

Navigator fault to the west which is spatially and temporally associated with regional folding and ironstone formation. Disseminated gold is hosted by Early Proterozoic, brecciated and deformed tuffaceous sandstone or greywacke, shale and siltstone of the Warramunga Group. Ore is found within massive magnetite lenses (termed *ironstones*) consisting of massive magnetite with varying proportions of quartz, chlorite and sericite. One of the ore lens contacts is gradational with quartz-hematite stringers. Gold occurs as free disseminated grains and in association with sulphide minerals, which vary with depth. The upper zone is mainly massive quartz-hematite with traces of bismuthinite, malachite and native copper (at Nobles Nob, oxidation depth reaches over 120 metres and explains the presence of massive hematite, specularite and limonite). The central zone, formed by secondary enrichment due to leaching of the upper zone, consists of deformed sericitic hematite minor pyrite, chalcopyrite, enargite, wittichenite and emplectite. The lower zone is composed of chlorite and magnetite with minor massive hematite and more important pyrite, chalcopyrite and enargite. W-striking, steeply-dipping shear zones subparallel to cleavage and their intersections with hematitic argillaceous units localized the quartz-hematite mineralization. Some lenses are also aligned along a NE-trending, moderately-dipping subsidiary system of faults. Hydrothermal alteration affected the sediments, and particularly the mudstones, which host the ironstones. Sediments are silicified, kaolinized and sericitized, and the more intense the alteration, the higher the ore grade. The metallic signature of the bulk of the ore is Cu-Au-Bi-Mo-Pb-Zn. Yates and Robinson (1990) suggested that the Nobles Nob deposit may be a largely oxidized and supergene-enriched equivalent of the magnetite-rich bodies present at deeper levels in the Tennant Creek Field.

75 Meekatharra (Paddy’s Flat) is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 53 metric tons. It is located in the Meekatharra area of the Meekatharra greenstone belt, Murchison province, Yilgarn block, Western Australia. The Meekatharra grenstone belt is folded into a tight NNE-trending syncline. The Mount Magnet-Reedy's Line Shear Zone is a regionally extensive, NNE-trending and steeply-dipping strike-slip fault system or structural zone with probable sinistral movement. Quartz veins and veinlets and associated disseminated sulphides are hosted by Archean, greenschist-grade schistose quartz-feldspar porphyry intrusions and sheared and altered dolerite and ultramafic volcanics. The gangue mineralogy of the veins is dominated by quartz with lesser tourmaline, sericite, kaolinite and azurite. Pyrite and arsenopyrite are the dominant ore minerals. The deposit occurs in a NNE-trending, steeply-dipping strike-slip fault, part of the regional fault system of the same orientation. The mafic and ultramafic hosts are carbonatized and pyritized along the veins and faults. The QFP intrusives are also albitized and sericitized. The known metallic signature of the bulk of the ore is Au-Ag-As.

81 Royal is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 65 metric tons. It is located in the Norseman area of the Norseman-Wiluna greenstone belt, Yilgarn Block, Western Australia. The Penneshaw Regional Anticline and a major NNW-trending fault corridor are the main regional tectonic structures in the area. Quartz veins and associated disseminated sulphides are hosted by Late Archean, upper greenschist grade gabbro dykes and tholeiitic pillowed basalt flows of the Woolyeenyer Group. Quartz is the dominant gangue mineral, with lesser carbonate, chlorite, biotite, fuchsite, tremolite and plagioclase. Ore mineralogy is dominated by arsenopyrite, pyrrhotite and pyrite, with lesser chalcopyrite, marcasite, sphalerite, galena and rare altaite. The Princess Royal Fault is a NW-trending, brittle-ductile to ductile, steeply-dipping dextral strike-slip fault which cuts across and displaces the North Royal Fault Zone, a N-trending, shallowly- to moderately-dipping reverse shear zone which is the locus of mineralization. However, both faults were important fluid channelways. The competency contrast between the gabbro dyke and surrounding rocks allowed fracturing within the dyke and linking of the shears by dilational veins which host the high-grade ore. In contrast with the Norseman gold deposits, the wallrock alteration is more widespread and distinctly zoned. An intense, inner zone of biotitic alteration consisting of biotite-Ca plagioclase-quartz-calcite extends up to 30 cm away from the veins. The inner biotitic zone grades into outer chloritic alteration zone (chlorite-quartz-calcite) which extends up to 2 metres from the veins. The metallic signature of the bulk of the ore is Au-Ag-As-Cu-Te-Bi.

84 Sons of Gwalia is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 158 metric tons. It is located in the Mount Margaret gold field within the Norseman-Wiluna greenstone belt of the Yilgarn Block, Western Australia. The deposit is on the western edge of the Keith-Kilkenny Lineament, a structure of regional significance, and near the Mount George Shear Zone. The latter coincides with the Sons of Gwalia Shear Zone, a SSW-trending, moderately-dipping, bedding-parallel, low-angle, ductile shear zone of regional extent marking an abrupt change in metamorphic grade. Quartz veins and associated disseminated sulphides are hosted by the Archean, greenschist grade Mine Schists unit (muscovite-chlorite schists derived from sheared and altered basalts and ultramafic volcanics) and high-Mg tholeiitic basalts. The gangue mineralogy of the veins consists mainly of quartz with carbonate and sericite. Ore mineralogy is dominantly pyrite, with lesser chalcopyrite, pyrrhotite, arsenopyrite, galena and sphalerite. Veins are commonly folded, and are associated with N-trending, E-dipping normal shear zones with associated folding indicating a significant component of dextral movement. The intersection of drag folds with cleavage or schistosity planes is reported to be an important ore control. A narrow inner zone of muscovite alteration, also usually silicified, grades outward to an intermediate biotite zone and an outer chlorite alteration zone. Carbonate alteration decreases outward in intensity and changes composition from ankerite-dominant in the muscovite alteration zone to calcite-dominant in the biotite and chlorite zones. The metallic signature of the bulk of the ore is Au-Ag-As-W-Rb-B. Groves *et al.* (1986) suggested a possible connection between the emplacement of the nearby granite of the Raeside Batholith and the creation of structurally favorable sites for gold mineralization.

85 Telfer is a rare type of intrusion-related, non-carbonate, stockwork-disseminated Neoproterozoic Au-Cu deposit with a total gold content of 736 metric tons. It is located in the Telfer district of the Paterson province of Western Australia. There are no known equivalents to the Telfer deposit outside of Australia. However, the Granites-Tamani and the Pine Creek gold fields (termed thermal aureole gold deposits) in the Northern Territory show similar structural controls. Four episodes of folding can be recognized in the Telfer district, of which the F_2 event was responsible for the formation of the Telfer Dome, a structural high related to two en-echelon assymetric, doubly-plunging anticlines. The mineralization was localized in a series of vertically-stacked, stratabound to stratiform “reefs” centered on anticlinal hinge zones and consisting of massive sulphide lenses linked by lower grade quartz stockworks and/or sheeted vein sets. The reefs are hosted by Middle to Late Proterozoic argillaceous and/or calcareous sandstones and siltstones of the Telfer Formation. The main gangue minerals of the reefs and veins are quartz, carbonate and albite, with minor and/or trace amounts of tourmaline and monazite. Ore minerals are pyrite, chalcopyrite and pyrrhotite, with lesser galena, sphalerite and scheelite. Supergene enrichment was an important ore-forming process at Telfer, and produced a wide variety of minerals such as chalcocite (after pyrite), bornite, chrysocolla, cuprite, tenorite, and malachite. The Telfer Lineament, a basement (decollement?) fault related to the 700 Ma Paterson orogeny may have been responsible for fluid focusing to the domal sites of mineralization in the stacked reefs, where evidence for structural control is reflected by the presence of extensive brecciation and axial planar faulting along the anticlinal hinge zone. Dilational zones related to folding and bedding plane slip within less competent siltstone unit or at the siltstone-sandstone interface localized much of the mineralization. Favorable horizons such as argillaceous sandstones and calcareous siltstones, were preferentially mineralized. Alteration is principally sericitic, and is best developed along the vein-stockwork selvages. Carbonates minerals typically accompany sericite development. Some degree of silicification also occurs in quartzose sandstones, a minor ore host. The geochemical anomaly related to mineralization is complex: Au-Cu-As-Pb-Zn-Bi-Co-Ni-Ag-La-Ce-Y-B-W-Mo. Nearby granitic rocks are magnetite-series granitoids; they have a very low gold content and are therefore discounted as the source of gold. The model proposed by Rowins *et al*. (1997) involves a granitoid at depth acting as the heat source which drove thermal convection cells. In those cells, metamorphic fluids scavenge gold, copper and sulfur from the surrounding sedimentary rocks.

87 The Granites gold deposits are Paleoproterozoic iron-formation-hosted vein and disseminated (Homestake type) deposits with a total gold content of 202 metric tons. They are located in the Tanami Desert, The Granites-Tanami Inlier, North Australia Orogenic Province, Northern Territory, Australia. Regional, tight to isoclinal F_1 folding accompanied metamorphism and produced dominant S_1 schistosity. Quartz veins and disseminated sulphides are hosted by greenschist to amphibolite grade rocks of the Early Proterozoic Mount Charles beds consisting of silicate-sulphide facies, carbonate facies and oxide facies iron formations enclosed in lightly mineralized footwall and hanging wall schists. Gold in the footwall and hanging schists units occurs in banded chert-ferromagnesian schists horizons, within calc-silicate veinlets and in quartz veins. Gangue and host rock mineralogy is mainly quartz, diopside and carbonate minerals, with lesser grossular, almandine, clinopyroxene, amphibole and cummingtonite. Ore mineralogy is dominated by pyrite, pyrrhotite and arsenopyrite, with lesser chalcopyrite and minor pentlandite, galena and sphalerite. Folds played a key role in the distribution of mineralization. Gold, along with quartz, other silicates and carbonates, were remobilized in dilatant structures formed by one or more of the folding episodes. Also, F_3 folding was responsible for significant thickening of the host unit and mineralized zones. Host rock lithology had a strong influence on grade control, with carbonate and sulphide facies iron formations markedly more mineralized than oxide and silicate facies. Silicification of the iron formations and schists of the Main Host Unit is the only notable hydrothermal alteration. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Ni-Pb-Zn.

91 Victory-Defiance is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 56 metric tons. It is located in the Kambalda-St Ives area of the Norseman-Wiluna greenstone belt, Yilgarn Block, Western Australia. The Boulder-Leroy Fault System and the Victory Fold, an assymetric recumbent fold with a N-trending, shallow-plunging hinge line, are the main regional tectonic structures in the area.

Mineralization at Victory is hosted by the Archean upper greenschist grade Kapai Slate, a sulphidic, graphitic slate or phyllite. Mineralization at Defiance and Orion is hosted by the Archean, greenschist-grade, stratiform and differentiated Defiance Dolerite, massive to pillowed variolitic Paringa Basalt and Devon Consols Basalt flows and interflow sediments and quartz-feldspar felsic intrusive rocks. Ore consists of quartz vein arrays, associated disseminated sulphides and stacked hydrothermal fault breccias in faults, shears and ultramylonite zones. Quartz is by far the dominant gangue mineral, with lesser albite and minor amounts of calcite, actinolite, chlorite and biotite. Ore mineralogy is mainly pyrite with minor chalcopyrite, sphalerite and scheelite. The Defiance fault, a 45^o dipping dip-slip reverse fault transecting the Victory fold, and the NNW-trending, low-angle reverse Victory and Repulse faults and subsidiary shears are the hosts of the mineralized lodes as well as the most important fluid channelways. Extensive hydrothermal alteration halos are present around the lodes. In the Defiance Dolerite and the basalts, an inner albitic zone of albite-ankerite/dolomite-quartz-pyrite grades outward to an intermediate biotitic alteration zone of albite-biotite-quartz-calcite/dolomite-magnetite-muscovite which then grades to the outer chloritic zone of chlorite-albite-quartz-calcite-magnetite. In the Kapai Slate, sulphidation of the magnetite-rich bands in the inner zone is directly associated with gold mineralization. An inner sericitic alteration zone of muscovite-albite-pyrite grades outward to a chloritic alteration zone of actinolite-chlorite-magnetite. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Zn-W.

92 Warrego is a Late Proterozoic, unknown-type of intrusion-related Au-Cu-Bi deposit with a total gold content of 44 metric tons. It is located in the Tennant Creek mineral field of the Tennant Creek Block, Tennant Creek Inlier, Northern Territory, Australia. The Navigator fault system is a major NNW-trending tectonic structure in the area. Disseminated gold is hosted by Early Proterozoic quartz-muscovite schists, quartzites and slates of the Warramunga Group and quartz porphyry rocks (the latter of probable pyroclastic origin). Greenschist grade of the host rocks is apparently dye to contact metamorphism related to emplacement of the Warrego granite 800 metres west of the deposit. The ore occurs within massive magnetite lenses (termed *ironstones*) consisting of massive magnetite (hematite in the oxide zone) with varying proportions of quartz (up to 50%) and chlorite (up to 40%) intergrown with lesser muscovite. Sulphides make up to 10% of the volume and consist of chalcopyrite, pyrite, bismuthinite, guanajuatite and marcasite. Gold ore pods contain abundant bismuthinite and guanajuatite, rare pyrite and are typically devoid of chalcopyrite. The Footwall Fault, a NNW-trending reverse fault, is a splay of the Navigator fault system, and lies just west of the orebody in its footwall. Magnetite lenses are localized within structural traps formed by fold closures of E-plunging, reclined folds. Intense chlorite alteration surrounds the magnetite lenses. Chlorite-sulphide stringers parallel to the cleavage planes underly the lenses and bridge the gap between the Footwall Fault and the lenses. The fault itself is unaltered, due to a combination of preferential channeling and fluid/rock chemical equilibrium (Rattenbury, 1994). The metallic signature of the bulk of the ore is Cu-Au-Bi-Mo-Pb-Zn. Rattenbury (1994) suggested that folding and ironstone lens formation are contemporaneous but pre-date mineralization. The Warrego granite is an obvious source for metals on the basis of chemical similarity (Stolz and Morrison, 1994), but the intrusion is younger than the mineralization by 120 Ma. The timing and genesis of the deposit is the subject of controversy.

Appendix 2

95 The Wiluna gold deposits are Archean, quartz-carbonate shear-zone-related gold deposits (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 112 metric tons. They are located in the Wiluna district of the northern part of the Norseman-Wiluna greestone belt, Yilgarn Block, Western Australia. The Perseverance fault is a regional, first-order normal and sinistral fault with a late phase of dextral movement separating the Wiluna domain from the Matilda domain. The Wiluna Fault System is a transpressional dextral strike-slip fault system and the major structural feature of the area. It has been interpreted either as a splay of the Perseverance Fault or as related to adjacent granitoid emplacement. Mineralization is hosted by Archean, low-grade (prehnite-pumpellyite) massive and pillowed tholeiitic, komatiitic and magnesian basalts and locally minor interflow sediments, and also by dolerite, quartz-feldspar porphyry and diorite intrusions. Mineralization consists of quartz veins within shears and associated disseminated sulphides, and also as hydrothermal fault breccia. Quartz is the dominant gangue mineral, ore mineralogy is dominated by pyrite, with lesser arsenopyrite, stibnite and tetrahedrite. Two sets of faults and their subsidiary structures within the Wiluna fault system control the distribution and localization of the mineralization. The N-trending, high-angle dextral strike-slip Graphite, East Lode and Creek faults control the East Lode, the North Lode, the West Lode and the southern part of the Happy Jack deposits. The NE-striking, steep to subvertical brittle-ductile dextral Happy Jack-Bulletin, Adelaide and Squib faults controls the Happy Jack, Bulletin and Moonlight deposits. Inhomogeneities within the faults, such as divergent bends in dextral strike-slip faults, dilational jogs and horsetail splays, effectively controlled the localization of the ore zones. These structural complexities developed in places with competency contrasts such as contacts between flows, and between flows and intrusive rocks. Minor ore loci are also related to drag folds hinges in volcanic flows and dolerite units. Hydrothermal alteration is zoned around the mineralized faults and shears, with an inner proximal sericitic alteration zone consisting of sericite-dolomite±chlorite±calcite, an intermediate zone of carbonatization represented by calcite-dolomite and a distal chlorite alteration zone of chlorite-calcite±epidote ±actinolite. The metallic signature of the bulk of the ore is Au-Ag-As-Ba-Sb-Te-W-Rb.

420 Pajingo (Vera-Nancy) is a Carboniferous epithermal, low-sulphidation Au-Ag deposit with a total gold content of 73 metric tons. It is located in the Janet Range within the Drummond Basin, Thomson Fold Belt, Queensland, Australia. A NW-trending lineament, believed to be a strike-slip fault is the major regional structural feature of the area. Crustiform, cockscomb and drusy quartz veins and hydrothermal breccias are hosted by Late Devonian to Early Carboniferous, brecciated and dominantly porphyritic andesite lava and andesitic lithic tuff (fine ash to bomb size) with minor feldspathic volcanic sandstone, quartzose sandstone and ignimbrite. Gangue minerals are dominantly chalcedony-silica with common limonite and hematite in bands, minor amounts of illite, kaolinite, occasional dolomite and rare adularia in deep vein infill. Ore mineralogy consist mainly of pyrite, with trace amount of acanthite, chalcopyrite, stromeyerite, argentite native Ag, sphalerite, galena, pyrrhotite, hessite, tetrahedrite and petzite. Syn-mineralization breccias occur as narrow zones adjacent to and within the main lodes structures. The breccias are heterolithic with a matrix of quartz, illite and pyrite with lesser chalcopyrite, sphalerite and galena. NW-trending, steeply-dipping normal faults and E-W-trending, steeply-dipping, normal dip-slip (sinistral) faults are the two main ore controlling structures and are probably coeval with one another. Dilatancy zones at the intersection of E-W normal faults and synchronous NE-trending normal faults were the principal loci of mineralization. Andesitic volcanic rocks and their intrusive counterparts show early and distal propylitic alteration of the assemblage albite-chlorite-quartz-calcite-epidote-ankerite-actinolite. This was followed by a low-temperature potassic alteration (adularia-quartz-chlorite-calcite-muscovite-pyrite-chalcopyrite) which is best developed adjacent to veins. Proximal intermediate argillic alteration (illite-illite/smectite(interlayered)-quartz-pyrite) is well-developed; its inner zone is overprinted by zones of silicic alteration. Both of the latter alteration types are broadly synchronous with mineralization. Late-stage abundant kaolinite-dickite argillic alteration and ferroan carbonate alteration are widespread and strongly developed along faulted host rocks, lithologic contacts and fragmental volcanics. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Cu-Pb-Zn±Ba±F.

423 Mount Leyshon is an Early Permian intrusion-related breccia pipe Au-Ag deposit with a total gold content of 83 metric tons. It is located in the Lolworth-Ravenswood Block of the Thomson Fold Belt, Lachlan Fold Belt, Queensland, Australia. The Mount Leyshon diatreme is a fault-bounded, circular vent straddling the intersection of an E-trending boundary between the Ordovician Ravenswood Batholith and the NW-trending Cambro-Ordovician Seventy Mile Range Group. Most of the mineralization (80%) consists of sulphides filling cavities and replacing the matrix of the Early Permian Mount Leyshon breccia, a clast-supported polymict breccia of probable phreatic origin. Disseminated sulphides, laminated quartz veins and stockworks are also hosted by the breccia and adjacent crystal-lithic tuff and other pyroclastic-epiclastic rocks and by porphyritic rhyolite and dolerite dykes and plugs. The breccia matrix, previously affected by propylitic alteration, has been replaced by a gangue mineral assemblage of quartz, chlorite, Mn-carbonates and muscovite, with minor adularia and anatase, and trace amounts of rutile, monazite and apatite. Ore mineralogy is dominantly pyrite, chalcopyrite, galena and sphalerite, with minor molybdenite, bismuthinite, wittichenite and cosalite and trace amounts of pyrrhotite, matildite and benjaminite. Quartz veins and veinlets are found within faults of unknown movement. The distribution of mineralization is related to small-scale fracture patterns and density and other permeability controls. The breccia pipe itself was, however, the greatest vector for fluid channeling. Sericitic alteration (sericite-pyrite) is dominant in the tuffs and pyroclastic rocks and developed during the early phases of the diatreme. Later porphyritic rhyolite dykes and plugs also show sericitic alteration. Potassic alteration (biotite-K-feldspar-actinolite-magnetite assemblage) is present in the breccia clasts and in the epiclastic rocks and metasediments to the NE. Potassic alteration also forms a restricted halo around early quartz-molybdenite veins. Propylitic alteration is pervasive within the Mount Leyshon breccia, replacing the original matrix with an assemblage of chlorite-Mn carbonate-anatase-base metal sulphides. Supergene oxidation and enrichment formed iron oxides-jarosite-alunite-kaolinite in cavities and veins and also disseminated throughout the host rocks. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-Bi.

431 The Cobar Au-Ag-Cu district, mined mainly from the 1870s to 1952, is made up of Early Devonian turbidite-hosted vein deposits with a total gold content of 83 metric tons. It is located in the Cobar Block (or Cobar Basin) within the Central Belt of the Lachlan Fold Belt, New South Wales, Australia. The Great Chesney Fault, a WNW-trending back thrust on the Rookery Fault (a WNW-trending extensional synsedimentary fault scarp) and the Chesney-Nurri Anticline, a moderate to tight, S-plunging anticline, are the two major regional tectonic structures in the area. Quartz veins and associated disseminated sulphides, and lenses of semi-massive sulphides are hosted by shales, sandstones, siltstones and brecciated rhyolites of the Late Silurian to Early Devonian Nurri Group. Gangue minerals of the veins are quartz and carbonates. Ore mineralogy of the veins and sulphides lenses is mainly pyrrhotite and chalcopyrite with pyrite, sphalerite and galena, and trace tetrahedrite, bismuth, bismuthinite, arsenopyrite and cubanite. The major ore-controlling structures are NNW-trending subvertical to west-dipping thrust shears with sinistral component (such as the Peak-Polaris shear at the Peak mine), subsidiaries of the Great Chesney Fault. Veins are also situated within cross faults linking two NNW-trending shears and in dilational jogs. The sheared rhyolite-sediment contact contains lenses of disseminated to semi-massive sulphides. Individual lenses of mineralization are localized within areas of higher strain within the deposit envelope (Stegman, 2001). Banded, Ag-rich lenses of sphalerite-galena are associated with a later period of shear reactivation and deposition in dilational sites. Shear zone alteration consisting of chlorite-talc-carbonate is intense. Silicification occurs around the shears and within the brecciated rhyolites, as well as within the sediments above and below the volcanic bodies. Silicification played a key role in focusing vein mineralization at the Peak mine, forming harder and more brittle horizons subject to fracturing and vein formation in dilational sites. Silicified bodies of sediments also host 2 minor sulphide lenses. Volcanic rocks adjacent to mineralization at Peak show an intense sericitic alteration associated with the silicification episode. Some clasts are altered to an assemblage of chlorite-quartz-Kspar. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-Fe-Mn-Co-Hg-Se. Deposits represented by the old mines of New Occidental, New Cobar, Great Cobar and Chesney are compatible with the turbidite-hosted vein model; however, the more recent Peak mine with its structurally controlled replacement ore of semi-massive sulphide lenses represents a distinctive style of mineralization of controversial origin and formation (see Stegman, 2001).

433 The Hill End goldfield, mined from 1865 to 1918 produced a total of 56 metric tons of gold. The deposits consisted of Early Carboniferous turbidite-hosted quartz-carbonate veins in the Hill End Synclinorial Zone of the Lachlan Fold Belt, New South Wales, Australia. The Hill End Anticline, a gently doubly-plunging, tight to isoclinal fold, and a set of steeply west-dipping reverse faults and thrusts are the main regional tectonic structures in the area. Folded and laminated quartz veins and minor breccias and stockworks are hosted by well-bedded turbiditic, greenschist grade mudstone, greywacke and feldspathic sandstone of the Middle to Late Silurian Chesleigh and Cunningham formations. Gangue minerals are predominantly quartz with subordinate calcite, chlorite and muscovite. Ore mineralogy consists mainly of pyrite, chalcopyrite, galena, sphalerite and local pyrrhotite and arsenopyrite. Mineralization is localized in E-dipping, bedding-parallel veins adjacent to anticlinal hinges. At Hill End, in the wacke-dominated Chesleigh Formation, the bedding-parallel veins occur in mudstone horizons a few millimetres above the mudstone-wacke lithological contact whereas at Hargraves, in the mudstone-dominated Cunningham Formation, the veins are in wacke and feldspathic sandstone beds separated by several metres of featureless mudstone. Competency, cohesion and permeability contrasts are key physical parameters in localizing the veins. Leader veins are narrow and discordant extensional crack-seal veins merging with but not crosscutting the bedding-parallel veins. High-grade zones of mineralization occur at the intersections of leader veins with the bedding parallel veins, and at intersections of late ENE-trending, subvertical, brittle dextral strike-slip faults with the bedding-parallel veins. Hydrothermal alteration of the wallrocks associated with veining is minor. Sericitization is limited to a few millimetres next to the veins. Carbonate alteration, either ankerite or calcite, forms an outer halo that extends up to a few tens of centimetres away from the veins. The metallic signature of the bulk of the ore is Au-Ag-As-Cu-Pb-Zn. Windh (1995) suggested that the bedding-parallel veins started to form prior to regional folding and possibly to lithification of the host rocks as well. The veins were modified during folding, with further additional vein material added. As deformation progressed and the fold tightened, the steepening dip would not allow continued reverse movement, thus causing cyclical fluid pressure fluctuations which may have in turn promoted gold deposition. An inferred blind thrust fault at the bottom of the fold may have been responsible for both folding and preferential upward fluid channeling into the eastern limbs of the folds.

434 The Maldon Gold Field, mined mainly from 1854 to 1926, is a district of Late Ordovician, turbidite-hosted vein (Bendigo-type) gold deposits with a total gold content of 57 metric tons. It is located in the Stawell-Bendigo Belt of the Lachlan Fold Belt, Victoria, Australia. N-S-striking, tight, upright folds overturned slightly to the west are the main regional structures in the area. Quartz veins are hosted by Early Ordovician metasediments (greywacke and quartzite) on the border of the Middle Devonian Harcourt Granodiorite. Contact metamorphism has produced pelitic to psammopelitic hornfels ranging from competent hard black quartz-biotite hornfels to soft fissile grey hornfels with prominent porphyroblasts of cordierite. Quartz is the dominant gangue mineral. Ore mineralogy consists of pyrite, arsenopyrite, chalcopyrite, sphalerite, galena, pyrrhotite, marcasite, molybdenite, scheelite, bismuth, maldonite, native antimony and stibnite. Quartz veins are localized along the anticlinal axial zones and limbs of several N-S trending fold axes. Most ore is within dilatant jogs related to folding. An immediate selvage of biotite±muscovite alteration surrounds the veins. Extensive alteration zones of carbonate and pyrite are also occur in adjacent wallrocks. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Zn-Bi-Sb-Mo-W.

436 Stawell is an Ordovician turbidite-hosted quartz-carbonate vein (Bendigo type) gold deposit with a total gold content of 105 metric tons. It is located in the Stawell area of the Stawell-Bendigo belt, Lachlan Fold Belt, western Victoria, Australia. The Stawell-Ararat Fault zone, an east dipping reverse fault, and the Magdala Antiform are the main regional structures in the area. Massive and laminated quartz veins and stockworks and associated disseminated sulphides are hosted by Cambrian, middle greenschist-grade carbonaceous and chloritic schists derived from deformed turbiditic sediments (Mine schists at Magdala and Wonga schists at Wonga) and volcanogenic sediments (Magdala volcanogenics) and by the Late Proterozoic, pillowed tholeiitic Magdala basalt flows. The metamorphic grade at Wonga is higher because of its close proximity to the Stawell Granite. Mineralization at Wonga is broadly contemporaneous with the Stawell Granite but pre-dates its final emplacement. Quartz and calcite are the dominant gangue minerals, with lesser muscovite, chlorite, sericite, biotite, fluorite and anhydrite. Ore mineralogy is dominated by pyrite, with lesser pyrrhotite, chalcocite, arsenopyrite and chalcopyrite, and minor sphalerite, galena, bornite, stibnite, tennantite, bismuthinite, loellingite, calaverite and native Bi. The Central Lode Shear system, a complex system of steeply-dipping thrusts with dextral shearing component, and the younger Scotchman's Fault Zone, a SW-trending, shallow to moderately dipping reverse fault and subsidiaries, are important ore controlling structures related to the late D_4 deformation event. Shears were formed mainly at the basalt-sediment interface which acted as a strong competency contrast and localized deformation. Hydrothermal alteration is confined to a few metres beyond the vein and consists of stilpnomelane-chlorite-calcite-quartz-sulphides within the volcanogenic sediments and the basaltic hosts. Schists and basalts at Wonga were sericitized and carbonatized along faults and quartz filled hydraulic fractures. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Bi-Te-Ni-PGE.

437 Kidston is an Early Carboniferous, intrusion-related, breccia pipe Au-Ag deposit with a total gold content of 116 metric tons. It is located in the Forsayth Subprovince of the Georgetown Inlier, Thompson Fold Belt, Queensland, Australia. Mineralization at Kidston consists of quartz veins and stockworks hosted by a magmatic/magmatic-hydrothermal multiphase breccia pipe which has intruded Middle Proterozoic Einasleigh Metamorphics and Siluro-Devonian Oak River Granodiorite. The earliest breccia phase consists of clast-supported fragments of rhyolite and rhyolite dykes, metamorphic rocks and granodiorite. The distribution of the clasts within the second breccia phase reflects the stratigraphy of the host rocks prior to brecciation, with mappable contacts. Breccia matrix consists of comminuted clast material partly supporting the clasts. The latest breccia phase consists of angular to sub-angular matrix-supported fragments of rhyolite, metamorphic rocks and granodiorite clasts. The matrix for this phase, like the second phase, also consists of comminuted clast material. This is followed by younger sheeted and combed veins of quartz, ankerite, calcite and sulphides cutting across the breccia. Cavities in the breccias filled with quartz, epidote, orthoclase, biotite, calcite, siderite, magnetite, tourmaline, and sulphides represent an early, uneconomic stage of mineralization. Ore mineralogy is dominated by pyrite with lesser pyrrhotite, sphalerite, chalcopyrite, galena, molybdenite, tetrahedrite, arsenopyrite, bismuthinite and bismuth tellurides. The forceful emplacement of post-breccia rhyolite dykes into the lower portion of the breccia pipe resulted into the formation of radial fractures occupied by the dykes, and inward-dipping concentric fractures and zone of enhanced permeability which played a major role in localizing cavity-infilling and quartz vein mineralization. Weak potassic alteration is related to early-stage, post-breccia uneconomic mineralization. Different types of cavity infill mineralization developed different alteration halos. Orthoclase alteration developed around the quartz-epidote cavity infills, secondary biotite alteration and phyllic alteration are associated with biotite-siderite-pyrite cavity infills, and propylitic alteration developed around calcite cavity infills. Alteration associated with late-stage, mineralized sheeted veins is mainly phyllic alteration consisting of haloes of muscovite-quartz-carbonate. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-Mo- Bi-Te-B.
438 The Gympie gold field consists of Middle Triassic, turbidite-hosted quartz-carbonate vein (Bendigo type) deposits with a total gold content of 119 metric tons. It is located in the Gympie Block (or Province), which is part of the New England Fold Belt, Queensland, Australia. The Electra fault system, occurring 10 km west of the Gympie gold field, defines the margin between the Gympie Block and the Biggenden Block. Mineralization consists of quartz-carbonate veins ans stockworks hosted by Permian carbonaceous shales, volcanic rocks and tuffs of the Rammutt Formation. Quartz and calcite veins contain chalcopyrite, galena and pyrite with free gold as inclusions within the sulphides. There are two main vein trends in the Gympie gold field: the Gympie veins occur as S-trending, steeply-dipping lodes and the Inglewood lodes occur as NW-trending, near vertical veins within faults (Inglewood Fault) intruded by microdiorite dykes. These NW-trending faults are thought to be splays of the Electra fault system. The highest gold grades occur where these structures cut the shales of the upper zone of the Rammutt Formation, which exerts a strong lithological control. The Top Break Shear and the Bottom Break Shear are shears at the top and bottom contacts of the Rammut Formation along which there is some stratabound, shale-hosted, Gympie-style vein mineralization. Weak and patchy alteration such as chloritization, hematization and epidotization of the volcanic rocks and tuffaceous rocks are present in the upper Rammutt Formation but their relationship to mineralization is unknown. The metallic signature of the bulk of the ore Au-Ag-Cu-Pb-As.

Appendix 2

439 Charters Towers is an Early Devonian, intrusion-related, batholith-associated quartz vein gold deposit with a total gold content of 207 metric tons. It is located in the Lolworth-Ravenswood Bloc of the Thompson Fold Belt within the extensive Tasman Fold Belt, northeastern Queensland, Australia. Quartz veins and associated disseminated sulphides are hosted by Middle Ordovician Towers Hill and Hogsflesh granodiorites, Siluro-Devonian Millchester Creek Tonalite and Alabama Diorite, and also, to a lesser degree, by pre-Ordovician, amphibolite grade, metamorphic country rocks adjoining the plutons. Gangue minerals of the veins are mostly quartz, calcite and ankerite with minor sericite (muscovite). Ore minerals are pyrite, sphalerite and galena, with lesser arsenopyrite, chalcopyrite, tetrahedrite and local tellurides. More than 75% of the production has come from several vein systems such as the Day Dawn, the Brilliant and Queen and the Towers Hill vein systems. Mineralized quartz veins are mainly contained within N- and E-trending, moderately-dipping, brittle shear zones which in many cases represent brittle reactivation of previous ductile mylonite and shear deformation. Ore shoots are also localized along the contacts of granitoid rocks. Lithology and competency contrasts played important roles in the localization of the veins as mineralized, brittle fractures within the intrusives fade out in the surrounding country rocks. Phyllic alteration forms small sericite-calcite-ankerite-pyrite haloes around the veins and shears, and grades outward to a propylitic assemblage of montmorillonite-illite-chlorite-epidote. Alteration around a single vein rarely extends outward more than one meter. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb-As-Cu-Te.

440 The Bendigo Goldfield deposits are Late Ordovician to Early Silurian, turbidite-hosted quartz-carbonate vein deposits with a total gold content of 533 metric tons. They are located in the Bendigo-Ballarat Structural zone, part of the Lachlan Fold Belt, Central Victoria, Australia. The Bendigo Goldfield is found at the culmination zone of a regional NNW-trending anticlinoria-synclinoria. Folded and laminated veins and associated disseminated sulphides at Bendigo are hosted by Early to Middle Ordovician, lower to middle greenschist-grade turbidites (sandstones and shales mostly) characteristic of a deep sea submarine fan. Quartz, carbonate, sericite and chlorite are the main gangue minerals. Ore minerals are pyrite, arsenopyrite, sphalerite, galena, chalcopyrite and pyrrhotite. Bendigo hosts spectacular saddle reef mineralization. Mineralization is localized within, and formed during the development of a variety of fault-related and fold-related dilational sites. NE-trending and doubly-plunging flexural-slip folds defining domal structure and the anticlinal hinges (rarely synclinal) of chevron folds controlled the distribution of the saddle and leg reefs. Brittle-ductile shear zones and bedding-discordant, moderately-dipping reverse faults led to the formation of neck reefs extending upward from the saddle reefs. The shale-sandstone interface seems to have been a preferential slip surface during folding; the shale also acted as an impermeable barrier to hydrothermal solutions, hence constraining fluid flow. Proximal carbonate alteration of the shales and sandstones with an assemblage of siderite-sideroplesite-ankerite-calcite gives way to intermediate chloritization and then distal sericitic alteration. The metallic signature of the bulk of the ore is Au-As-Pb-Hg-Cu.

534 Tasmania (Beaconsfield mine, exploiting the Tasmania reef) is a Devonian, turbidite-hosted quartz-carbonate vein ("Bendigo type") gold deposit with a total gold content of 48 metric tons. It is located in the Beaconsfield goldfield of the Beaconsfield Block, Lachlan Fold Belt, Tasmania, Australia. NNW-striking thrust faults related to the D_1 compressional regime of continental accretion constitute the major regional tectonic structure. Quartz-carbonate veins and associated disseminated sulphides are hosted by the Ordovician sequence of sandstones, siltstones, calcareous siltstones, conglomerate, pebble conglomerate, and stylolithic limestones of the Cabbage Tree Formation. Quartz and ankerite are the dominant gangue minerals, with minor calcite. Ore mineralogy is mainly pyrite, with lesser arsenopyrite and chalcopyrite, and minor galena, sphalerite and tetrahedrite. The Tasmania reef is found in ENE-trending, steeply-dipping transverse shears related to D_2 deformation and is crosscut by later dextral strike-slip faults with reverse dip-slip movement. Hydrothermal alteration consists of mild chlorite-sericite alteration around the veins and a pyrite-arsenopyrite sulphidation halo. Ankerite porphyroblasts are also present in the wallrocks. The metallic signature of the bulk of the ore is Au-Ag-As-Cu.

536 Ballarat East is an Early Ordocivian, turbidite-hosted quartz-carbonate vein gold deposit with a total gold content of 33 metric tons. It is located in the Ballarat goldfield within the Bendigo-Ballarat structural zone, Lachlan Fold Belt, Victoria, Australia. The Ballarat Anticlinorium, a N-trending anticlinorium, is the main regional structure in the area. Quartz-carbonate veins and related disseminated sulphides are hosted by an Early Ordovician turbiditic sequence of cyclic sandstones, mudstones and shales of the Castlemain Supergroup. Quartz is the dominant gangue mineral, with lesser ankerite. Gold is associated with sulphides such as pyrite and arsenopyrite, with minor galena, sphalerite, pyrrhotite, chalcopyrite, stibnite and marcasite. The First Chance Anticline is a N-trending, assymetric doubly-plunging overturned anticline. Along the anticlinal axis are subvertical quartz veins called “breached anticline reefs”. North-trending, moderate- to steeply-dipping reverse faults are the main ore-controlling structures; these faults are subparallel to bedding planes on west-dipping fold limbs and cut across the fold hinge and stratigraphy on the eastern limbs. The former makes steeply-dipping banded and laminated quartz reefs while the latter are more shallowly dipping and form anastomosing fault systems known as “leather jacket” faults. The leather jacket faults frequently form dilatant zones localizing massive quartz reefs. Lithological control of the grade occurs where mineralized reefs cut thin carbonaceous units (referred as "indicators"), resulting in very high-grade zones. A late, NE-striking, dextral strike-slip fault set offsets the mineralization. Weak hydrothermal alteration haloes of silicification and sericite-carbonate-chlorite alteration occur around the veins. Pyritization of the shales occurs in places. The metallic signature of the bulk of the ore is Au-Ag-As.

538 Cohen’s Reef (mined from 1863 to 1914) is a Devonian, turbidite-hosted quartz-carbonate vein (Bendigo-type) gold deposit with a total gold content of 46 metric tons. It is located in the Walhalla-Wood’s Point auriferous belt of the Melbourne structural zone, Lachlan Fold Belt, Victoria, Australia. The Walhalla Synclinorium, a series of NNW- to NW-trending, upright, non-cylindrical open symmetrical folds, and the Cohen's Reef Shear Zone, a SSE-trending, high-angle oblique-reverse shear zone, are the two major regional tectonic structures in the area. Laminated veins, stockworks and associated disseminated sulphides are hosted by Early Devonian, lower greenschist grade sandstone and siltstone beds of the Walhalla Group and within Late Middle Devonian diorite dykes. Quartz and subordinate calcite are the only gangue minerals. Ore mineralogy is dominated by arsenopyrite and pyrite, with rare galena, chalcopyrite, sphalerite, tetrahedrite, boulangerite and bournonite. The Footwall and Contact faults which bound the Cohen's Shear Zone are high-angle lateral wrench faults, and are interpreted to be reactivated reverse faults. Laminated veins occur within SSE-striking reverse splays. Mineralized ptygmatic veins forming a stockwork are tensional en echelon veins affected by F_2 folding caused by the movement in the Cohen’s Reef Shear Zone. Late stage, normal-oblique, subvertical cross faults offset the mineralized reefs and dykes. Hydrothermal alteration haloes occur around the veins and reverse faults. Sericitization of the sediments is evident at the vein selvages, within a larger sulphidation halo of pyrite and arsenopyrite. Diorite dykes are also affected by propylitic alteration when mineralized. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Cu-Pb-Zn.

542 Mount Morgan is an epithermal, Late Devonian, submarine gold-rich Au-Cu-Ag massive sulphide deposit with a total gold content of 296 metric tons. It is located in the Rockhampton district of the Yilgarn Block within the New England Fold Belt, eastern Queensland, Australia. A 70 km-long SE-trending anticline fold is the major regional structure in the area and several occurences of porphyry-style mineralization are localized along its axis. Mineralization at Mount Morgan consists of massive to disseminated sulphide ore and siliceous stringer stockworks within Middle to Late Devonian quartz-feldspar crystal-lithic tuff of the Upper and Lower Mine pyroclastics (Mine Corridor Volcanics). The main ore minerals of the orebodies are pyrite, pyrrhotite, chalcopyrite, magnetite, sphalerite, tellurobismuthinite, calaverite and tetradymite. Quartz is the principal gangue mineral. The structure of the mine is a faulted half dome. The doming is attributed to intrusion of a porphyritic trondjhemite stock, which was the source of the rhyolitic volcanism. Structural control is provided by an arcuate, inward-dipping normal fault array (Footwall faults set) which may be a hydrothermal collapse feature related to volume loss during alteration. The Trough fault is a graben fault inferred from a stratigraphic change indicating syn-volcanic normal movement (growth fault) and could be the main fluid channelway. Post-mineralization, NE-trending normal dip-slip faults such as the Slide and Ballard's faults cut across the mineralized zones. Immediately underlying the massive and stringer mineralization is an intense zone of silicification (quartz-sericite-pyrite) which grades into a sericitic alteration zone (sericite-quartz-pyrite-chlorite) that extends outward up to 1,5 km. Superimposed quartz-albite-actinolite-biotite alteration extends up to 100 metres from the tonalite contact and constrains tonalite emplacement to post-mineralization. Limited calc-silicate alteration is also associated with the tonalite intrusion, and within the limy sediments and limestone clasts. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Te-Bi-Mn-Cd.

543 Mount Rawdon is a Late Triassic, intrusion-related, breccia pipe Au-Ag deposit with a total gold content of 41 metric tons. It is located in the Gympie Block of the New England fold belt, southeast Queensland, Australia. The ENE-trending, dextral strike-slip Swindon fault and the Mount Rawdon diatreme are the dominant regional structures in the area. Faulting along the Swindon fault is thought to have generated a weakness that was exploited by syenitic magma, resulting in multiple magmatic pulses and diatreme development (Brooker and Jaireth, 1995). Sulphide-rich veins and veinlets, stringers and associated disseminated sulphides are hosted by a Late Triassic, matrix-supported diatreme breccia intruding Permian metasedimentary rocks (quarzite, phyllite and schists). The diatreme is the site of multiple intrusive events; initial syn-diatreme porphyritic syenite intrusions in the center, later but cogenetic syenite, trachyandesite and trachyte intrusions, and post-diatreme syenitic to granitic intrusion cogenetic with the Late Triassic Aranbanga Volcanic Group. A fragmental sequence occurs at the base of the diatreme and along its borders. Clasts are subangular to rounded and vary in size from lapilli to blocks; they are composed of syenite, dacite, granodiorite, schist, quartzite and trachyandesite. Bedding in the metasediments found inside the diatreme is disrupted and steepened in places. Gangue mineralogy of the veins consists of calcite, quartz and Fe-chlorite, with lesser tremolite, actinolite, epidote and apatite. Ore mineralogy is dominated by pyrite, with lesser sphalerite, chalcopyrite and galena, and minor arsenopyrite, native Bi, hessite, bismuthinite, matildite and aikinite. Mineralization is structurally controlled by the brecciated dykes and margins of syenite intrusions which may have acted as conduits for the mineralization. High gold grades occur in the margins of the fractured dykes and the adjacent fragmental units. Minor faults may have acted as controls on mineralization. Hydrothermal alteration of the pre-mineralization syenite intrusion consists of a core of moderate propylitic (calcite-chlorite-epidote) alteration, surrounded by a carapace of phyllic alteration represented by a muscovite-sericite assemblage. The same propylitic alteration is also found widespread in the lavas and the fragmental units within the diatreme. Intense and pervasive sericitic alteration in the fragmental units is coincident and probably genetically related with the mineralization. Patchy replacement zones of silica-pyrite and chloritic alteration overprints the sericitized rocks. This Fe-rich chlorite alteration in intimately linked with the mineralization and is located in the vein selvages, replacing the matrix and clasts of fragmental units. Late granodioritic-granitic intrusions in the diatreme are affected by illite-smectite argillic alteration. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-As±Bi. Boiling fluids of dilute magmatic origin, associated with a stage of resurgent magmatism, is thought to be the main deposition mechanism (Brooker and Jaireth, 1995). Fluids were hotter and more saline than those of epithermal systems, and isotopic analysis further suggest that ore-forming fluids consist of a mix of magmatic and meteoric waters. This led Brooker and Jaireth (1995) to suggest that Mount Rawdon is a transitional-style deposit with epithermal and porphyry characteristics similar to Kelian in Indonesia.

4057 Bronzewing is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 84 metric tons. It is located in the Eastern Goldfields of the Yandal greenstone belt, Yilgarn Block, Western Australia. The main regional tectonic structures in the area are the Moilers, Moongarnoo and Celia Shear Zones, which are greenstone belt-scale ductile dextral strike-slip mylonite zones around the Yandal Belt margins, and the Hook Antiform. Laminated quartz veins and associated disseminated sulphides in wallrocks are hosted by Archean, upper greenschist grade ophitic, pillowed tholeiitic basalts flows, dolerite sills and brecciated granodiorite. The main gangue minerals of the veins are quartz, with calcite, ankerite, albite, muscovite, biotite and tourmaline. Ore mineralogy is dominated by pyrite, pyrrhotite and chalcopyrite and lesser scheelite and tellurides. The Bronzewing Corridor is an informal name for the N-trending, ductile dextral strike-slip, anastomosing shear zones along which mineralization has been localized where the shear zones converge and diverge. The intersections of the N-trending shears with NE-trending, brittle dextral strike-slip faults and ESE-trending, brittle sinistral strike-slip faults (conjugate to the NE set) are also the loci of ore zones. Hydrothermal alteration defines halos zoned on the mineralization. Proximal sericitic alteration (muscovite-pyrite-rutile) grades to an intermediate carbonate alteration halo of ankerite-biotite-ilmenite-pyrrhotite and a distal chloritization halo with a chlorite-calcite-epidote-albite-leucoxene-magnetite assemblage. Chloritization of the granodiorite host is also present. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Bi-Te-W.

4058 Jundee is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 123 metric tons. It is located in the Jundee district of the Eastern Goldfields, Yandal greenstone Belt, Yilgarn Block, Western Australia. The Moilers Shear Zone is a major regional, SE-trending sinistral shear zone in the area. Quartz veins and veinlets are hosted by lower-greenschist grade, Archean tholeiitic basalts, dolerite sills and some quartz-felspar porphyry dykes. Quartz and calcite are the most important gangue minerals, with some sericite. The main ore mineral is pyrite, with lesser arsenopyrite, pyrrhotite, sphalerite, chalcocite, cobaltite, covellite and chalcopyrite. Two sets of brittle faults, in many places intruded by dolerite dykes, are critical to the distribution of the mineralization; a NE-trending, strike-slip dextral fault set and a set of E-trending, sinistral strike-slip faults conjugate to the first set. Two other vein directions coincide with N-trending brittle faults and NNW-trending ductile faults. A lithologic control is provided by the basalts, dolerites, and quartz-felsdpar porphyry dykes which deformed in a brittle fashion. The high Fe content of the basalts and dolerite led to enhanced gold precipitation. Hydrothermal alteration consists mainly of a chlorite-carbonate-pyrite-muscovite assemblage around the veins. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Zn-Cu-Co.

4090 Mount Todd is a Proterozoic, turbidite-hosted Au-Ag quartz vein (Bendigo type) deposit with a total gold content of 13 metric tons. It is located in the Mount Todd district of the southern portion of the Pine Creek Geosyncline, Northern Territory, Australia. The Pine Creek Shear Zone is a major regional NW-trending sinistral shear zone with apparent movement up to 2 km in the area. Sheeted to anastomosing mineralized quartz veins and associated disseminated sulphides are hosted by a lower greenschist turbidite sequence of greywackes and shales of the Early Proterozoic Burrell Creek Formation. The gangue minerals of the veins consist of quartz with minor tourmaline, biotite, muscovite and chlorite. Ore mineralogy is made up of sulphides with dominant pyrite and pyrrhotite (at depth) with lesser marcasite, chalcopyrite, arsenopyrite, bismuthinite, galena, cubanite, talnakhite, loellingite, pavonite and hedleyite. Bismuth minerals show a strong correlation to gold. Bedding-parallel sinistral-reverse faults preferentially localized within thin shale interbeds often contain quartz veins, but the most important faults are NNE-trending normal faults corresponding with the orientation of the main mineralized veins. With more than 3 km of apparent displacement, the development of this NNE fault set is synchronous with the bedding plane faults. A lesser ore control are WNW-trending faults showing minor sinistral movement and coinciding with a major joint set. Ore grade is also controlled by the lithology, shales being notably more sulphide-rich and enriched in gold. Hydrothermal alteration consists of a very thin selvages of chloritic alteration, and later sericitic alteration (sericite-chlorite-quartz-disseminated sulphides). The metallic signature of the bulk of the ore is Au-Ag-As-Bi-Cu-Zn-Te.

4092 Plutonic is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 166 metric tons. It is located in the Plutonic Well Greenstone Belt of the Marymia Dome or Inlier, Yilgarn Block, Western Australia. The Quartz Hill Thrust Fault and the MMR Fault, a sinistral strike-slip fault, are the two main regional tectonic structures in the area. Mineralized veins are hosted by Archean, upper greenschist to lower amphibolite grade, low-K tholeiitic basalts and amphibolites (representing probable high-Mg basalts) of the informal Upper and Lower Mine Mafic unit. The gangue mineralogy is mainly quartz and carbonate, with lesser chlorite, phlogopite, sericite, talc and tourmaline. Ore mineralogy of the lodes and associated disseminated sulphides is mainly arsenopyrite and pyrrhotite, with various amounts of pyrite and traces of loellingite, chalcopyrite, pentlandite, sphalerite, and scheelite. D_2 folding was responsible for the dome-and-basin folding pattern. During folding, the Mine Mafic unit behaved in a brittle fashion, developing faults and shears that allowed mineralizing fluids to travel through the unit, in contrast to the more ductile ultramafic units that are enclosing it. The mineralized lodes at Plutonic have the same orientation as the axial planes of the F_2 folds, which plunge gently NW, strike NW and dip NE. A thrust duplex developed during the D_3 Proterozoic Capricorn Orogeny deformation event has remobilized gold into quartz-rich veins and alteration zones and brought mineralization closer to the surface. The lodes have been displaced by later faults such as the Borrow Pit and Boundary faults. Propylitic and phyllic alteration associated with early mineralization of the mafic units are characterized by the assemblages chlorite-carbonate-albite and quartz-sericite-sulphides, respectively. These assemblages were later overprinted and partially to completely destroyed by the regional metamorphism. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Ni-Cu-Zn.

4093 The Lake Cowal Au-Cu deposits (including the Endeavour 42 deposit) are Late Ordovician, low-sulphidation epithermal deposits with a total gold content of 77 metric tons. They are located in the eastern Lachlan Fold Belt of central New South Wales, Australia. The Gilmore Fault zone, a regional fault zone, is the western boundary of the Girilambone Anticlinorial Zone, the tectonic block in which the deposit is found. Comb-textured quartz-carbonate veins and laminated veins are hosted by intermediate volcaniclastics and trachyandesites of the Ordovician Golden Lava unit and within the Muddy Lake diorite pluton and related fault-intruded diorite porphyry dykes. Other lesser hosts are the conglomerates of the Cowal Conglomerate unit and the pyroclastic debris of the Great Flood unit. Gangue minerals of the veins, in addition to quartz and carbonate, include adularia and chlorite. Ore mineralogy is dominated by pyrite and sphalerite, with lesser chalcopyrite, pyrrhotite and galena. The mineralization is strongly structurally controlled by a series of N-S and ENE-striking faults and shears which have been intruded by diorite porphyry dykes in many places. Most of those faults and brittle shears are interpreted to be related to the Gilmore Fault Zone. Veins occur within the Central Fault, a major N-S striking, steeply-dipping, ductile-brittle dip-slip sinistral fault, within the Western Fault, a broad, NW-striking anastomosing zone of deformation with dextral-normal offset and within minor but high-grade WNW-striking brittle shears such as the Lode Fault, the Jackpot Fault and the Jackflash Fault. Density and form of veins were also influenced by the rheology of the host unit. A broad peripheral halo of propylitic alteration (quartz-chlorite-epidote-K-felspar-hematite-rutile-calcite) has affected all rock types and is probably related to emplacement of the dioritic plutons or regional metamorphism. Sericitic alteration of the assemblage quartz-sericite-carbonate (ankerite) is intimately linked with faulting and carbonate-dominated mineralized veins and diminishes in intensity as it grades into the regional propylitic assemblage. Quartz-adularia alteration is found as narrow selvages around mineralized veins and as irregular zones of alteration throughout the Golden Lava unit. Chloritization represented by Fe-rich chlorite-carbonate-pyrite is associated with adularia alteration and with quartz-dominated veins. The metallic signature of the bulk of the ore is Au-Zn-Cu.

4140 Cadia Hill is a Late Ordovician(?) intrusion-related, porphyry Au-Cu deposit with a total gold content of 287 metric tons. It is located in the Cadia mining district, within the Molong Volcanic Belt, itself within the Lachlan Fold Belt of the Tasman Geosyncline, New South Wales, Australia. The nearby Big & Little Cadia deposits are distal skarns associated with the Cadia porphyry system. Cadia Hill, Cadia Quarry and Cadia East consist of subparallel vein systems hosted by or adjacent to the Cadia porphyries. The Wongalong Fault System is the major regional structure in the area and consists of a series of N-trending parallel thrust faults.

Mineralization at Cadia Hill consists mainly of subparallel ("sheeted") veins with associated disseminated sulphides and is hosted by the Late Ordovician Cadia Hill Monzonite (a quartz monzonite intrusion) and by volcanics and tuffaceous units of the Forest Hill Volcanics. Gangue mineralogy is predominantly drusy quartz, with lesser chlorite and calcite and minor K-feldspar, sericite, epidote and hematite. The dominant ore minerals are chalcopyrite, pyrite and bornite, with lesser chalcocite, digenite, molybdenite, covellite and magnetite. The deposits is bounded on the western and eastern sides by thrust fault, and a normal fault bounds it to the north. The predominant vein direction is NW, which is the same direction as some of the predominant reverse faults, such as the PC40 fault, and also the direction of a major dilation zone. This dilation zone probably facilitated the emplacement of the Cadia intrusion. The Gibb fault, a N-trending reverse splay of the Wongalong Fault System, resulted in Cadia Hill being thrusted partly over the Cadia East deposit. All rock types show varying degrees of propylitic alteration represented by the assemblage chlorite-epidote-calcite-sphene-hematite, which is more intense near the orebodies. Hydrothermal alteration at Cadia Hill consists of narrow and marginal K-feldspar zones which are thought to represent potassic alteration along the vein selvages. Late-stage sericitic alteration within and adjacent to some faults formed an assemblage of sericite-clay (or illite)-pyrite-quartz. Very late-stage fracture-filling carbonate alteration formed the assemblage siderite-ankerite-calcite-quartz in faults and fractures. Hydrothermal alteration at the Cadia East and Far East volcanic-hosted deposits is typical of porphyry deposits with at central potassic zone at depth, an outer potassic zone overprinted by propylitic alteration, a propylitic zone, and a higher (and intense) phyllic alteration zone. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Cu-Ag-Zn-Mo.

4212 Wallaby is an Archean quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 77 metric tons. It is located in the Laverton-Leonora area of the Laverton greenstone belt, Eastern Goldfields, Yilgarn Block, Western Australia. The Laverton Tectonic Zone, a N-trending structural corridor of reactivated reverse parallel oblique faults is the dominant regional tectonic structure in the area. The deposit lies close to the hinge zone of the Mt Margaret antiform, a broad, upright regional fold with a shallow plunge to the SSE. Quartz-carbonate vein and disseminated sulphide mineralization is hosted by an Archean, greenschist grade matrix-supported polymict conglomerate and within crosscutting syenitic to monzonitic dykes. Quartz and carbonate are the dominant gangue minerals, and pyrite is the only reported ore mineral at Wallaby. Mineralization is structurally controlled by NE-trending, laterally flat, gently-dipping shear zones and by the NW-trending shears linking the previous structures. Hydrothermal alteration consists of proximal carbonatization/sericitization (dolomite-silica-albite-sericite-pyrite-fuchsite alteration) associated with mineralized structures within a broad and pervasive alteration envelope of magnetite-actinolite. The metal signature of the bulk of the ore is unknown.

4217 Tarmoola is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 66 metric tons. It is located in the Leonora area of the Norseman-Wiluna greenstone belt, Eastern Goldfields Province, Yilgarn Block, Western Australia. Dominant regional tectonic structures in the area are the Keith-Kilkenny Tectonic Zone, a NNW-trending concentrated belt of D_2 reverse-sinistral shear zones, and the Sons of Gwalia Shear Zone, a N-trending, E-dipping, bedding-parallel, low-angle, ductile shear zone marking an abrupt change in metamorphic grade. Quartz-carbonate veins and stockwork mineralization is hosted mainly by greenschist grade Archean tholeiitic basalts and magnesian basalts, and by the Tarmoola Granodiorite. It is hosted to a lesser degree within chert and metasedimentary rocks. Quartz is the dominant gangue mineral, with minor carbonate. Ore mineralogy is dominated by pyrite and chalcopyrite, with lesser galena and sphalerite and trace amounts of stibnite and arsenopyrite. Emplacement of the Tarmoola granodiorite is coeval with initial tension stress in the Sons of Gwalia Shear Zone. D_2 shear strain and mineralization is concentrated in ultramafic-mafic rocks and also localized along the granite-greenstones NE-trending, shallow-dipping to subvertical contact due to the presence of homogeneous and competent granodiorite. Both W-trending D_1 reverse faults (with associated thrust-parallel and oblique en echelon vein sets), and N-trending, steeply-dipping D_2 reverse faults, occur in the greenstones and carry high-grade quartz-carbonate veins, whereas only the D_2 faults are present in the granodiorite. Most of the gold is found in the D_1 tension vein gashes. Veins hosted by the chert and metasediment units are in axial planar fractures related to the Tarmoola antiform, a gently N-plunging F_2 antiform. Dome-shaped geometry of the granodiorite in the SW area of the deposit hosts stockwork mineralization in NW-trending subvertical fault zones. Late SE-trending, subvertical D_3 sinistral strike-slip brittle faults, with minor offsets, displaced the orebodies. Hydrothermal alteration consists of intense silicification and carbonatization of the mafic-ultramafic sequence in shear zones at the contact with the granodiorite, with intensity increasing toward the granodiorite. Sericitic alteration forms discrete haloes around quartz veins and within the granodiorite itself, which is pervasively altered to the assemblage sericite-quartz-pyrite up to 50 metres away from its contact. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-As-Sb. According to Fairclough and Brown (1998), mineralization at Tarmoola is the result of strain perturbations along the Tarmoola Granodiorite during D_1 thrusting (following D_1 extension), combined with later D_2 faulting. The deposit thus shares early structural characteristics with the Sons of Gwalia and Harbour Light deposits, and later features of the Granny Smith deposit.

4218 Carosue Dam is an Archean(?) gold deposit of undetermined type with a total gold content of 36 metric tons. It is located SW of the Leonora area in the Norseman-Wiluna greenstone belt of the Eastern Goldfields Province, Yilgarn Block, Western Australia. The Keith-Kilkenny Tectonic Zone, a NNW-trending concentrated belt of D_2 reverse-sinistral shear zones, is the dominant regional tectonic structure in the area. The deposit is on the western limb of the regional Yilgangi syncline. Quartz stockwork and hydrothermal breccia mineralization are hosted by greenschist grade volcaniclastic rocks and greywacke of the Archean(?) Gundockerta Formation. Mineralization is associated with albite, K-feldspar, silica, hematite, carbonate and pyrite alteration assemblages. There is very limited geological information available on this deposit. Carosue Dam may correspond to a turbidite-hosted quartz-carbonate vein (Bendigo-type) deposit. Production startup is scheduled for first quarter of 2001.

4263 Sunrise Dam/Cleo is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 125 metric tons. It is located in the Laverton-Leonora area of the Laverton greenstone belt (Laverton Tectonic Zone), Eastern Goldfields Province, Yilgarn Block, Western Australia. The major regional structure in the area is the Laverton Lineament, a N-trending structural corridor of parallel oblique faults. Laminated and brecciated quartz-carbonate veins and associated disseminated sulphides are hosted by

Archean, lower greenschist grade, intermediate volcaniclastic rocks, turbiditic magnetite-rich shales and siltstones, porphyritic granodiorite dykes (2677±6 Ma), and by ultramafic intrusions. Minor ore-bearing crackle-breccias are hosted by the granodiorite dykes. Quartz and ankerite are the dominant gangue minerals, with minor tourmaline. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser tetrahedrite-tennantite and chalcopyrite, and minor electrum and tellurides. The S- to SW-trending, gently- to moderately-dipping Sunrise Shear Zone is a D_2 structure with dextral-reverse movement, subsequently reactivated as a dextral-normal structure. It runs parallel to, and along the western limb of, a N-trending D_2 antiform. Granodiorite dykes and first stage ore-bearing quartz-carbonate veins and disseminated sulphides occur inside the Sunrise Shear Zone. Areas of high gold grade are related to a flexure in dip and change in strike of the shear zone. Stage two “Western Lodes” type mineralization consists of quartz-carbonate veins and associated disseminated sulphides in NE- and SW-trending, steeply-dipping fractures compatible with D_3 deformation, and refracted across the Sunrise Shear Zone. Chemical-lithological control is provided by magnetite-rich shales which are preferentially replaced by pyrite. Granodiorite dykes acted as more competent and brittle rocks within the shear zone during deformation, and localized fracturing and fluid flow inside and along their contacts with the surrounding rocks. Hydrothermal alteration is centered on the ore-bearing veins and the Sunrise Shear Zone, and consists predominantly of carbonate alteration which may extend up to 100 metres away. Proximal ankerite/dolomite-sericite-pyrite-arsenopyrite grades away to an assemblage of ankerite/dolomite-chlorite±sericite-pyrite, and to a distal barren assemblage of chlorite-calcite. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Cu-Te.

BOLIVIA

1771 Kori Kollo is a Middle Miocene, transitional-type Au-Ag deposit with a total gold content of 118 metric tons. It is located in the La Joya district of the Central Bolivian Altiplano, Andean Cordillera, Bolivia. The Soledad Caldera is the main regional tectonic structure in the area, but domes emplacement was controlled by regional NW-trending structures. Sulphide-rich veins and veinlets, disseminated sulphides and hydrothermal breccia mineralization are hosted by Middle Miocene porphyritic tonalite stocks or sills and flow-banded dacite domes. Gangue mineralogy of the veins is mainly quartz (although relatively minor in comparison with other minerals), except for some veins which contain supergene alunite. Ore mineralogy is dominated by pyrite, marcasite, arsenopyrite and chalcopyrite, with minor stibnite, tetrahedrite and sphalerite, galena, realgar, zinckenite and chalcocite. A well-developed zone of supergene enrichment with copper sulphides (covellite) mined for Cu-Au-Ag and an oxide zone mined for Au-Ag are present in the upper part of the deposit. The veins occur in NNE- to NE-trending, steeply-dipping fractures, and the hydrothermal breccias are confined to the borders of the tonalite stocks-domes. Hydrothermal alteration consists of a central core of tourmaline-silica, surrounded by pervasive phyllic (sericitic) alteration of the tonalite stocks and intruded sediments to an assemblage of sericite-quartz-pyrite. Propylitic alteration forms the outer alteration halo. Supergene advanced argillic alteration forms zones and veins of quartz-alunite and jarosite. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Sb-Pb-Zn-Hg-Bi-B-W-Sn. Classification of the deposit is problematic, as some features are of porphyry gold affinities and others would relate to an epithermal, both high- and low-sulphidation systems. The deposit is thus viewed as a transitional type between the magmatic (intrusion-related) and epithermal clans.

Appendix 2

BRAZIL

98 Crixas (Mina III) is a probable Late Proterozoic to Late Ordovician, unclassified gold deposit with a total gold content of 87 metric tons. It is located in the Crixas greenstone belt of the Goias Massif, at the western margin of the Sao Francisco craton, Tocantins province, Brazil. Large-scale low-angle folds and low-angle thrust faults are the dominant regional tectonic structures in the area. Massive to disseminated sulphide bodies and quartz-carbonate veins are hosted by lower amphibolite grade, foliated amphibolite (probably metamorphosed mafic volcanics), silicified dolomite, graphitic pelite and banded quartz-biotite-chlorite-plagioclase schist of the Archean Ribeiro das Antas Formation. Ore mineralogy is dominated mainly by arsenopyrite, pyrrhotite, chalcopyrite and pyrite, with minor galena and scheelite. Gangue minerals are quartz, ferroan carbonates and plagioclase, with minor apatite and tourmaline. The deposit is structurally controlled by NS-trending, low-angle thrust faults with frontal and lateral ramps and movement toward the east. EW-trending folding affected the rocks and mineralization but it is not clear whether this had any real impact on ore distribution. Hydrothermal alteration consists of a mixture of carbonate alteration, silicification, muscovite alteration and sulphidation. A zone of 'incipient alteration' corresponds to the passage from unaltered amphibolite to chlorite-calcite-quartz schists, which grades into muscovite-dolomite-quartz-oligoclase schist and finally into completely carbonatized ferroan dolomite rock. The highest gold grades occur at the transition between the muscovite-dolomite schist and the massive ferroan dolomite rock. Sulphidation is present in all the alteration zones. Silicification is present only near the vein mineralization, with replacement of phyllosilicates by fine-grained quartz. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Pb-W. Thompson (1987) proposed an epigenetic, thrust-related model of ore formation of Brasiliano age. According to Jenkins *et al.* (1997), this deposit represents a cross between the gold-rich volcanogenic massive sulphide and the quartz-carbonate shear-zone-related types. Jost *et al.* (2001) suggest a model where the massive sulphide lenses represent a syngenetic, volcanogenic exhalative oxide-silicate iron formation later sulphidized along specific layers during the Brasiliano quartz vein formation and shearing events related to thrust deformation. Age data obtained by Fortes *et al.* (1997) on muscovite schists spatially related to the massive sulphide lenses are interpreted by Jost *et al.* (2001) as being reset during the Brasiliano thrusting event.

100 Morro Velho is an Archean to Early Proterozoic, iron-formation-hosted vein and disseminated (Homestake type) gold deposit with a total gold content of 507 metric tons. It is located in the Gandarelay Syncline area of the Rio das Velhas greenstone belt, Quadrilatero Ferrifero, Sao Francisco craton, Brazil. The Rio das Velhas Anticlinorium is the major regional tectonic structure in the area. Stratabound and stratiform massive and banded to disseminated sulphide mineralization (with very minor quartz veins) is hosted by greenschist grade massive quartz-carbonate rock with subordinate graphite called "Lapa Seca" Formation, which probably represents D_1 altered volcanic or volcaniclastic rocks, and iron formation of the Archean Nova Lima Group. Gangue mineralogy is dominated by quartz, dolomite and ankerite, with lesser siderite, chlorite, sericite and plagioclase and trace calcite, rhodochrosite and magnetite. Pyrrhotite, arsenopyrite and pyrite are the dominant ore minerals, with minor local chalcopyrite, cubanite, sphalerite, galena, tetrahedrite, ullmanite, scheelite, wolframite and bornite. Ore is structurally controlled by E-trending, moderately-plunging, tight and asymmetric folds in which ore was concentrated in hinge zones during D_2 deformation and quartz veins were folded. NE-striking, subvertical shear zones subparallel to bedding also host orebodies. A lithological control is evident as iron-formation layers have been preferentially sulphidized/replaced. Hydrothermal alteration is symmetrically zoned around the orebodies and consists of proximal sericitic alteration (ankerite-sericite/fuchsite-quartz), intermediate carbonate alteration (ankerite-quartz±chlorite±sericite/fuchsite) and distal chloritic alteration (chlorite-plagioclase-quartz-calcite). The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-As-Sb-Pb-Zn-Ni-W-B. It is still controversial whether this deposit is of syngenetic or epigenetic origin; however, there is evidences of Late Archean-Early Proterozoic remobilization of lead originally present in the sulphide grains during Early Proterozoic metamorphism and deformation (De Witt *et al.*, 1994).

101 Passagem de Mariana is a Middle to Late Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 60 metric tons. It is located in the Ouro Preto district of the Rio das Velhas greenstone belt, Quadrilatero Ferrifero, Sao Francisco Craton, Brazil. A SE-striking, regional open anticline in which gold mineralization occurs in the nose, and a low-angle, bedding-parallel thrust fault upon which iron formation was emplaced over deformed metasedimentary rocks are the dominant regional tectonic structures in the area. Quartz vein and disseminated sulphide mineralization is hosted by upper greenschist to lower amphibolite quartz-biotite and amphibolite schists, graphitic and sericitic phyllites, amphibolites, carbonate rocks and quartzite of probable affinity with the Proterozoic Minas Supergroup. Gangue mineralogy of the veins is dominated by quartz and ankerite, with lesser tourmaline and sericite. Arsenopyrite, pyrrhotite and pyrite are the principal ore minerals, with lesser chalcopyrite, marcasite, galena, stibnite, bismuthinite, cosalite, native bismuth, maldonite, tetradymite, tsumoite, joseite, pilsenite, aurostibite, ullmanite and gersdorffite. The thrust fault which emplaced iron formation over the schistose units is thought to have provided channelways for the mineralizing fluids and structurally controlled the mineralization. Earlier, banded and lenticular concordant veins are cut by later (but structurally compatible) vertical extension veins. Hydrothermal alteration consists of symmetrical halos of sericite-carbonate alteration and sulphidation around the veins. Tourmalinization is also very common. The metallic signature of the bulk of the ore is Au-Ag-As-W-Bi-B. There is still controversy as to whether the concordant veins and disseminated sulphide mineralization corresponds to a syngenetic or epigenetic model of ore formation (Fleischer and Vial, 1991). Chauvet *et al.* (2001) proposed a model for mineralized quartz vein formation in an extensional context subsequent to a regional thrust event at around 490 Ma.

102 Raposos is an Archean to Early Proterozoic, iron-formation-hosted vein and disseminated gold deposit (Homestake type) with a total gold content of 103 metric tons. It is located in the Rio das Velhas greenstone belt of the Quadrilatero Ferrifero, Sao Francisco craton, Minas Gerais, Brazil. The NW-striking Rio das Velhas Anticlinorium is the dominant regional tectonic structure in the area. Massive sulphide replacement (and very minor disseminated sulphide and quartz vein) mineralization is hosted by the greenschist grade carbonate and oxide facies iron formations of the Archean Nova Lima Group. Ore mineralogy is dominated by pyrrhotite, pyrite and arsenopyrite, with rare chalcopyrite and galena. Lithological control of the siderite-rich iron-formation facies which are preferentially replaced and mineralized is evident. N- to NE-trending, shallow to moderately E- to SE-plunging asymmetrical and isoclinal F_2 folds are prominent ore controlling structures. Mineralized NE-striking dextral(?) shear zones parallel to S_2 are host to quartz veins and imply that the ore is related to or post-D_2. Hydrothermal alteration is symmetrically zoned around the orebodies and consists of proximal sericitization (ankerite-sericite/fuchsite-quartz), intermediate carbonate alteration (ankerite-quartz±chlorite±sericite/fuchsite) and distal chloritization (chlorite-plagioclase-quartz-calcite). The metallic signature of the bulk of the ore is Au-Ag-As-B-Ba. Due to its proximity and similarity with the Morro Velho deposit, it is inferred that the age of the mineralization event is similar.

556 Sao Bento is an Archean(?), iron-formation-hosted vein and disseminated (Homestake type) gold deposit with a total gold content of 158 metric tons. It is located in the Barra Feliz district of the Rio das Velhas greenstone belt, Quadrilatero Ferrifero, Sao Francisco craton, Brazil. The Conceicao anticline is a NE-trending regional anticlinal fold and the dominant tectonic structure in the area. Discordant sulphide-rich veins and stratabound massive sulphide replacement bodies are hosted by greenschist grade sulphide and oxide facies iron formations and graphitic schists of the Archean Nova Lima Group. Quartz is the dominant gangue mineral of the veins, with minor carbonate and plagioclase. Arsenopyrite, pyrrhotite and pyrite are the dominant ore minerals, with lesser scheelite, titanite, sphalerite, covellite, galena and bornite. The mineralization is syn- to late-deformation, and has been affected and controlled by E-striking ductile-brittle dextral shearing in fold limbs and NE-striking folding. Hydrothermal alteration around the veins consists of a proximal carbonatization and sulphide replacement of the iron formation (quartz-ankerite-muscovite-pyrrhotite-arsenopyrite-pyrite), an intermediate sericitic alteration zone of quartz-muscovite±carbonate± sulphides±chlorite±magnetite and a distal zone of chloritic alteration with quartz-chlorite-muscovite-magnetite-carbonate±pyrite. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-W-Hg. There is still a controversy regarding an epigenetic or syngenetic origin of the deposit.

557 Morro do Ouro (Brasilia mine) is a Late Proterozoic, turbidite-hosted quartz-carbonate vein gold deposit with a total gold content of 246 metric tons. It is located in the Paracatu area of the Brasilia folded thrust belt, at the western border of the Sao Francisco craton, Minas Gerais, Brazil. A regional, S-trending low-angle (10^o dip) thrust fault with movement toward the east is the dominant tectonic structure in the area. Quartz veins are hosted by greenschist grade, phyllitized carbonaceous mudstones and sandstones of the Middle to Late Proterozoic Paracatu Formation (Canastra Group) which forms a slice or duplex within a thrust fault. Quartz is the dominant gangue mineral, with lesser sericite and carbonate. Ore mineralogy is dominated by pyrite, with minor sphalerite, galena, tetrahedrite and arsenopyrite. The deposit is controlled by a S-trending, low-angle thrust fault that is subsidiary to the regional structure. Complex episodes of folding, and interference between F_4/F_5 and F_2 resulted in the development of transtensional and transpressional sites favorable to gold deposition. The mineralization was concentrated where S-C surfaces transformed into dilatant sites during progressive shearing, and within NW- to NNW-trending hinge zones of small isoclinal F_2 folds. Sericitization is the only alteration present and it is unclear whether it is related to the mineralization or the deformation. The metallic signature of the bulk of the ore is Au-Ag-As-Cu-Pb-Zn.

558 Fazenda Brasileiro is an Early Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 70 metric tons. It is located in the Weber belt district at the extreme southern part of the Rio Itapicuru greenstone belt, Sao Francisco craton, northeast Brazil. Regional structure is dominated by large scale, asymmetric, tight to open F_2 folds superimposed on an EW-trending, moderately-dipping dextral strike-slip D_1 shear zone (corresponding to host schist unit). Brecciated, boudinaged and massive quartz veins and associated disseminated sulphides are hosted mainly by a greenschist grade, Early Proterozoic unit of chlorite-magnetite schist of probable gabbroic origin but also occur in sheared and altered gabbro and metapelite units. Quartz and albite are the dominant gangue minerals, with lesser carbonate and minor biotite. Ore mineralogy is dominated by pyrite, with lesser pyrrhotite and arsenopyrite and minor chalcopyrite and sphalerite. The ore is structurally controlled by EW- to NE-trending, steeply-dipping, ductile-brittle oblique D_2 shears with mostly strike-slip movement (with reverse component) which correspond to the main channelways. Mineralization also occurs along E-plunging F_2 fold axes and hinges where it is thickened; veins are also parallel to the axial planar cleavage. The chlorite-magnetite schist unit represents a chemical trap and a permeable horizon along a lithologic contact bordered by incompetent and less permeable sediments. Hydrothermal alteration consists of albitization and sulphidation of the chlorite-magnetite schist. An assemblage of albite-quartz-chlorite-pyrite-pyrrhotite forms an outer (or ‘incipient’) zone of alteration, and grades inward to a centimetre to decimetre scale inner alteration zone of albite-calcite-pyrite-arsenopyrite. The metallic signature of the bulk of the ore is Au-Ag-As-Ba-Bi-Cu.

564 Cuiaba is an Archean, iron-formation-hosted (Homestake type) vein and disseminated gold deposit with a total gold content of 171 metric tons. It is located in the Sabara area of the Nova Lima district, Rio das Velhas greenstone belt, Quadrilatero Ferrifero, Sao Francisco craton, Brazil. Massive sulphide mineralization is hosted by lower amphibolite grade, altered banded oxide and carbonate facies iron formations. Discordant quartz vein mineralization is hosted by lower amphibolite grade iron formation, andesite, mudstone and rhyodacitic tuff. All host rocks are part of the Archean volcano-sedimentary Nova Lima Group. Gangue mineralogy is mainly quartz, with accessory magnetite, rutile, monazite, albite, scheelite, ilmenite and leucoxene. Ore mineralogy is dominated by pyrite, arsenopyrite and pyrrhotite, with minor sphalerite, chalcopyrite, marcasite, galena, gersdorffite and stibnite. Massive sulphide ore is structurally controlled by hinge zones of D_2 folds which is where most of the ore is concentrated. NE-striking, moderately-dipping D_2 shear zones host quartz veins and adjacent iron formation layers have been replaced by massive sulphides. Sulphidation of siderite and magnetite of the iron formation was an important process in the formation of massive sulphide ore. Hydrothermal alteration around the mineralized quartz veins hosted by volcanic rocks has formed a proximal zone of sericitic alteration consisting of quartz-albite-sericite-ankerite/calcite, an intermediate carbonatization zone of ankerite/calcite-quartz±chlorite±rutile and a distal chloritic alteration assemblage of chlorite-plagioclase-quartz-calcite-sphene-epidote. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Zn-Cu.

566 Igarapé Bahia is a Late Archean lateritized controversial style of Au-(Cu) deposit with a total gold content of 250 metric tons. It is located in the Carajas area of the Itacaiunas shear belt, Amazonian Shield, Para, Brazil. A regional WNW- to ESE-trending fault, with a pronounced bend in the deposit area is the dominant tectonic structure in the area. Stratabound and stratiform disseminated to massive sulphides and discordant quartz veins are hosted by greenschist grade altered sedimentary breccia, schists (of basaltic and pyroclastic origin), and iron formations of the Late Archean Rio Fresco Formation (Igarapé Bahia Group). Mineralogy of the lateritic ore is mainly goethite. Gangue mineralogy is dominated by quartz and chlorite, with lesser calcite, sericite, epidote, fluorite, monazite and stilpnomelane. Sulphide mineralogy is made up dominant chalcopyrite with lesser pyrite, bornite, magnetite and hematite, and minor molybdenite, covellite, chalcocite, ferberite, hessite, uraninite and native silver. Most of the disseminated mineralization occurs in the breccia, which is lithologically confined between the lower volcanic part and the upper sedimentary part of the Igarapé Bahia Group. Hydrothermal alteration consists mainly of chloritization, which becomes more intense toward the ore zones and particularly intense in the host schists and breccia. Carbonatization is also important. There is minor silicification, biotitization and tourmalinization in the breccia. Rare sericitic alteration and albitization are present throughout the deposit. The zone of superficial ferruginous alteration (weathering) contains the main gold enrichment, where gold is associated with iron oxide-hydroxide nodules. The metallic signature of the bulk of the ore is Au-Ag-As-Cu-B-Sn-W-U-REE. There are two main models for the formation of the Igarapé Bahia deposit: 1) an Olympic Dam-type model and 2) a volcanogenic-exhalative model with metals furnished by a magmatic source(Villas and Santos, 2001). Similarities with the Olympic Dam model include the metal suite, the alteration styles, fluid compositions and tectonic environment. Arguments in favor of the second model are the volcanic-dominated environment, the rift setting, the fact that the orebodies are conformable to the host rocks and that all Au-Cu mineralization in Carajas is confined to supracrustal rocks. Villas and Santos (2001) are in favor of the syngenetic model.

567 Jacobina is an Early Proterozoic, Au-U paleoplacer deposit with a total gold content of 80 metric tons. It is located in the Jacobina mining district of the Jacobina Basin, part of the Jequie Block, Serra de Jacobina, Sao Francisco craton, Brazil. The Contendas-Jacobina lineament is a N-trending structure between the Archean Gaviao and Jequie blocks and the dominant regional tectonic structure in the area. Disseminated gold and sulphide mineralization is hosted by lower amphibolite grade quartz-pebble conglomerates (with textures varying from well-packed to pebble- and matrix-supported) and coarse sandstones of the Early Proterozoic Serra do Corrego Formation. The mineralogy of the conglomerates is made up of quartz, sericite and fuchsite with accessory zircon, rutile, tourmaline, andalusite and chromite of detrital origin. Ore mineralogy is dominated by pyrite, with minor uraninite, chalcopyrite and pyrrhotite. The ore is primarily lithologically controlled as ore minerals are found only within the conglomerates and coarse sandstones of the Serra do Corrego Formation. However, sinistral wrench-thrust shears which crosscut the bedding of the host conglomerates have affected the distribution of the ore zones. A set of N-trending, steep to subvertical faults (such as the Itaitu fault) bound the deposit to the east and west. Hydrothermal alteration consists of newly-formed fuchsite-rutile-tourmaline-andalusite halo around the gold reefs. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-U-Cr-Zr-Ti-B. Teixeira *et al.* (2001) favor an epigenetic model for the Jacobina deposit based on an intimate association between gold reefs and anastomosing shear zones and development of hydrothermal alteration broadly synchronous with emplacement of peraluminous granite in the area between 1970 and 1800 Ma.

<u>BULGARIA</u>

1787 Chelopech is a Late Cretaceous(?) high-sulphidation epithermal Au-Cu-As deposit with a total gold content of 36 metric tons. It is located in the Panagyurishte district within the Sredna Gora (Srednogorie Zone) of the Carpathian-Balkan arc, Balkan Peninsula, Bulgaria. The major regional tectonic structures are the Maritsa fault, a deep fault separating the Srednogorie Zone from the Rhodope Massif, and the Chelopech stratovolcano, within which the Chelopech deposit is situated. Sulphide-rich siliceous replacement zones forming massive sulphide lenses and sulphide-rich veins are hosted by andesites, dacites and andesitic tuffs (vitric tuffs, crystal and lithic tuffs) of the Late Cretaceous Lower Chelopech Formation. Ore mineralogy is dominated by pyrite, together with enargite, luzonite, tennantite, bornite, chalcopyrite, galena and sphalerite as the major minerals. A complex suite of minor sulphides and sulphosalts such as colusite, famatinite, digenite, covellite, chalcocite and telluride minerals form the rest of the ore. Gangue mineralogy is composed of quartz (chalcedony), barite, fluorite, sericite, chlorite, kaolinite, gypsum and ankerite. The deposit is zoned, with high Pb-Zn contents and high-grade Au ore in barite and chalcedony at high levels and high Cu content at deeper levels. Mineralization is structurally controlled by NE- and NW-trending, steep to subvertical faults; larger ore lenses are located at the intersections of the two trends. Silicification is intimately associated with the mineralization process. An inner quartz-sericite zone grades outward into propylitic alteration. The metallic signature of the bulk of the ore is Au-Ag-Cu-As-Pb-Zn-Se-Te-Bi-Tl-Sn-Ga-Ge-Mo. The classification of the Chelopech deposit is controversial, it has been interpreted as 1) a VMS deposit, 2) a high-sulphidation epithermal deposit, and 3) a telescoped system with an early marine VMS-style mineralization followed by a sub-aerial high-sulphidation epithermal mineralization event (R. Moritz, personal communication to B. Dubé, April 2000).

BURKINA FASO

319 Poura is an Early Proterozoic, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 24 metric tons. It is located in the Poura district of the Boromo greenstone belt, West African craton, Burkina Faso. A NE-trending, D_3 dextral shear zone is the main regional tectonic structure in the area. Banded quartz veins and stockwork mineralization are hosted by Early Proterozoic, greenschist grade volcanic rocks including rhyodacitic tuffs, basalts and andesites and a sedimentary assemblage of sandstones and conglomerates. The gangue mineralogy of the veins is dominated by quartz, with abundant white mica, calcite and ankerite and lesser chlorite, albite and rutile. Ore mineralogy is dominated by arsenopyrite and pyrite, with minor sphalerite, galena, chalcopyrite and tetrahedrite. The mineralization is structurally controlled by SE-striking, steeply-dipping brittle-ductile faults. It is displaced by a series of late NNE- to E-trending sinistral strike-slip faults, NE-trending dextral strike-slip faults, and NE- to SE-trending faults of undetermined movement. Alteration consisting mainly of carbonate and sericite with accessory rutile is pervasive but extends no more than 25 cm away from the veins. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Pb-Zn-Cu.

CANADA

103 Buffalo Ankerite is a Late Archean, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 32 metric tons. It is located in the Porcupine mining camp (near Timmins) of the Abitibi greenstone belt, Superior Province, Ontario, Canada. The deposit is on the southern limb of the Porcupine Syncline and just north of the Destor-Porcupine Fault, a crustal-scale fault of possible sinistral-reverse motion. Banded quartz veins and associated disseminated sulphides are hosted mainly by greenschist grade amydaloidal pillow basalt flows of the Late Archean Tisdale Group (Hersey Lake Formation). Quartz-feldspar porphyry bodies and syn- to post-porphyry heterolithic breccia host a minor part of the ore. Cr-rich tourmaline (chromian dravite) is the dominant gangue mineral (up to 65%), with abundant quartz and ankerite, and lesser albite. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, sphalerite, pyrrhotite, and arsenopyrite. Mineralization is structurally controlled by competency contrasts along litholgical contacts, such as at the basalt flows interface, and along the basalt-quartz-feldspar porphyry intrusion. The mine area is on the southern limb of the NNW- to NW-trending Karoyum syncline, and mineralized quartz veins in conglomerate are located in fractured hinge areas. Orebodies are cut by the Spur fault, a NNW-trending, moderately- to steeply-dipping fault splaying from the Destor-Porcupine fault. Hydrothermal alteration consits of intense carbonatization adjacent to the veins. Areas of disseminated sulphide mineralization and small-scale veining in the heterolithic breccia, the QFP and in the basalts adjacent to the porphyry bodies are bleached and affected by sericitization, silicification and pyritization. Carbonate-sericite alteration also affects the ultramafic rocks. A tourmalinized breccia dyke has been recognized in the QFP bodies but its economic significance is unclear. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-B-Cu-Zn-As.

107 Aunor (also known as Pamour #3) is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 78 metric tons. It is located in the Timmins district of the Abitibi greenstone belt, Superior province, Ontario, Canada. The regional Destor-Porcupine fault is the main tectonic structure in the area. Quartz vein mineralization is hosted by greenschist grade, pillowed komatiitic basalts and overlying mafic tuffs of the Late Archean Tisdale Group. Quartz is the dominant gangue mineral, with lesser but abundant ankerite and tourmaline, and minor fuchsite, stilpnomelane and mariposite. Ore minerals are sulphides such as pyrite, pyrrhotite, sphalerite, arsenopyrite and chalcopyrite. Quartz-ankerite veins are comformable to the stratigraphy, and are also boudinaged in places. These veins could be structurally related to a SE-trending syncline in the area, and to lithological contacts and competency contrasts between the different volcanic flows and beds. Quartz-tourmaline veins are subparallel to normal faults, to which they are most likely linked. Hydrothermal alteration consists of carbonate alteration of the wallrocks, and restricted (3 to 5 cm-wide) sericitic alteration along the vein selvages. The metallic signature of the bulk of the ore is Au-Ag-Cu-Cr-Ni-Co.

111 Beattie-Donchester is an Archean, intrusion-related non-carbonate-hosted stockwork-disseminated deposit proximal to a syenite porphyry stock, with a total gold content of 44 metric tons. It is located in the Duparquet area of the Abitibi greenstone belt, Superior province, Quebec, Canada. The major regional tectonic structures in the area are the Destor-Porcupine Fault, and an E-plunging, overturned syncline. Mineralized hydrothermal breccias, disseminated sulphides and quartz-carbonate stockworks are mainly hosted by altered and brecciated, finely banded, intermediate tuffs horizons, and by a syenite porphyry stock. Quartz and carbonate are the dominant gangue minerals, with minor chlorite and fluorite. Ore minerals are mainly pyrite and arsenopyrite, with lesser chalcopyrite, sphalerite, galena and molybdenite. Orebodies are restricted to a short distance from the syenite porphyry. The major part of the mineralization is represented by tuff-hosted hydrothermal breccia, and is described as a bleached and altered tuffs cemented by tiny quartz-carbonate stringers. Stockwork and disseminated ore occurs along steeply-dipping to vertical shear zones localized within the syenite body and along its contact. Other gangue minerals include minor chlorite and fluorite. Minor, steeply-dipping (normal-dextral?) faults offset the orebodies. The syenite porphyry (mainly hornblende) is altered to a chlorite-carbonate assemblage. Intense sericite-carbonate alteration affected the brecciated tuffs and the sheared metasediments and syenite. Albitization of the syenite porphyry and potassic alteration (K-feldspar) near the orebodies are also noted. The metallic signature of the bulk of the ore is Au-Ag-As-Te-Cu-Zn-Pb-Mo-Ga.

120 Bousquet No.1 (Thompson-Bousquet) is a Late Archean, epithermal volcanogenic massive sulphide deposit with a total gold content of 36 metric tons. It is located in the Bousquet district of the Abitibi greenstone belt, Superior province, Quebec, Canada. The deposit is situated near the major regional Cadillac-Larder Lake fault zone, and lies in the Dumagami-Bousquet deformation zone, an intense, 500-metre wide, ductile to brittle deformation zone characterized by intense S_2 mylonitic foliation. Disseminated sulphides and quartz veins within shears and faults are hosted by greenschist grade quartz-muscovite schists, andalusite schists, mylonites and phyllonites probably derived from Late Archean Blake River Group felsic and mafic volcaniclastic rocks. Gangue mineralogy of the veins consists of quartz, rutile, muscovite, chlorite, calcite and ankerite. Ore mineralogy is dominated by pyrite and chalcopyrite, with lesser magnetite, sphalerite, pyrrhotite, arsenopyrite, bornite, galena, gudmundite, stannite and tellurides, such as altaite and calaverite. There are two types of mineralized quartz veins: foliation-oblique veins and foliation-parallel veins. The foliation-oblique vein set is controlled by steeply-dipping conjugate shear fractures related to the competent protoliths, and by S- and Z-shaped folds, which created extension fractures and focused fluid flow. Ductile and reverse shears and faults, and openings created by decoupling schistosity laminae and irregular surfaces, controlled the distribution of foliation-parallel veins. Hydrothermal alteration consists of a pre-metamorphic aluminous alteration (andalusite-quartz-kyanite-white mica-diaspore) affecting the host schists, retrograded to an advanced argillic assemblage (pyrophyllite-kaolinite-diaspore-muscovite). Faults and shears and their related quartz veins have developed post-metamorphic “retrograde” alterations represented by the chlorite-carbonate-pyrite assemblage and by sericitization.. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-Zn-As-Pb-Sb-Sn-Te. Tourigny *et al.* (1992) suggested that the genesis of the gold mineralization is a multi-stage process. The mineralogy of the ore, its metallic signature and the nature of alteration strongly suggest an early, synvolcanic, Au-bearing sulphide mineralization which has been remobilized and deposited in structural traps during D_2 deformation greenschist metamorphism (Tourigny *et al.*, 1992).

127 Camflo-Malartic Hygrade is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 59 metric tons. It is located in the Malartic district of the Abitibi greenstone belt, Superior province, Quebec, Canada. The regional Cadillac-Larder Lake Fault Zone is the main tectonic structure in the area. Quartz veins, stockworks and disseminated sulphides are mainly hosted by the 2685±10 Ma Camflo monzonite-diorite stock. Other hosts are oxide facies iron formations (also hosting semi-massive sulphides), calc-alkaline andesites, basaltic rocks and conglomerates of the Late Archean Kewagama Group. Gangue minerals are quartz, microcline, calcite, fluorite, titatine, rutile, tourmaline and anhydrite. Pyrite is the main ore mineral, with lesser galena, chalcopyrite, molybdenite, tellurides, scheelite, pyrrhotite and arsenopyrite. The Marban-Nolartic corridor affects the local structure. Minor thrust faults control the mineralization outside the intrusive rocks. The Camflo stock is in a small EW-trending, Z-shaped F_2 folds and is a brittle, highly fractured porphyritic intrusion. The monzonite-metasediment contact is another controlling structure, and hosts ore-grade quartz veins. Sericite-pyrite alteration and K-metasomatism are associated with gold-bearing quartz veins and also occur along shears and faults and adjacent wallrocks. Local albitization also occurs near quartz veins. Semi-massive sulphide mineralization occurs where faults cut across the iron formations, and is the result of intense pyritization of the oxides. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-W-Ba-Rb. The 2621±4 Ma age on titanite obtained from a gold-bearing quartz vein precludes a genetic link between the Camflo stock and the veins. Gold mineralization is more likely associated with deep metamorphism and related fluid circulation.

128 Campbell Red Lake- Arthur White - Robin Red Lake is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 663 metric tons. It is located in the Red Lake greenstone belt of the Uchi subprovince, Superior Province, Ontario, Canada. The major regional tectonic structures in the area are the SE-trending Cochenour-Gullrock Lake Deformation Zone (or 'Red Lake mine trend'), correponding to a zone of heterogeneous, protracted D_2 strain, and SE-trending, SE-plunging F_{2a} folds, which form an antiform-synform pair. Sheeted, banded and colloform-crustiform-cockade-textured carbonate veins, sulphide-rich siliceous replacement along veins, and disseminated sulphides are hosted by middle greenschist to amphibolite grade (the latter caused by contact metamorphism due to emplacement of the nearby Walsh Lake Pluton), altered and deformed, Fe-rich tholeiitic basalt and basaltic komatiites of the Middle Archean Balmer assemblage. Gangue mineralogy consists dominantly of dolomite, chert and quartz. Ore minerals are mainly arsenopyrite and pyrite, with lesser pyrrhotite, stibnite, magnetite and sphalerite. Alteration and mineralization are controlled by two parallel, SE-trending, steeply-dipping reverse-sinistral dip-slip D_2 faults, the Campbell fault zone and the Dickenson fault zone. These faults flattened F_{2a} folds, and strained and transposed limbs. A W-plunging, F_{2b} fold with NE vergence compatible with reverse movement along the Campbell fault affects the veinlets and the foliation. Carbonate veins are deformed (boudinaged) and affected by S_2 foliation; boudinage is thought to be contemporaneous with folding (Dubé *et al.*, 2002). Intersecting SE-, E- and SSE-oriented high-strain zones control W-plunging, spectacular geometric ore shoots at the Arthur White mine (renamed Red Lake mine), with an average grade of 88 g/t gold. Lower pressure F_{2a} fold hinges focused the mineralizing fluid in the high-grade zones, and the overlying carbonatized ultramafic rocks are thought to have played a role in the ponding of ore fluid, mechanically acting as a less permeable barrier controlling fluid migration along or near the contact with the folded basalts (Dubé *et al.*, 2001). E- to SE-trending, brittle, barren millimetre-wide faults filled by tourmaline and quartz cut across the alteration and ore zones. Hydrothermal alteration consists of proximal (along the margins of carbonate veins), gold-bearing silicic replacement (silicification) and sulphidation (arsenopyrite) of strongly foliated basalts. This alteration overprints a biotite-carbonate alteration, with disseminated pyrite and carbonate veinlets in well foliated basalts. This alteration is considered as a key vector for high-grade ore by Dubé *et al.* (2002). This in turn grades away to (and overprints) distal carbonate-chlorite alteration and aluminous alteration. The latter alteration is also zoned, with a bleached zone of quartz-andalusite-sericite±margarite±chloritoid±cordierite grading outward to a more chloritic zone of quartz-chloritoid-chlorite±sericite and to a distal chloritic garnetiferous zone of quartz-chlorite-garnet±chloritoid±sericite±cordierite± cummingtonite. Chloritization is associated with carbonate veins at the Campbell mine. Silicification and sericitic alteration (quartz-sericite-pyrite-arsenopyrite) are associated with sulphide-rich siliceous replacement of wallrocks. The metallic signature of the bulk of the ore is Ag-Au-As-Sb-Hg-Zn-K. Many features (alteration mineralogy, vein textures and metallic signature) and structural compatibility with D_1 structures suggest that this deposit is a metamorphosed, low-sulphidation epithermal deposit (Penczak and Mason, 1999). This scenario is considered unlikely by Dubé *et al.* (2002), who favor a progressive and syn-D_2 mineralization event dominated by silicification of carbonate veins, with some late, post-D_2 local remobilization of gold in fractures.

137 Cochenour Willans is an atypical Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 39 metric tons. It is located in the Red Lake greenstone belt of the Uchi subprovince, Superior Province, Ontario, Canada. The major regional tectonic structures in the area are the SE-trending 'Red Lake mine trend' (Cochenour-Gullrock Lake Deformation Zone), corresponding to a zone of heterogeneous, protracted D_2 strain, SE-trending, SE-plunging F_{2a} folds, and a regional unconformity underlined by the Huston conglomerate. Sulphide-poor siliceous replacement zones, cockade and colloform-crustiform carbonate veins, and hydrothermal breccias are hosted by highly deformed and altered Fe-rich tholeiitic basalt and basaltic komatiites of the Middle Archean Balmer assemblage, and by crosscutting felsic dykes, interflow cherts and sedimentary rocks. Throughout the Cochenour Mine, gold mineralization is related to "cherty" silicification of basaltic rocks and carbonate veins, the latter occurring exclusively within highly-strained, hanging wall mafic volcanic rocks. Within the carbonate veins, gold is concentrated in crosscutting quartz veins and zones of silicified carbonate breccias. Ferroan carbonate (ankerite), quartz and calcite are the main gangue minerals of the veins, with lesser chlorite, muscovite and biotite. Ore mineralogy consists of common arsenopyrite, pyrrhotite, pyrite and chalcopyrite, with lesser stibnite, sphalerite and magnetite occurring within the most pervasively silicified material. Mineralization is located on the southern limb of the EW-trending F_2 Cochenour Anticline, overturned to the N and moderately- to steeply-plunging to the W. Orebodies are associated with the ESE-trending D_2 Cochenour shear zone, developed along the south limb and hinge zone of the Cochenour Anticline. Subsidiaries of the Cochenour shear zone, such as the West Carbonate shear zone, are SSE-trending reverse-dextral high-strain zones that localized some of the carbonate veins. Subvertical brittle faults ("black line faults") of various orientations and of dextral or sinistral movement transect the D_2 structures and offset the orebodies (late- to post-D_2), they may have contributed to the mineralization of the brittle interflow cherts. Hydrothermal alteration consists of proximal (along the margins of carbonate veins), gold-bearing silicic replacement (silicification) and sulphidation (arsenopyrite-pyrite-sphalerite-stibnite-pyrrhotite-chalcopyrite) of strongly foliated basalts. A sericite-fuchsite-quartz-ankerite forms the proximal envelope to this gold-bearing silicified zone. This grades outward to (and overprints) pervasive carbonate alteration. Felsic dykes are intensely sericitized. The metallic signature of the bulk of the ore is Au-Ag-As-Cu-Sb-Zn.

142 Delnite is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 30 metric tons. It is located in the Porcupine district of the Abitibi greenstone belt, Superior Province, Ontario, Canada. The NE- to ENE-trending reverse and sinistral oblique-slip Destor-Porcupine fault zone, and the E- to NE-trending, doubly-(moderately-) plunging Porcupine syncline are the dominant regional tectonic structures in the area. Quartz-carbonate vein mineralization is hosted by greenschist grade pillowed basalts of the Late Archean Tisdale Group (Hersey Lake Formation). Quartz is the dominant gangue mineral, with lesser (but abundant) ankerite and tourmaline. Ore mineralogy is dominantly pyrite and arsenopyrite. The deposit is located on the south limb of a moderately- to steeply-plunging E-trending drag fold. Mineralization consists of a set of ‘ladder veins’ subparallel to the stratigraphy. Lithological contacts and competency contrasts between basaltic and komatiitic flows may have played a role in localizing the individual veins, as they die out in the altered komatiite. Post-ore normal faults and WNW-striking shear zones crosscut and offset the orebodies. Hydrothermal alteration consists of a broad zone of intense and pervasive carbonatization (ankerite) of the host basalts around the veins. Zones of silicification and sericitic alteration (represented by a sericite-chlorite-pyrite assemblage) occur in the immediate vein selvages. The ankerite alteration grades outward to a distal chlorite-calcite alteration assemblage. Quartz porphyry intrusions and adjacent areas at the Delnite mine have been affected by pervasive albitization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-B.

145 Detour Lake is a Late Archean(?), quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 55 metric tons. It is located 250 km N of the Porcupine District, in the Chibougamau-Mattagami Belt of the Abitibi Subprovince, near its contact with the Opatika Subprovince, Superior Province, James Bay area, Ontario, Canada. The dominant tectonic structures in the area are a W-trending, overturned, isoclinal regional syncline and the NW-trending Sunday Lake Deformation Zone, which strongly affects the northern limb of the syncline. Locally folded quartz-carbonate stockworks and veins are hosted by tholeiitic basalts and ultramafic volcanics of the Detour assemblage, and by quartz-feldspar porphyry and mafic intrusions. Gangue mineralogy consists of quartz, carbonate, actinolite and tremolite. Ore minerals are mainly pyrrhotite, pyrite and chalcopyrite, with minor sphalerite, pentlandite and tellurides. The Sunday Lake Deformation Zone is a high-strain zone of intense brittle and ductile faulting/shearing and mylonitization. Mineralization is structurally controlled by NW-trending, high-angle parallel shears forming the SLDZ, and by lesser EW-oriented thrust shears and NE-trending sinistral strike-slip shears in the SLDZ. Volcanic rocks are highly silicified and may be mistaken for a chert unit or an exhalite. Potassic alteration (quartz- K-feldspar -chlorite-sericite) forms the core of the alteration system, grading outward into sericitic (quartz-sericite-epidote-biotite-chlorite) and biotitic (quartz-plagioclase- K-feldspar -biotite-phlogopite) zones of alteration. Schistose units are chloritized, epidotized and carbonatized, and ore-hosting felsic intrusions are affected by weak carbonate and sericitic alterations near the veins. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-Zn-Ni-Te. The QK zone is a recent (1995) discovery consisting of stockworks and quartz-K spar veins hosted near the folded contact between massive and pillowed basalts, and spatially associated with a swarm of porphyritic felsic dykes. This zone, and the overall alteration styles of the Detour Lake deposit, share similarities with intrusion-related porphyry deposits. A model of gold remobilization and relocation near the intrusions has also been proposed (Placer Dome, 1997).

Appendix 2

146 Discovery is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 32 metric tons. It is located in the MacKenzie district of the Sedimentary Domain of the Yellowknife Greenstone Belt, Slave geological province, Northwest Territories, Canada. The NE-trending, shallowly-dipping sinistral-reverse(?) Discovery fault is the dominant regional tectonic structure in the area. Banded quartz veins and stockworks and associated disseminated sulphides are hosted by amphibolite grade quartzose greywacke, argillite (in places graphitic) and argillaceous greywacke of the Archean Burwash Formation, Yellowknife Supergroup. A minor part of the mineralization is hosted by metamorphosed andesite volcanic rocks also belonging to the Yellowknife Supergroup. Banding in the quartz veins is defined by biotite. Gangue mineralogy consists of quartz with lesser biotite, oligoclase, muscovite, calcite, sericite amphibole and chlorite, with rare andalusite. Ore mineralogy is dominated by pyrrhotite, with lesser pyrite and minor to trace amounts of galena, arsenopyrite, chalcopyrite, sphalerite, scheelite and pentlandite. Mineralization is structurally controlled in the sedimentary rocks by NNE-oriented, steeply N-dipping drag folds (with high-grade zones in the hinge area) with steeply W-dipping limbs, whereas in the volcanic rocks, control by NNE-trending shear zones (such as the Lux Lake Shear Zone) is more important. At the newly discovered Ormsby zone, mineralization is associated with tension fractures. The volcanic rocks unit acted as a butress during deformation and localized most of the deformation and folding within the softer greywacke-argillite sediments. Hydrothermal alteration consists of intense biotite-chlorite alteration adjacent to the veins, chlorite±sericite±carbonate alteration assemblage are also present around quartz veins. Silicification, potassic metasomatism and sulphidation occur along the Discovery fault and other related structures. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Pb-As-Cu-Zn-W.

147 Dome is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 493 metric tons. It is located in the Abitibi greenstone belt, Superior Province near Timmins, Ontario, Canada. The deposit is on the south limb of the Porcupine Syncline, north of the Destor-Porcupine Fault, a crustal scale fault of possible sinistral-reverse motion. Different styles of ore are exploited including 1) boudinaged concordant ankerite interflow veins cut by gold-bearing en enchelon extensional quartz veins confined within Fe-tholeiitic flows and 2) carbonate and quartz-fuchsite-tourmaline veins hosted by greenschist-grade basaltic and komatiitic rocks of the Tisdale Group, sediments of the Timiskaming Group, and also by the sericitized Preston and Paymaster (the latter to a lesser degree) quartz-feldspar porphyries. Whereas the concordant ankerite interflow veins are mostly restricted to Fe-tholeiitic rocks, gold also occurs in disseminated sulphides zones, extensional en echelon vein arrays and in stockworks inside the Timiskaming sedimentary through and porphyry units. Gangue mineralogy is dominated by quartz and ankerite, with lesser fuchsite, chlorite, tourmaline, apatite and albite. Ore mineralogy (sulphides <5%) consists of pyrite, pyrrhotite, galena, chalcopyrite and sphalerite. High-grade zones are marked by chlorite-fuchsite ribbons and the presence of galena in laminated quartz veins. The reverse Dome Fault is the focus of intense fluid flow and alteration. Lithologic/competency contrasts between interflow sediments and volcanic flows at least partly controlled the distribution of the mineralized veins. Hydrothermal alteration consists of sericite-carbonate alteration in the Dome Fault and the surrounding volcanic rocks and quartz-feldspar porphyries. This alteration grades outward into zones of intense chloritization. QFPs are also affected by intense albitization. Sulphidation of the host metavolcanics extends up to 1 metre away from the veins. The metallic signature of the bulk of the ore is Au-Ag-Cr-Pb-Zn-B. Presence of concordant ankerite interflow veins cut by quartz-tourmaline veins and their confinement underneath the Timiskaming sedimentary trough, and variably deformed, mineralized quartz veins hosted by the folded Timiskaming sediments and 2690 Ma porphyry stocks, illustrate the complex and multistage nature of the Dome Mine.

152 Doyon is an Archean, Au-Cu sulphide-rich vein (Au-Ag) deposit with a total gold content of 177 metric tons. It is located in the Bousquet district of the Abitibi Belt, Superior Province, Quebec, Canada. The dominant tectonic structures in the area are the regional Cadillac - Larder Lake Fault Zone (just S of the deposit) and the Destor-Porcupine Fault. Disseminated sulphides and sulphide-rich (10 to 75%) veins and veinlets are hosted by upper greenschist grade felsic volcanic and volcaniclastic rocks of the Late Archean Blake River Group, and by the tonalitic part of the synvolcanic Mooshla pluton. Gangue mineralogy of the veins is mainly quartz, dolomite and calcite, with other rare minerals such as muscovite, rutile and tourmaline. Ore mineralogy consists of dominant pyrite and chalcopyrite, with lesser sphalerite and tellurides (such as calaverite, tellurobismuthite, petzite, altaite), and minor tennantite, bornite, chalcocite, tetradymite, pyrrhotite, galena and arsenopyrite. EW-trending, subvertical to steeply S-dipping reverse D_2 shear zones (such as the Dumagami Fault) are the main ore-controlling structures. The Mooshla pluton has also been affected by brittle faulting and fracturing. Late NE-trending sinistral-normal dip-slip faults (such as the Doyon Fault) offset the orebodies. Alteration associated with mineralization is both intense and extensive, with a proximal aluminous alteration (quartz-andalusite±kyanite) grading outward to a more distal quartz-sericite (retrogade metamorphism-related?) assemblage. Weak vein-scale aluminous alteration is noted in the tonalitic body. The metal signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-Te-As. The genesis of the Doyon mine is controversial. Most of the deposit (zones 1 and 2) is compatible with deformed non-carbonate stockwork-disseminated style of mineralization, whereas mineralized veins in the West Zone are cut by pre-D_2 deformation diorite dykes. These features suggest that the mineralization is pre- or early D_2 main-stage deformation, and the deposit could be intrusion-related and associated with the emplacement of a late magmatic phase (tonalite) of the multistage Mooshla pluton.

155 Agnico-Eagle is an Archean gold-rich (Au-Ag) VMS deposit with a total gold content of 36 metric tons. It is located in the Joutel district of the Harricana-Turgeon belt, Abitibi belt, Superior province, Québec, Canada. The Harricana River Tectonic Zone is a SE-trending, steeply-dipping regional shear zone and the dominant tectonic structure in the area. Another similar SE-trending, steeply-dipping shear zone at the contact between rhyolite-mafic intermediate lavas and a NW-SE oriented anticlinal centered on the Joutel pluton are also important regional structures. Disseminated to semi-massive sulphide lenses (locally massive) are hosted by an Archean sedimentary breccia (with volcanic clasts), greywacke, conglomerate and siltstone. Stockwork-stringer mineralization is hosted by felsic tuffs, tuff breccia, lapilli tuffs and basalts. Gangue mineralogy is dominated by siderite with lesser ankerite and minor dolomite, quartz, chalcedony, calcite and feldspar. Ore mineralogy is mainly pyrite, with minor pyrrhotite and magnetite. Some pyrite bands, particularly in argillite sediments, are of diagenetic origin and are always sterile. Gold mineralization is overprinted and structurally controlled by SE-trending, steeply-dipping shear zones broadly conformable with lithologies, but which are crosscutting in detail. The shears are most probably splays of the Harricana River Tectonic Zone. A penetrative schistosity crosscut, folded and transposed stockwork mineralization. Late, NE- to

ENE-trending faults offset lithologies. Hydrothermal alteration mainly consists of intense carbonate alteration. Siderite-ankerite impregnations occurs in tuffs and volcanics hosting slightly auriferous but often sub-economic stringer ore, and total replacement of the sedimentary breccia, greywacke, conglomerate and siltstone hosting sulphide lenses. Sericitization of the felsic tuffs also occurs. Siderite is progressively replaced by chalcedony during a later silicification stage, to which is associated fine-grained auriferous pyrite. A later diabase dyke induced contact metamorphism and proximal calc-silicate alteration (calcic pyroxene-amphiboles-chlorite), and remobilized and concentrated a part of the ore in pyrrhotite and magnetite. This contact metamorphism metasomatism grades into distal chloritization. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-W-Cr. Multiple genetic hypothesis exist, from syngenetic exhalative deposit (Barnett *et al.*, 1982; Dubé *et al.*, 1991) to epigenetic (Wyman *et al.*, 1986). Presence of (non-mesothermal) colloform textures and mineralized breccias in the main ore zone, below a ribboned sulphide facies, lead Gauthier *et al.* (2000) to suggest a gold-rich VMS Mattabi-type for the Agnico-Eagle deposit.

157 The East Malartic - Barnat-Sladen - Canadian Malartic deposit is an Archean, non-carbonate-hosted stockwork-disseminated gold deposit with a total gold content of 160 metric tons. It is located in the Malartic district of the Abitibi greenstone belt, Superior Province, Quebec, Canada. The major regional tectonic structure in the area is the Cadillac-Larder Lake Tectonic Zone. Disseminated sulphides, stockwork zones and minor quartz veins (<5%) are hosted by intensely sheared and dislocated, upper greenschist to lower amphibolite grade greywackes of the Pontiac Group, and by monzodioritic intrusions and komatiites of the Piché Group. Gangue mineralogy is dominated by quartz, with lesser albite, K-feldspar and tourmaline. Ore mineralogy consists of dominant pyrite and lesser tellurides, chalcopyrite, sphalerite and scheelite. Orebodies are structurally controlled by ESE- to E-trending sets of faults (such as the steeply-dipping Barnat and Sladen faults) which are considered by Sansfaçon and Hubert (1990) to be broadly synchronous with S_2-parallel faults. Monzodiorite stock and dike contacts are also important controls on the localization of orebodies. Pervasive potassic alteration (characterized by microcline and biotite) affected all rock types near the ore zones. Prominent silicification occurs in the host intrusions and greywackes along faults, whereas carbonate alteration occurs in host intrusions and komatiitic rocks. Oxidation (represented by hematite) is commonly associated with potassic alteration in dioritic rocks. Local sericitization and chloritization also occur. The metallic signature of the bulk of the ore is Au-Ag-Te-Cu-W. The genesis of the Malartic deposit is still controversial, mainly because the chronological relationships between the ore and faults (especially the Sladen Fault) and intrusions remain unclear. Post-ore faulting has also obscured the original nature and distribution of the ore. Proposed models range from a porphyry-type model (Issigonis, 1980) to a syngenetic origin for sediment-hosted ore (Kerrich, 1983). Robert (2001) proposed a proximal, possibly syenite-associated model for the Malartic deposits.

163 Tundra (FAT) is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold resource of 234 metric tons. It is located in the MacKenzie area of the Courageous Lake greenstone belt, Slave Province, Northwest Territories, Canada. Quartz veins and associated disseminated sulphides are hosted by sheared and altered, Archean felsic volcanics and pyroclastics rocks. Gangue mineralogy consists of quartz, with lesser tourmaline. Ore mineralogy is dominated by arsenopyrite, pyrite and pyrrhotite, with rare amounts of chalcopyrite, sphalerite and scheelite. Mineralization is structurally controlled by a series of parallel, subvertical, conformable shear zones. Hydrothermal alteration consists of sericitization and sulphidation of the felsic rocks along the shear zones. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Zn-W.

166 Troilus (or Lac Troilus) is a Late Archean, pre-metamorphic intrusion-related porphyry Au-Cu deposit with a total gold content of 66 metric tons. It is located in the Chibougamau district, Frotet-Evans greenstone belt, Opatica subprovince, Superior Province, Quebec, Canada. The Frotet Anticline is the dominant regional tectonic structure in the area. Disseminated sulphides and sulphide-rich veins and veinlets are hosted by lower amphibolite grade 2782 Ma feldspar porphyry dykes and sills, by felsite dykes and basalt, and by in-situ breccias along the contact between intermediate and mafic rocks. Pyrite is the dominant ore mineral, followed by chalcopyrite; the latter is the only major copper mineral. Other ore minerals are pyrrhotite, sphalerite, galena, bornite, cubanite, molybdenite, tetrahedrite, tennantite and tellurides (such as calaverite). Sulphide mineralogy is zoned from chalcopyrite-pyrrhotite in the structural footwall, to an intermediate zone of pyrite-chalcopyrite and a hanging-wall assemblage dominated by pyrite. Mineralization is structurally controlled by the dykes and hydrothermal breccia zones, and by the dyke-breccia contact. Sulphide-rich veinlets or seams locally follow fractures and foliation. Zoned hydrothermal alteration consists of a core of potassic alteration (biotite-actinolite-K-feldspar) centered on a large felsic dyke, and grading successively outward to an inner propylitic alteration zone (actinolite-albite-epidote), an outer propylitic zone (albite-epidote-calcite), and a distal phyllic alteration zone (sericite-quartz±albite). The metallic signature of the bulk of the ore is Au-Cu-Ag-Pb-Zn-Mo-Bi-Te. Felspar porphyry dykes injecting the breccias are cut by cooling fractures which are mineralized, suggesting that 2782 Ma dykes are synchronous with the mineralization event (Boily, 1998).

168 George Lake is an Archean, iron-formation-hosted vein and disseminated (Homestake type) gold deposit with a resource of 31 metric tons of gold. It is located in the Back River area of the Slave Structural province, Northwest Territories, Canada. Folded turbidite sequences of the Yellowknife Supergroup host silicate and oxide facies iron formation, of which granulestone interbeds have been dated at 2690±7 Ma by U-Pb on zircon. The iron formation is cut by quartz-feldspar porphyry intrusions dated at 2883±2 Ma. Disseminated sulphides and quartz veins are hosted by upper greenschist grade silicate and oxide facies iron formations occurring along the western limb of a tightly folded syncline. Ore mineralogy consists of pyrite, pyrrhotite and arsenopyrite. Sulphidation of the iron oxide facies iron formation occurs as a halo around quartz veins. This illustrates that availability of iron-rich species within the iron formation is a key factor in the control of gold deposition (Henderson and Nesbitt, 1993). Chloritic alteration is also present. The metallic signature of the bulk of the ore is Au-Ag-As-Ba-Cd-Co-Cu-Mo-Ni. Spatial relationships between disseminated gold-bearing sulphides and quartz vein mineralization suggest an epignenetic process of Au deposition (Henderson and Nesbitt, 1993).

169 Giant-Lolor-Supercrest is an Archean quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 246 metric tons. It is located in the Yellowknife area, Yellowknife greenstone belt, Slave geological province, Northwest Territories, Canada. The Campbell Shear and the Con Shear are the main regional tectonic structures in the area. Quartz-carbonate veins and stockworks, and sulphide-rich siliceous replacement zones are hosted by amphibolite grade quartz-ankerite-sericite schists derived from basalts of the Kam Group. Quartz and ankerite are the dominant gangue minerals. Ore mineralogy consists of pyrite, arsenopyrite, pyrrhotite, stibnite and scheelite. Mineralization is structurally controlled by SW-NE-trending, steeply-dipping, brittle-ductile, reverse D_1 anastomosing shear zones (Giant deformation zone) that are subsidiaries of the Campbell shear. These have been deformed by D_2 coaxial folding and mullioning (synchronous to D_2 reverse-dextral shearing at the Con deposit). The deposit is then offset and dislocated by the NS-oriented sinistral strike-slip and NE-trending dextral, Proterozoic West Bay and Akaitcho D_3 faults, which bound the deposit to the north and south respectively. Hydrothermal alteration is confined to shear zones, and grades laterally from a proximal sericite-ankerite assemblage near the vein orebodies to a distal zone of chlorite-calcite alteration. Silicification is associated with ore-bearing zones of sulphide-rich replacement. The metallic signature of the bulk of the ore is Au-Ag-As-W-Sb-Zn-Cu. Siddorn and Cruden (1999) suggested a model whereby the Giant and the Con deposits consist of a once-linked Archean deposit. In this model, evidence linking free gold precipitation and depth, a lower metamorphic grade at Giant (compared with the grade at Con) and the apparent increase in pyrrhotite abundance with depth indicate that the Giant deposit may represent an upward extension to the Con deposit. Metamorphism of the Burwash Formation turbidites (Van Hees *et al.*, 1999), or of the Yellowknife greenstone belt (Boyle, 1951), are thought to have originated the mineralizing fluids.

174 Casa Berardi is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 72 metric tons. It is located in the Casa Berardi district of the Abitibi Subprovince, Superior province, Quebec, Canada. The 3 mines of the Casa Berardi deposit are located near the Casa Berardi (D_4) fault, an EW-trending, brittle, reverse fault that crosscuts the major regional D_1 Casa Berardi Deformation Zone, which is characterized by intense mylonitic foliation. Banded, en echelon quartz and quartz-carbonate veins, stockworks and associated disseminated sulphides are hosted by lower greenschist-grade clastic rocks (siltstones, mudstones and greywackes) and minor volcanic rocks (basalts, andesites and pyroclatics) of the Taïbi Domain. Gangue minerals are mainly quartz and ankerite, with minor graphite, sericite and tourmaline, and trace amounts of fuchsite, chlorite and leucoxene. Pyrite and arsenopyrite are the dominant ore minerals, with trace amounts of chalcopyrite, pyrrhotite and sphalerite. EW-oriented, ductile to brittle-ductile, high-angle reverse shear zones (splays of the Casa Berardi fault) are the major ore-controlling structures in the emplacement of the mineralized shear veins. ENE-trending F_2 and F_3 folds have significantly modified the initial geometry of the orebodies and the F_1 folds. Post-mineral EW-oriented brittle strike-slip D_3 faults, EW-oriented reverse D_4 faults, and NS-oriented, normal dip-slip D_5 faults affect the area. Hydrothermal alteration consists of sericitic (quartz-sericite-pyrite-arsenopyrite) alteration of the veins selvages, and graphitic alteration (development of graphite). Carbonatization is centered on the deposit, grading inward from distal calcite, to dolomite, to proximal ankerite near the gold-bearing veins. The metallic signature of the bulk of the ore is Au-Ag-As-Bi-Pb-Sb-W. Pilote et al. (1990) and Théberge (1997) proposed a syn-tectonic model of vein formation during late ductile to brittle-ductile D_1 deformation. In this model, vein emplacement is synchronous with mylonitic foliation and late D_1 folding, which are related to N-S shortening linked with the Casa Berardi Deformation Zone evolution.

175 Goldex is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 53 metric tons of gold. It is located in the Val d'Or district of the Abitibi greenstone belt, Superior province, Quebec, Canada. The Cadillac-Larder Lake fault zone is the dominant regional tectonic structure in the area. Quartz veins and related disseminated sulphides are hosted by a granodiorite sill at the contact between ultramafic and intermediate volcanic rocks. Gangue mineralogy of the veins is dominated by quartz, with lesser tourmaline and carbonates. Pyrite is the main ore mineral. Two types of veins can be distinguished: 1) steep to vertical veins typical of "shear veins" with ribbon textures and variably sheared walls; 2) moderately-dipping extensional veins with characteristic open-space filling textures. Quartz veins are structurally controlled by E- to ESE-trending, steep to subvertical shear zones (related to type shear veins), linking EW-oriented extensional fractures zones (related to extension veins). The deposit is located in between two NW-trending, dextral (second-order?) shear zones, the Marban and the Western Quebec shear zones. Hydrothermal alteration consists of a broad, ore-bearing halo of chlorite+/-carbonate adjacent to the quartz veins, giving the granodiorite a darker color (which is then termed quartz diorite). Disseminated pyrite is associated with bleaching of the veins selvages. Ultramafic volcanics south of the deposit have been affected by silicification. The metallic signature of the bulk of the ore is unknown. Robert (unpublished field notes, 1987) suggested that the deposit may be located in an extensional jog between the Marban and Western Quebec shear zones.

179 The Hard Rock - McLeod-Cockshutt - Mosher gold deposit is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 65 metric tons. It is located in the Geraldton-Beardmore area of the Wabigoon greenstone belt, Superior province, Ontario, Canada. The major regional tectonic structures in the area are the Bankfield-Tombill dextral strike-slip fault, and the Hard Rock Synclinorium. Quartz-carbonate veins and stockworks, and sulphide-rich siliceous replacement mineralization are mainly hosted by oxide facies iron formations, greywacke and intrusive rocks (quartz-feldpar porphyry-diorite). Quart-carbonate veins and stockwork zones crosscut many lithologies, whereas the replacement ore is confined to iron formation adjacent to the veins. Gangue mineralogy is dominated by quartz and ankerite, with lesser calcite, tourmaline and fuchsite. Pyrite is the dominant ore mineral, with lesser arsenopyrite, chalcopyrite, galena and some minor tellurides. Shear zones are a major component of the deformation in the sedimentary rocks, and veins commonly follow those shears. Shears are also localized at lithological contacts such as the sediment-porphyry and sediment-ironstone contacts, which are also important ore-controlling structures. Quartz-carbonate veins and related sulphide-rich lenses also occur within noses of drag folds in the iron formation. Hydrothermal alteration consists of carbonate alteration of the host greywackes and iron formation, greywackes are also affected by sericitic alteration adjacent to the veins. Pyritization of the iron oxides and silicification around the veins in the iron formation are thought to be responsible for the sulphide-rich siliceous replacement ore. The metallic signature of the bulk of the ore (derived from its mineralogy) is Au-Ag-Cu-Pb-W-B.

180 Hemlo is an intensely deformed and highly complex, Late Archean, probable non-carbonate-hosted stockwork-disseminated gold deposit, with a total gold content of 671 metric tons. It is located in the Hemlo-Heron Bay greenstone belt of the Wawa Subprovince, Superior Province, Ontario, Canada. Hemlo is currently the largest gold producer in Canada. The main tectonic structure in the area is the E- to SE-trending, ductile, sinistral transpressional Hemlo Shear Zone. Disseminated sulphides and stockworks are partly hosted by the Moose Lake quartz-feldspar porphyry (2722±2 Ma), whereas most of the ore is hosted by the adjacent amphibolite-grade, 2694 to 2688 Ma clastic feldspathic sedimentary and mafic fragmental rocks (greywackes, mudstones and minor conglomerates) on the northern margin of the porphyry. Gangue mineralogy consists of barite, vanadian muscovite, scapolite, rutile, titanite, calcite and fluorite. Ore mineralogy is dominated by pyrite and molybdenite, with minor cinnabar, stibnite, realgar, chalcopyrite, roscoelite and tellurides. The ore zones are located inside the Hemlo Shear Zone, where the deformation is the strongest. F_2 (S-shaped) folding, the Moose Lake Fold, has strongly affected the host units; moreover, the disseminated ore and veinlets of pyrite-molybdenite-vanadian muscovite are transposed by the main S_2 foliation. The folded lower porphyry contact acted as a mechanical trap for the ore fluids by concentrating fluid flow in the more permeable, underlying fragmental units, whereas the barite horizon served as a chemical trap by oxidizing the ore fluids. Hydrothermal alteration consists of a proximal, ore-related, zone of silicification (restricted to porphyry unit) and K-metasomatism, grading away to distal biotite alteration in the sedimentary rocks and muscovite alteration in the porphyry unit. Local albitization, chloritization, carbonatization, tourmalinization and pyritization also occur throughout the deposit. The metallic signature of the bulk of the ore is Au-Mo-V-Ag-As-Sb-Hg-Te. Many models have been proposed to explain the genesis and deformation history of the Hemlo deposit (see Lin, 2001). The occurrence of pyrite and molybdenite veinlets transposed parallel to the S_2 foliation, of late- to post-ore 2677.2±1.5 Ma aplite dikes deformed by S_2 and F_2, and the particular metallic signature of the ore all suggest that the Hemlo deposit represents a deformed and metamorphosed deposit, transitional between a porphyry and epithermal system, and emplaced pre- to early- main phase of D_2 deformation.

183 Pamour is a Late Archean quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 247 metric tons. It is located in the Timmins district of the Abitibi greenstone belt, Superior Province, Ontario, Canada. The Destor-Porcupine fault zone and a NE-trending syncline are the dominant regional tectonic structures in the area. The host sequence is overturned to the south and forms the north limb of a syncline which has been truncated by the Destor-Porcupine Fault (Poulsen et al., 2000). The deposit is spatially distributed along the Timiskaming unconformity over a strike length of more than 5 km. Steeply- to moderately-dipping laminated quartz-carbonate sheeted veins, en echelon shallowly-dipping extensional quartz-carbonate veins and associated disseminated sulphides are hosted mainly by folded but low-strain Late Archean Timiskaming Group conglomerates and greywackes near the base of the sequence, which rests unconformably on Late Archean Tisdale and Deloro Group mafic and ultramafic volcanic rocks. The structurally controlled quartz-carbonate veins are hosted by all rock types. Gangue mineralogy consists of dominant quartz, with lesser tourmaline and ankerite and minor amounts of albite, calcite and chlorite. Ore mineralogy is dominated by pyrite, with lesser pyrrhotite and minor amounts of arsenopyrite, sphalerite, galena and chalcopyrite. Abundance of pyrite and/or pyrrhotite, as well as presence of sphalerite and/or galena, are commonly indicative of high-grade mineralization. Laminated quartz veins are associated with EW-oriented and NE-trending, moderately- to steeply-dipping, reverse shear zones. Flat extensional veins locally fringe the laminated quartz veins. Late NW- and NNE-trending, dextral and sinistral faults cut and offset the orebodies. Hydrothermal alteration around veins hosted by volcanic rocks consists of a proximal zone of carbonate alteration characterized by an assemblage of chlorite-carbonate±albite, grading outward successively to carbonate-sericite±chlorite, to carbonate-chlorite, to carbonate-chlorite-sericite, and finally to a distal zone of chlorite-carbonate alteration. Alteration around veins hosted in sedimentary rocks consists of a proximal zone of arsenopyrite-sericite-dolomite-magnetite (the latter grading to pyrrhotite away from the veins), which grades outward to a sericite-dolomite-pyrrhotite zone, and to a distal zone represented by a sericite-chlorite-albite-dolomite-pyrite assemblage. The metallic signature of the bulk of the ore is Au-Ag-Zn-As-Pb-W. Gray and Hutchinson (2001) have proposed that the presence of auriferous clasts derived from older rocks at the base of the Timiskaming conglomerate prove the existence of pre-Timiskaming gold concentrations.

189 Joe Mann (ex-Chibex mine) is a Late Archean, quartz-carbonate shear-zone-related Au-Cu deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 42 metric tons. It is located in the Chibougamau district of the Abitibi greenstone belt, Superior Province, Quebec, Canada. The Opawica-Guercheville deformation zone is the main regional tectonic structure in the area. Ribbon-textured, laminated or brecciated quartz veins and associated disseminated sulphides are mainly hosted by sills of gabbroic rocks and felsic tuffs of dacitic composition, all metamorphosed to upper greenschist facies. Gangue mineralogy consists of quartz, plagioclase and ankerite. Ore minerals are pyrite, pyrrhotite, chalcopyrite, and lesser arsenopyrite. Mineralization is structurally controlled by EW-oriented, brittle-ductile, high-angle reverse shears that are part of the Opawica-Guercheville deformation zone. The shears are sub-parallel to one another, and to the stratigraphy. Z-shaped drag folds related to reverse shearing have affected both the foliation and the quartz veins. Quartz veins are associated with EW-oriented porphyritic and fine-grained felsic dykes; the former are undeformed whereas the latter are moderately to strongly sheared. The geometry and location of the mineralized veins and shears are controlled by the competency contrast between the host gabbro sill and the felsic dykes. Late NE-trending, sinistral strike-slip faults offset the orebodies. Sheared gabbro near the veins is altered to chlorite-ankerite schists (chlorite-ankerite-plagioclase-sericite-sulphides) or biotite schists (biotite-sulphides-ankerite-plagioclase). Sheared tuff have been affected by sericitic (sericite-pyrite) alteration. The metallic signature of the bulk of the ore is Au-Cu-Ag-As-Ba-Bi-Rb.

191 Kerr Addison is a Late Archean, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 327 metric tons. It is located in the Abitibi greenstone belt, Superior Province, Ontario, Canada. The deposit is localized on the southern limb of a large EW-oriented synclinorium, and occurs within or near the regional, NE-trending, reverse Kirkland Lake-Larder Lake Fault Zone. Quartz-carbonate stockwork veins ("carbonate ore") and disseminated sulphides (mainly pyrite, called "flow ore") are hosted by intensely altered and sheared, greenschist grade schists derived from tholeiitic and ultramafic flows (and interflow sediments) of the Late Archean Larder Lake Group. Diorite-syenite dykes also host disseminated sulphide mineralization. Gangue mineralogy of the "carbonate ore" consists of quartz and carbonate. Ore mineralogy is dominated by pyrite, with lesser scheelite and gersdorffite. "Flow ore" consists mainly of quartz, chlorite and carbonate, with variable amounts of sericite, albite, pyrite and graphite. The gold in "flow ore" is mainly associated with fine-grained pyrite. The distribution of the alteration and mineralization is controlled by the main Kirkland Lake-Larder Lake fault zone, and its minor splay faults (such as the Kerr Fault) and folds. Orebodies are roughly stratabound, suggesting some degree of lithological control of the mineralization. Hydrothermal alteration consists of a proximal carbonate-albite-pyrite assemblage that has affected the volcanic-derived schists and volcanic rocks, and which grades outward to a carbonate-muscovite zone and to a distal carbonate-chlorite assemblage. Diorite-syenite dykes are pervasively albitized. The metallic signature of the bulk of the ore is Au-Ag-W-As-Sb. “Carbonate ore” is regarded as a good example of a Mother Lode-type deposit (Poulsen et al., 2000), but the origin of the disseminated pyrite ores remain enigmatic. “Flow ore” has been regarded as having the same origin as the quartz-carbonate veins (Kishida and Kerrich, 1987; Hodgson and Hamilton, 1989), or as having a pretectonic, exhalative origin (Ridler, 1970; Hutchinson, 1993).

192 Kiena is a Late Archean, intrusion-related, non-carbonate-hosted stockwork-disseminated gold deposit with a total gold content of 47 metric tons. It is located in the Val d’Or district of the Abitibi greenstone belt, Superior Province, Quebec, Canada. The Cadillac-Larder Lake fault zone and a regional Z-shaped fold are the major tectonic structures in the area. Hydrothermal breccias (in part stratiform) and multistage carbonate-albite-pyrite stockworks are hosted by greenschist grade, deformed, brecciated and altered 2697 Ma albitite dykes and sills (previously known as diorite dykes), tholeiitic basalt flows and komatiitic volcanic rocks of the Late Archean Jacola Formation. The breccia consists of albitite dyke fragments separated by vein material. Gangue minerals are carbonate, quartz and albite, with rare tourmaline and stilpnomelane. Ore minerals are pyrite, pyrrhotite, chalcopyrite and scheelite, with minor pentlandite, galena and sphalerite, and rare arsenopyrite and cobaltite. The breccia is located in the nose of a Z-shaped fold, the latter on the NS-oriented limb of the regional fold. The orebodies are thought to represent tectonically-separated boudins (Morasse *et al.*, 1995). Small-scale NW-trending, brittle-ductile faults offset the orebody. A pervasive, pre-ore texture-destructive albitization is the earliest hydrothermal event and obscures the real nature of the albitite dykes. Hydrothermal alteration consists of intense carbonatization and pyritization of the ore-bearing breccia and enclosing rocks. Nearby calc-alkaline intrusions have been affected by potassic and propylitic (sericite-chlorite) alterations. Basaltic and komatiitic rocks Basaltic and komatiitic rocks are deformed and altered to a talc-carbonate-chlorite schist in the area adjacent to the orebodies are deformed and altered to a talc-carbonate-chlorite schist. The metallic signature of the bulk of the ore is Au-Ag-As-Zn-Ba-Hg. Granodiorite dykes coeval with the intermineral feldspar porphyry dykes hosting mineralization have been dated at 2686±2 Ma by U-Pb on zircon, and show that the albitite dykes emplacement, brecciation and part of the stockwork mineralization are older than 2686 Ma, whereas some stockwork veining and alteration of calc-alkaline intrusions are younger than 2686 Ma. The Kiena deposit shares analogies with the Holloway deposit, especially in terms of alteration and chronology relative to deformation.

193 Kirkland Lake is a large scale (5 km long X 2 km deep), Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 758 metric tons. It is located 2 km north of the regional EW-oriented reverse Cadillac-Larder Lake fault in the south-central Abitibi greenstone belt, Superior Province, Ontario, Canada. The last operating mine in the area, the Macassa mine, suspended its operations in June 1998 due to low gold price. High-grade quartz-carbonate fault-fill and breccia veins, sheeted veinlets and stockwork/breccia zones containing minor sulfides are mainly hosted by a steeply-dipping composite stock of syenite, porphyritic syenite and augite syenite intruded within folded volcaniclastic and sedimentary rocks of the Late Archean Timiskaming Group and trachyte tuffs. Locally, gold-bearing quartz-carbonate fault-fill veins are hosted by brittle-ductile shear deforming the Timiskaming conglomerate. Gangue mineralogy is dominated by quartz and carbonate, with lesser sericite, chlorite and actinolite. Pyrite is the dominant ore mineral, with lesser altaite, calaverite, chalcopyrite, sphalerite and molybdenite. The orebodies are structurally controlled by, and occur inside, the Kirkland Lake Main Break and its subsidiary NE-trending faults and folds. The Kirkland Lake Main Break consists of a set of discrete ENE-trending, steeply-dipping reverse brittle faults cutting across the syenite stocks. Hydrothermal alteration associated with the veins and stockwork/breccia zones consist sof widespread Fe-carbonate alteration, and local, vein-scale, sericitization (±K-feldspar), silicification and pyritization. Fault zones have been locally affected by chloritic and weak sericitic alteration. The metallic signature of the bulk of the ore is Au-Ag-Te-As-Sb±W±Mo. A magmatic-hydrothermal origin for the fluid and a genetic connection between ore and syenite plutonism was proposed by Cameron and Hattori (1987), based on sulphur isotopic composition of pyrite and the presence of (largely post-ore) hematite and sulphate minerals. This is in contrast to Kerrich and Watson (1984), who suggested (based on oxygen isotopic composition of silicates and the CO_2-rich nature of the fluids) a possible metamorphic origin for the ore fluids, produced during a period of late ductile deformation and batholithic granitoid emplacement.

195 Bousquet 2 - LaRonde 1 (Dumagami) is an Archean, Au-Ag-Cu volcanogenic massive sulphide deposit with a total gold content of 120 metric tons. It is located near the regional Cadillac-Larder Lake fault zone in the Abitibi greenstone belt, Quebec, Canada. Massive sulphide lenses, semi-massive and disseminated sulphides, and late sulphide-rich veinlets are hosted by deformed, altered and schistose rhyolitic and dacitic volcanic rocks of the Blake River Group. Metamorphic grade of the rocks is between greenschist and lower amphibolite grade. Mineralogy of the sulphide lenses is pyrite, chalcopyrite, bornite, chalcocite, sphalerite, tennantite, galena and minor tellurides. High-grade auriferous zones are associated with bornite. The massive sulphide lenses are bounded in the footwall by the South Fault, a steeply-dipping reverse shear with late sinistral movement. A similar shear, the North Fault, occurs higher in the stratigraphical succession and bounds the upper part of the deposit in the hanging wall. The Au-Ag-Cu sulphide-rich veinlets are associated with discordant, foliation-oblique extension fractures. NNE-trending faults are locally coated with gold. Hydrothermal alteration consists of a proximal, pervasive aluminous alteration assemblage of quartz-sericite-andalusite±kyanite especially well-developed in the footwall of the ore zone. Massive silicic alteration has affected the immediate footwall of the massive sulphides in the core of the hydrothermal system. Massive silicic clasts are also present in the sulphide lenses. Aluminous alteration grades outward to a distal sericitic alteration characterized by a quartz-sericite-feldspar assemblage. An advanced argillic alteration assemblage of muscovite-kaolinite-pyrophyllite-quartz is associated with retrograde metamorphism to lower greenschist grade. Presence of a similar retrograde mineral assemblage within the late Au-Ag-Cu veins indicates that they are related to the same event. The metal signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-Te-Sb-Sn-As-Cd-Se-Ge-V. Gold and sulphides were deposited during felsic volcanism, and later remobilized within late extension fractures during subsequent deformation and metamorphism (Poulsen and Hannington, 1996). The nature of alteration (advanced argillic and massive silicic), the Cu and Au association and metal distribution, and the geological setting demonstrate that the deposit corresponds to a shallow marine, high-sulphidation epithermal gold-rich VMS deposit.

Appendix 2

197 Sigma-Lamaque is a typical Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 358 metric tons. It is located in the Val d'Or district of the Abitibi greenstone belt, Superior Province, Quebec, Canada. The regional ENE-trending, steeply-dipping reverse-oblique Cadillac-Larder Lake fault zone is the dominant tectonic structure in the area. A large network (extending over an area of 2 x 1.5 km and to depths of almost 2 km) of quartz veins and associated disseminated sulphides are mainly hosted by 2705±1 Ma andesitic flows and volcaniclastic rocks of the Late Archean Malartic Group, and by 2704±3 Ma dioritic intrusions. Quartz is the dominant gangue minerals, with lesser tourmaline and minor calcite, chlorite, ankerite, white mica, biotite (at depth) and apatite, and trace amounts of plagioclase and epidote. Ore mineralogy is dominated by pyrite, with lesser scheelite, pyrrhotite, chalcopyrite, tellurides (calaverite, petzite, tellurobismuthite), sphalerite and galena. Distribution of laminated fault-fill veins and jigsaw-puzzle breccias is controlled by numerous reverse-oblique 2nd and 3rd order conjugate sets of D_2 shear zones. Extension veins extend laterally away from shear zones into less strained rocks. Zoned hydrothermal alteration consists of a proximal carbonate-albite-pyrite zone (commonly carrying gold-grade mineralization), which grades progressively outward into a muscovite-carbonate zone, and to an outer chlorite-muscovite-carbonate halo. The metallic signature of the bulk of the ore is Au-Ag-B-W+/-Te. A late, post-peak metamorphic emplacement is interpreted from the fact that mineralized veins and their host structures clearly cut across all intrusive types, and that wallrock alteration minerals replace metamorphic minerals (Poulsen *et al.*, 2000). Robert (1990) suggested that the compatibility between vein geometries, structures, and kinematics of the host shear zones indicate that the veins were formed in late, active shear zones with only minor degree of overprinting by late transcurrent deformation.

200 Holt-McDermott is a Late Archean, intrusion-related, non-carbonate-hosted stockwork-disseminated deposit with a total gold content of 40 metric tons. It is located in the Harker-Holloway district of the Abitibi greenstone belt, Superior province, Ontario, Canada. The EW-oriented D_2 Porcupine-Destor fault zone is the major regional tectonic structure in the area. Disseminated sulphides and quartz stockworks are hosted by altered tholeiitic basalts and ultramafic volcanics of the Late Archean Kinojevis Group. Syenite dykes also carry ore-grade mineralization. Gangue mineralogy is dominated by quartz, with lesser albite, scheelite, carbonate and sericite. Pyrite is the dominant ore mineral, with lesser arsenopyrite and chalcopyrite. Orebodies are structurally controlled by EW- to ENE-trending, steeply-dipping, brittle or brittle-ductile reverse faults such as the McKenna and Ghostmount faults, (which may represent splays of the Destor-Porcupine fault zone) along which syenite dykes were emplaced. Mineralization is centered on altered basalts surrounding the syenite dykes. Hydrothermal alteration consists of intense and pervasive albite and carbonate (ankerite) replacement, grading outward to distal carbonate (calcite) alteration. Oxidation (represented by disseminated specular hematite) commonly occurs in mineralized alteration zones. The metallic signature of the bulk of the ore is Au-Ag-Cu-As-Te-W-Mo. Robert (2001) suggested an intrusion-related, syenite-associated model for the Holt-McDermott deposit, whereby mineralization is related to satellite dykes at variable distances from the parent stocks. The relative age of the ore is uncertain, but seems to predate the development of the penetrative D_2 foliation, as is also indicated by syntectonic, barren D_2 extension quartz veins cutting the mineralization (Robert, 2001).

Appendix 2

203 Lupin is a LateArchean iron formation-hosted vein and disseminated (Homestake type) deposit with a total gold content of 105 metric tons. It is located in the MacKenzie district of the Contwoyto Sedimentary Domain, central Slave Province, Nunavut, Canada. NE-trending F_1 folds affected by N-trending, steeply-plunging, tight to isoclinal F_2 folds are the major regional tectonic structures in the area. Massive to disseminated sulphides and discordant quartz veins are hosted by amphibolite grade sulphide-, oxide- and silicate-facies iron formation in turbiditic rocks of the Late Archean Contwoyto Formation. Orebodies consist of pyrrhotite-rich layers, with lesser arsenopyrite, loellingite and scheelite. Late quartz veins are fringed with gold-bearing arsenopyrite-loellingite haloes, the veins themselves containing only minor amounts of gold. The regional F_2 folds and associated S_2 foliation control the shape and distribution of the iron formation and enclosing rocks. The deposit is centred on a steeply-plunging anticline-syncline pair, and mineralization is confined to F_2 fold noses. Hydrothermal alteration consist of a proximal sulphidation zone of As-sulphides-hornblende-quartz-hedenbergite-epidote-actinolite. This grades outward to a Fe-sulphides-hornblende-quartz-hedenbergite-epidote-actinolite zone, to a distal amphibole alteration zone represented by a grunerite-quartz±magnetite assemblage. Pyroxene-chlorite and hedenbergite-quartz±epidote±scheelite±grossular garnet calc-silicate alteration assemblages occur in haloes adjacent to veins. The metallic signature of the bulk of the ore is Au-Ag-As-Cu+/-W. The genesis of the Lupin deposit is controversial. Kerswill (1993, 1996) proposed a syngenetic origin of the sulphide mineralization hosted by the iron formation. However, Bullis *et al.* (1994) showed that pyrrhotite distribution, as well as gold and arsenopyrite distribution, appears to be controlled by the late discordant quartz veins. The latter strongly supports an epigenetic origin for the gold and (at least) some part of the sulphide mineralization (Bullis *et al.*, 1994). In this case, pyrrhotite-rich BIFs would represent coalesced, gold-rich, pyrrhotite-replacement zones around the late veins and the Lupin deposit would be akin to manto-type deposits (Poulsen *et al.*, 2000).

206 Madsen is an Archean, high-temperature, non-carbonate-hosted stockwork-disseminated replacement type deposit with a total gold content of 76 metric tons. It is located in the Red Lake district of the Red Lake greenstone belt, Uchi subprovince, Superior Province, Ontario, Canada. Disseminated sulphide mineralization is hosted by two altered and deformed Archean "tuff" horizons (the McVeigh and Austin tuffs) consisting of massive and pillowed basaltic rocks and mafic volcaniclastic and related epiclastic rocks. A single quartz vein with high-grade gold values is hosted by a talc schist; is the only example of vein-type ore in the deposit. Ore mineralogy consists of dominant pyrite, with lesser pyrrhotite, arsenopyrite, chalcopyrite and sphalerite. The deposit occurs at the deformed unconformity between the Balmer and the Confederation assemblages. Ore is structurally controlled by the competency contrast between the Austin tuff and a quartz-feldspar porphyry, and by the F_2 fold hinges affecting the tuff horizons. Small-scale, moderate strain sinistral shear zones in the Austin tuff are also important structures. D_2-related folds and shears appear to have affected both the mineralization and its alteration, suggesting that the deposit formation is pre- to early-D_2. U-Pb ages of 2744±1 Ma on a pre-mineralization quartz-feldspar porphyry unit and 2699±4 Ma on a post-ore granodiorite-diorite dyke further constrain the timing of the deposit formation. Hydrothermal alteration consists of a proximal zone of biotite-rich, siliceous bands with microcline-quartz-muscovite, alternating with amphibole-rich bands with actinolite-hornblende-clinopyroxene-zoisite, and is notoriously andalusite and staurolite-free. This grades outward to a zone of barren aluminous alteration characterized by an assemblage of andalusite-garnet-biotite-staurolite-amphibole. Presence of strong carbonate alteration with a calcite halo is commonly indicative of proximity to a higher grade zone. At the contact with the orebodies, the tuffs are typically affected by sericitic alteration. Tourmaline-rich layers occur inside and outside of the aluminous alteration zone. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Cu-Hg±Zn. The Madsen deposit shares strong analogies with high-temperature (400 to 600°C) gold deposits hosted by mafic rocks in Australia. The deposit also shares analogies, especially in terms of alteration and mineralogical assemblages, with gold skarns hosted by mafic rocks. Its relationship with the nearby Killala-Baird Batholith (2704±1.5 Ma) remains ambiguous.

210 Malartic Gold Fields is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 53 metric tons. It is located in the Malartic district of the Abitibi greenstone belt, Superior Province, Quebec, Canada. The Cadillac-Larder Lake fault zone is the main regional tectonic structure in the area. Disseminated sulphides and minor quartz veins are hosted by Archean diorite lenses and quartz-feldspar porphyry dykes intruding the diorite; the intersection of these two units generally results in high-grade geometric ore shoots. The diorite lenses are set within zones of talc-chlorite schist that are the result of alteration and shearing of komatiitic volcanics of the Archean Piché Group. The gangue mineralogy of the veins consists of quartz and tourmaline. The main ore minerals are pyrite and arsenopyrite, with trace amounts of chalcopyrite and galena. The Malartic Gold Fields Fault and its subsidiary structures are closely associated with the development of the fracturing. The competency contrast between the diorite lenses and the enclosing schists confined the development of fracturing and mineralization to the diorite lenses. Likewise, small diorite lenses of less than 10 meters width are more fractured and mineralized than the larger ones. Hydrothermal alteration of the diorite is intense, and consists of ore-related pyritization, silicification, biotite, carbonate and tourmaline alteration. Quartz-feldspar porphyry dykes have been affected by albitization, which varies according to the intensity of fracturing. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Pb.

216 The McIntyre-Hollinger-Coniaurum complex is a Late Archean, quartz-carbonate shear-zone-related Au-Cu-Ag-Mo deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) and the largest gold deposit in Canada, with a total gold content of 987 metric tons. It is located in the Timmins district of the Abitibi greenstone belt, Superior Province, Ontario, Canada. The NE-trending Destor-Porcupine fault zone and the Central Tisdale Anticline are the major regional tectonic structures in the area. Extensive quartz-ankerite veins and associated disseminated sulphides (covering an area of 2 by 1 km on surface and plunging to a depth of 2.4 km) are hosted by folded basaltic rocks of the Late Archean Tisdale Group, wedged between steeply-plunging, ore-bearing quartz-feldspar porphyry stocks of the 2690 Ma Pearl Lake Porphyry. Gangue mineralogy of the veins is dominated by quartz and ankerite, with lesser albite, tourmaline and hematite. Pyrite is the dominant ore mineral, with lesser scheelite and tetrahedrite. However, stockworks of quartz-anhydrite-chalcopyrite-pyrite-galena-molybdenite and associated pink anhydrite alteration occur at depth in the Pearl Lake Porphyry, and are associated with an early porphyry-style Cu-Au-Ag-Mo mineralization overprinted by 2673 Ma albitite dykes. Overprinting the porphyry mineralization and the albitite dikes is the main (extensive) gold-bearing vein system, mostly of extensional styles, which represents the bulk of the gold mineralization. Structural control of the ore is related to the NE-trending Hollinger-McIntyre Shear Zone, which transects the three mine properties, and lithological competency contrasts such as the mafic volcanics-porphyry interface and the mafic volcanics-interflow sediments interface. The top of the volcanic flows and breccia zones also focused Au mineralization. The veins are parallel to the main regional foliation, and are associated with a sericite-ankerite alteration. Hydrothermal alteration consists of an extensive zone of carbonate alteration centred on the quartz-ankerite veins system within the core of a doubly plunging anticline, grading laterally into distal chlorite-calcite alteration. The metallic signature of the bulk of the ore is Au-Ag-W±B±Zn±Te±Bi.

226 Negus-Nerco Con is an Archean quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 187 metric tons. It is located in the Yellowknife area, Yellowknife greenstone belt, Slave Province, Northwest Territories, Canada. The Campbell Shear and the Con Shear are the main regional tectonic structures in the area. Quartz-carbonate veins and sulphide-rich zones of siliceous replacement are hosted by sheared and altered basaltic rocks of the Kam Group and tuffaceous cherts. Quartz and ankerite are the dominant gangue minerals. Ore mineralogy consists of pyrite, arsenopyrite, sphalerite, pyrrhotite, stibnite, chalcopyrite, scheelite and diverse sulphosalts. Mineralization is structurally controlled by SW-NE-trending, moderately- to steeply-dipping brittle-ductile, reverse/reverse-dextral D_1 anastomosing shear zones (Campbell, Con and Negus-Rycon shears). These have been deformed and reactivated by D_2 EW-shortening mainly represented by reverse-dextral shearing and F_2 eastward west-over-east vergence folds and associated schistosity. The deposit is offset and dislocated by the Proterozoic NS-oriented, sinistral strike-slip West Bay and Pud D_3 faults, which bound the deposit to the east and west respectively. Hydrothermal alteration is coincident with the shear zones, and consists of zoned carbonate alteration of carbonate-sericite-quartz-pyrite-arsenopyrite assemblage near the orebodies, and grading outward to a distal chlorite-carbonate assemblage. The metallic signature of the bulk of the ore is Au-Ag-As-W-Sb-Zn-Cu. Siddorn and Cruden (1999) suggested a model whereby the Giant and the Con deposits consist of a once-linked Archean deposit. In this model, evidence linking free gold precipitation and depth, a lower metamorphic grade at Giant comparatively to a higher one at Con, and the apparent increase in pyrrhotite abundance with depth indicates that the Giant deposit may represent an upward extension to the Con deposit. Metamorphism of the Burwash Formation turbidites (Van Hees *et al.*, 1999), or of the Yellowknife greenstone belt (Boyle, 1951), are thought to have originated the mineralizing fluids.

232 New Britannia (formerly known as Nor-Acme) is an Early Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 47 metric tons. It is located in the Snow Lake area of the Flin Flon-Snow Lake greenstone belt, Churchill Province, Manitoba, Canada. The McLeod Road Thrust is a the main regional tectonic structure in the area. Quartz veins and breccia zones are hosted by greenschist grade basalts and felsic pyroclastic rocks of the Early Proterozoic Snow Lake arc assemblage. Gangue mineralogy consists of quartz, carbonate, tourmaline and axinite. Ore mineralogy is dominated by arsenopyrite, pyrrhotite and pyrite, with minor chalcopyrite, cubanite, sphalerite, galena, ilmenite and scheelite. The highest grades occur where acicular arsenopyrite forms radiating masses on wall rock fragments. Mineralization is structurally controlled by the Nor-Acme Fault (formerly called the Howe Sound Fault), an arcuate brittle-ductile shear splay from the McLeod Road Thrust, that is parallel to the contact between the mafic volcanics and the felsic pyroclastics. Galley *et al.* (1989) suggested that the mineralization may occur where the Nor-Acme Fault truncates the nose of the Nor-Acme anticline. Hydrothermal alteration consists of intense silicification and carbonatization zone sheared or brecciated basaltic and felsic pyroclastic rocks. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Pb-Zn-B-W.

239 Musselwhite is a Middle Archean, iron-formation-hosted vein and disseminated (Homestake-type) deposit with a total gold content of 103 metric tons. It is located in the North Caribou-Weagamow greenstone belt of the Sachigo subprovince, Superior Province, Ontario, Canada. Rocks in the area are folded along NW-trending synform/antiform pairs with a shallow to moderate plunge to the NW. Mineralized zones of silica flooding and disseminated sulphides are hosted by amphibolite-grade silicate and oxide facies iron formation, consisting of chert, amphibole, garnet, grunerite, magnetite and chlorite. Quartz-albite-almandine-calcite-pyrrhotite veins are a very minor part of the ore. The dominant ore mineral in the disseminated/silicified zones is pyrrhotite, with lesser arsenopyrite and chalcopyrite, and minor pyrite, sphalerite, scheelite and altaite. Mineralization and D_2 deformation are syn- to post-peak metamorphism, and mineralization is commonly associated with F_2 fold hinges, which acted as structural traps for the mineralizing fluids. Hydrothermal alteration consists of ore-related silicification and sulphidation of the iron formation (magnetite converted to pyrrhotite). Arsenic-rich metasomatism is characterized by the development of arsenides in and outside the host rocks. Some local biotite and phlogopite attest to restricted potassic metasomatism. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Zn-W-Te.

246 Paymaster is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 37 metric tons. It is located in the Timmins district of the Abitibi greenstone belt, Superior province, Ontario, Canada. The Destor-Porcupine fault zone and the Porcupine Syncline are the main regional tectonic structures in the area. Quartz-carbonate veins, quartz stringers and associated disseminated sulphides are hosted by lower greenschist grade, altered and pillowed basaltic and komatiitic flows. Although no ore is hosted by the nearby Paymaster Porphyry, a porphyritic quartz-feldspar intrusion, quartz content and gold grades of veins decrease away from the porphyry, implying a spatial and possibly genetic link. Gangue mineralogy consists of ankerite, quartz, albite, sericite and tourmaline. Ore minerals are pyrite, pyrrhotite, sphalerite, chalcopyrite, galena, molybdenite and scheelite. Mineralization is structurally controlled by the Porcupine Creek Fault, and by its EW-oriented shear splays. Cross-anticline and minor folds are also associated with the Porcupine Creek Fault, and localized some of the ore. Late, EW-oriented normal faults offset the orebodies. Hydrothermal alteration consists of carbonatization of mafic and ultramafic rocks in and along shear zones, represented by a chlorite-carbonate-talc assemblage. The Paymaster porphyry is affected by sericitization and carbonatization, and is also silicified and albitized. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-Mo-B-W.

248 Perron-Beaufort/North Pascalis is a Late Archean, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 32 metric tons. It is located in the Val d'Or district of the Abitibi greenstone belt, Superior Province, Quebec, Canada. The regional ENE-trending, steeply-dipping reverse-oblique Cadillac-Larder Lake fault zone is the dominant tectonic structure in the area. Gold-bearing laminated and ribbon-textured quartz veins are hosted by quartz diorite of the 2700 Ma Bourlamaque batholith. Quartz is the dominant gangue mineral, with lesser tourmaline, ankerite, calcite, chlorite et rutile. Ore mineralogy is dominated by pyrite, with minor to trace amounts of chalcopyrite, scheelite, tetradymite (and other tellurides), molydenite, pyrrhotite and sphalerite. The two mines are located in a highly fractured zone set between two EW-oriented faults: the N-dipping Perron Fault to the north, and the S-dipping South Fault to the south. Mineralization is structurally controlled by W-trending, moderately- to steeply-dipping reverse shear zones developed along mafic dykes, and by ESE-trending, moderately-dipping reverse shear zones also developed along mafic dykes, but generally thinner. Orebodies are also associated with NS-oriented, subhorizontal to gently W-dipping extension fractures. Moreover, SW- to WSW-trending, poorly-developed conjugate reverse shear zones at Perron are also gold-bearing (Tessier, 1990). The competency contrast between the Bourlamaque batholith and the surrounding volcanic rocks of the Marlartic Group probably played a key role in localizing deformation and mineralization. According to Tremblay (2001), E-trending reverse shear zones initially served as fluid conduits and were later reactivated as post-mineral faults. W-trending, steeply-dipping to subvertical dextral strike-slip faults with local reverse movement crosscut the orebodies. Hydrothermal alteration consists of proximal, centimetre-wide bleaching (sericitization) of the quartz diorite that is characterized by the sericite-albite-calcite assemblage. This grades outward to a metre-wide chloritic alteration envelope represented by a chlorite-carbonate sericite assemblage. The metallic signature of the bulk of the ore is Au-Ag-As-Cu-Bi-Te-W-Ni-Co.

249 Pickle Crow is an Archean iron-formation-hosted vein and disseminated (Homestake-type) Au-Ag deposit with a total gold content of 43 metric tons. It is located in the Pickle Lake area of the Uchi subprovince, Superior Province, Ontario, Canada. The Pickle Crow syncline (part of an isoclinally-folded anticlinoria-synclinoria), and the NE-trending Pickle Crow fault and Highland Crow shear zone, are the dominant regional tectonic structures in the area. Quartz-carbonate veins and associated disseminated sulphides are hosted by upper greenschist grade iron formation, porphyritic quartz-feldspar intrusions and pillowed basalt flows. Some minor stratiform sulphides are also hosted by the folded iron formations. Gangue mineralogy of the veins is dominated by quartz and carbonate, with lesser tourmaline. Ore mineralogy consists of pyrite, arsenopyrite, pyrrhotite and lesser scheelite. The most productive veins are localized in anticlinal areas associated with metabasalt and iron formation, and also inside subsidiaries of the Pickle Crow fault. However, some veins are confined within sericitized faults and shears located in the Pickle Crow porphyry stock. Hydrothermal alteration consists of large, ore-related zones of ankerite alteration, chloritization and silicification of the iron formation and basalts, and of sericitic alteration of the quartz-feldpar porphyry. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-B-W.

253 Preston is an Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 48 metric tons. It is located in the Timmins district of the Abitibi greenstone belt, Superior Province, Ontario, Canada. The deposit lies on the northern limb of the Porcupine syncline, close to the Destor-Porcupine fault zone, which is a major regional tectonic structure in the area. Quartz veins, quartz stockworks and associated disseminated sulphides are hosted by lower greenschist grade quartz-feldspar porphyry of the Preston and Preston West stocks, and by altered tholeiitic basalt flows of the Late Archean Tisdale Group. Stockwork zones are hosted exclusively by the porphyry stocks. The gangue mineralogy of the veins is dominated by quartz, with lesser tourmaline and minor chlorite, albite, ankerite and calcite. Ore minerals are pyrite, chalcopyrite, pyrrhotite, sphalerite and scheelite. Mineralization is structurally controlled by faults, which induced fracturing and vein emplacement. Quartz-tourmaline veins are commonly affected by folding. Hydrothermal alteration consists of chlorite-carbonate alteration envelopes surrounding veins hosted in mafic volcanic rocks. Carbonate and tourmaline alteration zones are associated with porphyry-hosted veins. Quartz stockworks in pyritized porphyry are associated with bleaching and sericitic alteration. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Zn-B-W.

257 Renabie is a Late Archean, quartz-carbonate shear-zone-related Au-Ag-Cu deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 40 metric tons. It is located in the Michipicoten district of the Wawa subprovince (Wawa Domal Gneiss Terrane), Superior province, Ontario, Canada. Banded and ribonned quartz veins and associated disseminated sulphides are hosted by gneissose trondhjemite (2728 Ma) and hornblende-biotite tonalite (2722 Ma) of the Late Archean Missinabi Lake Batholith. Quartz is the dominant gangue mineral, with lesser sericite, ferrugineous carbonate, tourmaline, rutile, anhydrite and hematite. Ore mineralogy is dominated by pyrite, with minor galena, molybdenite, chalcopyrite, bornite, sphalerite and Pb-Bi-Au-Ag tellurides such as altaite, hessite, petzite, tellurobismuthite and rucklidgeite. Mineralization is structurally controlled by two sets of oblique-reverse (sinistral) shear zones; 1) a SE-trending, moderately- to steeply-dipping shear zones subparallel to the contact between the volcanic rocks of the Michipicoten greenstone belt and the intrusions of the Wawa Domal Gneiss Terrane, and 2) an EW-trending, steeply-dipping to subvertical set of en echelon ductile-brittle shear zones. Younger NNW- to N-trending subvertical sinsitral dip-slip faults affect the rocks in the mine area. Hydrothermal alteration consists of a sericite-carbonate-chlorite-albite assemblage near the veins, along with silicification, pyritization, hematization and anhydritization confined to the host shear zones. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Mo-Bi-Te-B.

258 Ross is an Archean, quartz-carbonate shear-zone-related Au-Ag-Cu deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 35 metric tons. It is located in the Matheson district of the Abitibi greenstone belt, Superior province, Ontario, Canada. The Destor-Porcupine fault zone is the dominant regional tectonic structure in the area. Quartz veins and stringers and associated disseminated sulphides, as well as local breccias, are hosted by lower greenschist grade sericite-carbonate and chlorite-carbonate schists (after basaltic flows). Breccias consists of mineralized quartz vein clasts in a matrix of extensively milled and broken altered rock. Gangue minerals of the veins are dominantly quartz and carbonates (ankerite-dolomite-calcite), with lesser chorite, sericite, epidote, plagioclase and kaolinite. Ore mineralogy consists mainly of tennantite, pyrite, chalcopyrite, proustite and pearceite, with minor sphalerite, galena, bornite, chalcocite and nickeline, and rare calaverite. Mineralization and alteration are structurally controlled by EW- and NW-oriented sinistral shear zones. Post-ore NS-oriented, brittle, dip-slip faults have displaced and offset vein mineralization, and are related to the development of breccia ore. Hydrothermal alteration is extremely intense, obliterating the original nature of the host rock, and is highly variable. Basaltic rocks and schists are affected by sericitization and ankeritization. Intense silicification and albitization, with associated pyritization, occur in the core of the stringer zones. Chloritization, hematization, anhydritization and epidotization also occur. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-As-Te.

262 San Antonio (Bissett) is an Archean, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 44 metric tons. It is located in the Rice Lake area of the Rice Lake greenstone belt, Uchi subprovince, Superior Province, Manitoba, Canada. The transcurrent, dextral strike-slip Wanipigow fault is the dominant regional tectonic structure in the area. Quartz-carbonate veins and overprinting stockwork zones are hosted by a unit of tholeiitic composition, the San Antonio Mine Unit, interpreted as either a gabbroic sill or a mafic flow. Gangue mineralogy of the veins is dominated by quartz, ankerite and albite, with minor tourmaline and iron oxides. Ore mineralogy consists of dominant pyrite, with lesser chalcopyrite, sphalerite and galena, and minor tellurides. Mineralized veins are structurally controlled by en echelon sinistral-reverse shear zones confined to the San Antonio Mine Unit and related to the Normandy Creek shear zone, a ductile sinistral-reverse fault. The veins are commonly internally zoned. They are composed of a quartz-albite-ankerite fringe, an internal contact and a central quartz core with ribbon structures. Stockworks are zones of intense fracturation and mineralized host rock with an en echelon distribution and are composed of three structural elements: an inner central quartz vein; a central breccia zone of angular wallrock fragments cemented by quartz veins; and a peripheral zone of arrays of extensional, sigmoidally shaped “ladder veins”. Hydrothermal alteration consists of a proximal albite-muscovite assemblage, which grades progressively outward to a carbonate alteration assemblage of ankerite-paragonite, to a chlorite-calcite assemblage, and to a distal actinolite-epidote alteration assemblage. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Zn-Pb-Te-B.

279 Sullivan is a Late Archean, quartz-carbonate shear-zone-related Au-Ag(-W) deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 35 metric tons. It is located in the Val d’Or district of the Abitibi greenstone belt, Superior province, Quebec, Canada. The Cadillac-Larder Lake fault zone (just south of the deposit) is the major regional tectonic structure in the area. Quartz-carbonate veins and associated disseminated sulphides are hosted by a quartz diorite phase of the 2700±1 Ma Bourlamaque batholith (at its westernmost extremity), and by crosscutting diorite dykes. Gangue mineralogy consists mainly of quartz, carbonate, tourmaline and chlorite, with minor ablite, epidote and sericite. Ore minerals are pyrite, chalcopyrite, sphalerite, scheelite, molybdenite, galena and tellurides. Mineralization is structurally controlled by NW-SE- and E-W-trending, moderately-dipping reverse-oblique shears, which are spatially coincident and overprint mafic dykes. The latter, due to their competency contrast with the batholith host, behaved as weak layers in an isotropic body, and focused deformation and fluid flow. Hydrothermal alteration consists of an assemblage of chlorite-ankerite-plagioclase-sericite-sulphides, which has affected the diorite dykes and the quartz diorite along the mineralized shear zones. Albitization of the quartz diorite along the veins selvages is also noted. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-B-W+/-Te.

288 Upper Canada is a Late Archean, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 47 metric tons. It is located in the Kirkland

Lake district of the Abitibi greenstone belt, Superior Province, Ontario, Canada. Fault-fill quartz veins and veinlets are hosted by Late Archean Timiskaming Group trachytic volcanic and pyroclastic rocks and arkosic sediments, and by syenite porphyry sills and dykes. Due to their similar mineralogy and alteration mineralogy, the trachytic rocks (the surface expression of the syenites) are typically difficult to distinguish from the syenite intrusions. Gangue mineralogy is dominated by quartz, with lesser calcite and feldspar. Ore minerals are pyrite, tellurides, sphalerite, tennantite, chalcopyrite, galena, arsenopyrite and molybdenite. Orebodies are structurally controlled by, and confined to, the Upper Canada shear zone, which is a system of branching, subparallel, gouge- and vein-filled fractures. Silicified lithological contacts between tuffs, trachytes and syenite bodies are the loci of quartz vein emplacement. Quartz veins are in places affected by drag folds, and offset by late, (dextral) strike-slip faults with relatively small displacement. Hydrothermal alteration consists of silicification of the host rocks, with disseminated pyrite and arsenopyrite in the veins selvages. Tourmaline development (in places massive) also occurs adjacent to the veins. This grades outward to a carbonate alteration halo represented by calcite. In some orebodies, intense sericitization-carbonatization is related to ore-bearing shear zones. Minor chlorite alteration and anhydrite also occur. The metallic signature of the bulk of the ore is Au-Ag-As-Pb-Zn-Sb-W-Mo.

295 Young-Davidson is a Late Archean, syenite-associated porphyry Au-Ag deposit with a total gold content of 30 metric tons. It is located in the Matachewan district of the Abitibi greenstone belt, Superior Province, Ontario, Canada. The Kirkland Lake-Larder Lake fault zone is the major regional tectonic structure in the area. Disseminated sulphides, quartz stockworks and veins are hosted exclusively by a large, lenticular stock and associated dykes of highly fractured, porphyritic syenite of Late Archean age, which has intruded Timiskaming conglomerates at the contact of the andesitic-basaltic volcanic domain of the Upper and Lower Supergroup. Gangue minerals of the stockworks and veins are quartz, carbonate, tourmaline and K-feldspar. Ore minerals are mainly pyrite and chalcopyrite, with lesser galena, molybdenite, scheelite and specular hematite. The mineralization is overprinted by the deformation, and thus predates it. Hydrothermal alteration consists of potassic alteration (K-feldspar-hematite) of the syenite and of zoned carbonate alteration represented by ankerite near the core of the system and by peripheral dolomite and calcite. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Mo-W-B.

453 Phoenix is a Jurassic-Cretaceous intrusion-related Au-Ag-Cu skarn with a total gold content of 62 metric tons. It is located in the Boundary-Greenwood mining district, within the Quesnel Terrane of the Omineca Belt, Canadian Cordillera, British Columbia, Canada. N- to NNE-trending faults (which may be related to post-Laramide orogeny extensional collapse) are the dominant regional tectonic structures in the area. Faults of the Republic (Granby fault) and the Toroda graben bound the mining camp to the east and west, respectively. Replacement and disseminated sulphides are hosted by impure limestone of the Middle to Late Triassic Brooklyn Group. Ore mineralogy consists of pyrite, chalcopyrite, magnetite and specular hematite. Mineralization is lithologically controlled by the relatively impure limestone unit. This unit overlies the footwall argillite, which focused fluid flow into the limestone. A well-developed fault system structurally localized the orebodies. An EW-oriented thrust fault makes a sharp bend in the Phoenix mine area, and NS-oriented faults are conspicuous. In places, the latter have infillings of weakly-mineralized, banded quartz-calcite-pyrite-chalcopyrite. Skarn alteration consists of a chlorite-epidote-garnet-calcite-quartz assemblage. Silicification (jasperoid) of limestones and limestone breccia also occurs. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn. Due to the lack of any granitic intrusions in the vicinity of the deposit, it has been proposed that the Phoenix deposit is related to a deep-seated granitic body that produced mineralizing solutions, which were then channelled by the faults to the favorable limestone units for replacement and ore deposition.

483 Cariboo (Aurum) is a Mesozoic, intrusion-related gold manto and superposed quartz-carbonate shear-zone-related gold mineralization (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 40 metric tons. It is located in the Cariboo district within the Barkerville Terrane of the Omineca Belt of the Canadian Cordillera, British Columbia, Canada. Rocks in the area are metamorphosed to the greenschist facies and are folded on a regional scale by the Cunningham and Island Mountain anticlinoria. Quartz vein mineralization is hosted within competent, carbonaceous quartzite beds; massive sulphide lenses are hosted by or at the contact of limestones and limy rocks and represents about one third of the total gold production. Gangue minerals of the veins are quartz and ankerite, with minor sericite. The main ore mineral is pyrite, with abundant arsenopyrite and scheelite, and less common chalcopyrite, galena, sphalerite, tetrahedrite, cosalite and bismuthinite. In places, the veins connect with the massive sulphide lenses, which are masses of fine grained pyrite with minor amounts of scheelite, galena, sphalerite and arsenopyrite. F_2 fold noses and drag folds commonly localized sulphide lenses, which are intensely transposed when located in the hinges. Limestone beds and their contacts are preferentially mineralized by the manto-style ore. F_2 folds are also responsible for the opening of extension fractures and controlled the emplacement of mineralized quartz veins. Quartz veins are also preferentially located in competent quartzite beds, which localized fracture deformation during folding. Late, NE-trending, dextral strike-slip faults affected and displaced the folds. Carbonate-sericite alteration is most intense in the footwall of the massive sulphide lenses and also surrounds the quartz veins. A narrow fringe of silicification typically affects the limestone units on the boarder of the sulphide lenses. Skarn-type, calc-silicate alteration occurs higher in the stratigraphic succession. The metallic signature of the bulk of the ore is Au-Ag-As-Bi-W. Alldrick (1982) proposed a model of gold-bearing fluids of metamorphic origin circulating through the folded rocks, precipitating mineralized quartz veins in open fractures and reacting with carbonate bed along dilatant fold noses and troughs to form massive sulphide lenses. However, Poulsen *et al.* (2000) clearly distinguished two distinct stages of mineralization: pyritic orebodies are transposed by S_2 cleavage and predate the development of F_2 folds, whereas quartz veins have formed late in the development of these folds. The two styles of mineralization are considered as independent by Poulsen *et al.* (2000).

487 Snip is an Early Jurassic intrusion-related, Au-Ag-Cu sulphide-rich vein type deposit with a total gold content of 32 metric tons. It is located in the Iskut River area, part of the Stikine Terrane within the Intermontane Belt, Canadian Cordillera, British Columbia, Canada. Regional NS- to NNW-trending thrust faults and NE- and NW-striking normal block faults are the dominant tectonic structures in the area. Banded and laminated sulphide-rich veins, quartz veins, and disseminated sulphides in biotite-rich and carbonate replacement zones are hosted by greywacke, feldspathic wacke, and feldspathic siltstone correlative of the Late Triassic to Middle Jurassic Hazelton Group. Minor ore is hosted by quartz diorite, quartz monzonite and granodiorite of the Early Jurassic Red Bluff porphyry. Gangue minerals proportions vary according to the ore type, calcite and quartz are nevertheless the most dominant gangue minerals, with sometimes abundant biotite and chlorite, and minor amounts of ankerite and K-feldspar.

Pyrite is the dominant ore mineral, with lesser pyrrhotite and sphalerite, and minor magnetite, galena, molybdenite, chalcopyrite, hessite, cosalite, tellurobismuthite, volynskite, altaite, tetrahedrite and native Bi. Mineralization is structurally controlled by the Twin Zone, a SW-trending, moderately- to steeply-dipping, brittle-ductile oblique-reverse shear zone, and its subsidiaries. The Twin Zone has a pronounced internal banding of four different ore types: foliation-parallel sulphide-rich veins (almost massive sulphides veins) and quartz veins, grades outward to carbonate ore, and to biotite ore. Gradation from quartz vein to sulphide-rich vein implies a genetic relationship between these two ore types (Rhys, 1992). Two sets of NW- and NE-trending, moderately-dipping extension veins cut accross the Twin Zone and define a conjugate set indicating later reverse shearing. Late brittle faults with variable displacements occur throughout the area. Hydrothermal alteration around the sediment-hosted vein type ore consists of a thin proximal envelope of biotite alteration, grading to a potassic alteration assemblage of quartz-K-feldspar-biotite-carbonate. The complete gradation from carbonate to biotite ore indicate they are closely related genetically and may have formed by progressive wallrock alteration of the Twin Zone (Rhys, 1992), with the vein-type ore being the youngest mineralization. The Red Bluff porphyry is affected by intense potassic alteration (represented by a quartz-magnetite-sericite-K-feldspar-biotite assemblage) associated with Au-Cu-Mo mineralization. This is overprinted by a phyllic (sericite-pyrite-quartz) alteration associated with quartz veins. The

492 Nickel Plate a Late Triassic to Early Jurassic intrusion-related gold skarn deposit with a total gold content of 66 metric tons. It is located in the Hedley district of the Intermontane Belt, Canadian Cordillera, British Columbia, Canada. A regional anticline is the dominant tectonic structure in the area. Semi-massive sulphide ore is hosted by limestones and limy siltstones of the Lower to Middle Jurassic Nicola Group. Sedimentary rocks are intruded by the Toronto stock, a diorite to quartz diorite batholith part of the Hedley intrusions, a group of 206±1 Ma dioritic to gabbroic plutons. The main ore minerals are arsenopyrite and pyrrhotite, with lesser chalcopyrite, pyrite, sphalerite, gersdorffite and hedleyite. Native bismuth and Bi-tellurides, along with arsenopyrite, are closely associated with gold. Mineralization is confined to shallow marine, carbonate-rich sediments affected by small, gently plunging, NW-striking folds that are related to the regional anticlinal. An early-stage of alteration is characterized by the development potassic alteration in the intrusions and of biotite-K-feldspar-quartz hornfels in the sediments. Main-stage skarn formation is characterized by a prograde assemblage of hedenbergite-garnet-biotite-orthoclase-quartz-wollastonite. This is overprinted by the ore-stage skarn assemblage of sulphides-scapolite-axinite-epidote. A retrograde skarn assemblage of chlorite-epidote-sericite-prehnite assemblage overprints all previous assemblages. The metallic signature of the bulk of the ore is Au-Ag-As-Bi-Te-Cu-Pb-Zn-Co-Ni. Nickel Plate is a reduced, calcic skarn deposit and isconsidered as one of the best examples in the world of a gold skarn deposit (Poulsen *et al.*, 2000).

493 Cinola (also known under the names of Harmony, Specogna or Babe deposit) is a Cenozoic, low-sulphidation epithermal Au-Ag deposit with a total gold resource of 98 metric tons. It is located on Graham Island, in the Insular Belt of the Canadian Cordillera, British Columbia, Canada. The deposit is situated near the NNW-trending Sandspit Fault, a regional dextral strike-slip fault part of a major dextral strike-slip fault system linked to the Queen Charlotte transform fault. Banded and ribbon-textured quartz-feldspar veins and stockworks, and associated disseminated sulphides are hosted by hydrothermally-brecciated conglomerates and calcareous mudstones of the Miocene-Pliocene andesite-derived Skonun Formation, and by rhyolite dykes. Gangue mineralogy consists mainly of quartz and adularia. Pyrite, marcasite and pyrrhotite are the dominant ore minerals, with minor cinnabar and very minor chalcopyrite and sphalerite. The Specogna Fault, a N-trending parallel dextral strike-slip segment of the Sandspit Fault, forms the western boundary of a half-graben and is an important feeder structure. The major part of the mineralization occurs in NE-trending, subvertical extensional fractures located between the Specogna and Sandspit faults. Early hydrothermal alteration is represented by high temperature sericitic (quartz-sericite-pyrite) alteration in the hanging wall of the Specogna Fault, which is associated with low-grade disseminated gold. Vein-related alteration consists of extensive proximal potassic alteration and silicification, characterized by quartz-adularia-pyrite±illite. This grades outward to a barren argillic alteration halo of kaolinite-illite/smectite-quartz-pyrite±alunite±sericite which extends laterally from the hydrothermal breccias and the potassic-silicic alteration zone. Distal propylitic alteration is characterized by an assemblage of chlorite-smectite/illite-quartz-pyrite. The partial metallic signature of the bulk of the ore is Au-Ag-Hg-As-Sb. Champigny and Sinclair (1982) have proposed a Carlin-type model for the formation of the Cinola deposit, in which the rhyolite intrusions are thought to have originated the brecciation and initiated the movement of meteoric water and the development of the hydrothermal system. More recently, Madeisky (1995) has proposed an epithermal environment of formation.

494 Silbak Premier is a Mesozoic hybrid deposit type transitional between a porphyry Au-Ag deposit and an epithermal, low-sulphidation Au-Ag deposit, with a total gold content of 65 metric tons. It is located near the regional Long Lake-Fish Creek Fault Zone, a major N-trending fault zone in the Stikine Terrane of the Intermontane Belt, Canadian Cordillera, British Columbia, Canada. Quartz veins, quartz stockworks, siliceous breccias and locally concordant and layered semi-massive sulphides (15-75% sulphides) are hosted by Early Jurassic, greenschist grade andesite flows and lapilli tuffs, and by porphyritic granodiorite and tonalite intrusions. Quartz veins and breccias gangue minerals are dominated by quartz and K-feldpar, with minor chlorite and carbonate. Ore minerals are pyrite, sphalerite, galena, tetrahedrite, chalcopyrite, arsenopyrite and silver sulphosalts such as pyrargyrite, polybasite, and argentite. Native silver locally occurs inside veins. Mineralization is structurally controlled by NE-trending, moderately- to steeply-dipping sinistral and dextral faults and shears. Breccias are typically localized at the porphyry/andesite contacts. Hydrothermal alteration consists (up to 10 meters wide) of intense proximal silicification and potassic alteration of the breccias (adularia-sericite±silica). This grades outward into peripheral propylitic alteration composed of an inner carbonate alteration halo, and an outer chlorite-pyrite alteration halo. Peripheral propylitic alteration is most intense in the volcanic rocks. The mineralization is spatially and probably genetically related to the Premier Porphyry, a K-feldspar, granodioritic/tonalitic porphyry intrusion. The metallic signature of the bulk of the ore is Ag-Au-Cu-Pb-Zn-Ba-As.

495 Centre Star Group is a Cenozoic, intrusion-related, Au-Cu-Ag sulphide-rich vein deposit with a total gold content of 74 metric tons. It is located in Rossland area of the Omenica Belt, Canadian Cordillera, British Columbia, Canada. The deposit consists of 3 mines situated near the major Rossland Break (a regional thrust fault); the Center Star, Le Roi and War Eagle mines, the last one closing in 1942. Sulphide-rich veins and veinlets are hosted by greenschist grade intrusive rocks of the Rossland monzonite and Rossland sill; the latter consisting of diorite, augite porhyry and monzonite. Minor volcanic rocks also host some mineralization. Veins consist mainly of pyrrhotite and chalcopyrite, with lesser pyrite, minor molybdenite and sphalerite, and trace amounts of native silver and stromeyerite (a silver bearing mineral). Gangue minerals consist of quartz and calcite, with minor actinolite, garnet and magnetite. Structural control on the mineralization is exerted by minor faults and intrusion contacts. Proximal sericitization and sulphidation (pyritization) are associated with vein emplacement. Distal chloritization can be observed on a regional scale. Vein-related calc-silicate alteration of the host rocks is indicated by the development of grayish, banded wollastonite. The metallic signature of the bulk of the ore is Ag-Au-Cu-Mo+/-Pb+/-Zn.

496 Bralorne-Pionner is a Mesozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 129 metric tons. It is located near the regional tectonic contact between the Cadwallader and Bridge River terranes, Bridge River district of the Coast Belt, Cordillera, British Columbia, Canada. The deposit occurs within a block of sub- to lower greenschist grade, steeply-dipping turbidites, argillites and basaltic andesites bounded by the Fergusson and the Cadwallder faults, two regional, NW-trending, steeply-dipping, dextral strike-slip faults. Quartz-carbonate veins are hosted by dioritic and sodic granitic rocks of the Bralorne intrusions (Bralorne mine), and by peridotitic and mafic volcanic and volcaniclastic rocks (Pioneer mine). Gangue mineralogy consists mainly of quartz and carbonate, with lesser sericite, fuchsite, scheelite, tourmaline and rutile. Ore minerals are pyrite, arsenopyrite and pyrrhotite, with minor chalcopyrite, sphalerite, galena, stibnite and tetrahedrite. Sphalerite and galena are particularly important as they are associated with gold-rich portions of the veins. Mineralized veins are mainly shear veins, hosted by narrow, ductile-brittle, reverse to reverse-oblique shear zones. Other quartz-carbonate veins are tension veins linking the shear veins. Ore-related alteration is wide (up to 10 meters) and zoned, with a proximal assemblage of quartz-sericite-ankerite-(fuchsite)-(pyrite), grading outward to an assemblage of carbonate-albite-(sericite), and to a distal assemblage of chlorite-epidote. The metallic signature of the bulk of the ore is Au-Ag-As-Zn-Pb-W-Sb-Cu.

2205 Eskay Creek is a Mesozoic, high-grade gold-rich Au-Ag-Zn-Cu-Pb volcanogenic massive sulphide deposit with a total gold content of 110 metric tons. It is located in Lower to mid-Jurassic rocks of the Iskut River area, in the Intermontane Belt of the Canadian Cordillera, British Columbia, Canada. The mine sequence is folded along the Eskay anticline, an assymetric, gently-plunging anticline, and mineralization is localized near the hinge zone of the fold. A monzodiorite porphyry, the Eskay porphyry, is exposed near the core of the anticline. The South Unuk-Harrymel shear zone is a major sinistral strike-slip fault zone in the area, with a displacement of nearly 20 km in some parts of the fault. Altered, massive, flow-banded and brecciated Eskay rhyolite hosting stockwork mineralization is overlain by argillite and carbonaceous mudstone hosting massive and disseminated sulphide lenses. Massive and pillowed basalts overlying the clastic rocks are weakly altered and mineralized. Mineralization can be divided into three distinct zones: the 21A and 21B zones, and the Pumphouse/Pathfinder zone. The 21A zone is a small lens of Au-Ag-rich stibnite-realgar-cinnabar mineralization at the base of the “contact argillite”, with disseminated stibnite-arsenopyrite-tetrahedrite in the rhyolite footwall. The 21B zone consists of beds of clastic sulphides and sulphosalts, mainly sphalerite, tetrahedrite, Pb-sulphosalts such as boulangerite and bournonite, freibergite, galena and minor pyrite and chalcopyrite. The Pumphouse/Pathfinder zone is a zone of stockwork and disseminated sulphides containing veins of sphalerite-pyrite-galena-tetrahedrite with some silica flooding in the pervasively chloritized (Mg-chlorite) footwall rhyolite. This stockwork zone is considered to be the feeder system for the deposit, as it is situated beneath the sulphide lenses. Lithological contacts (rhyolite-mudstone and basalt-mudstone) are the main ore-controlling structures. The late, NE-trending Pumphouse Creek fault and related splays offset the 21B zone, and minor, NNW-trending faults affected the Eskay anticline. Quartz-sericite-pyrite-(K-feldspar) alteration of the rhyolite-mudstone-argillite sequence is pervasive. The footwall rhyolite and mudstone near the Pumphouse/Pathfinder zone is also pervasively (Mg-)chloritized, and locally pervasively silicified. The metallic signature of the sulphide ore lenses is Au-Ag-As-Sb-Hg-Ba-Cu-Pb-Zn-Rb, whereas the vein mineralization has a distinctive Au-Fe-Zn-Pb-Cu signature. The deposit shows composite characteristics of kuroko-type VMS and high-sulphidation epithermal gold-rich VSM deposits.

4059 Meadowbank is an Early Proterozoic(?) iron-formation-hosted vein and disseminated (Homestake-type) deposit with a total gold resource of 101 metric tons. It is located in the Keewatin district of the Rankin Subprovince, western Churchill Province, Nunavut, Canada. The EW-oriented, dextral strike-slip Wager Shear Zone is the dominant regional tectonic structure in the area. Semi-massive to disseminated sulphides and narrow quartz veins are hosted by altered, greenschist grade oxide facies iron formation and felsic to intermediate volcaniclastic rocks of the Archean Woodburn Lake Group. Pyrrhotite and pyrite are the dominant ore minerals, with minor chalcopyrite and arsenopyrite. Iron formation hosts were affected by a NNE-trending D_1 event of shallowly-plunging, isoclinal-recumbent anticlinal folding and associated S_0/S_1 cleavage, which is the dominant fabric. Ultramafic volcanics form the core of the anticlinal. D_2 deformation consists of refolding of the first fabric in tight to isoclinal folds, and the development of high-strain zones of layer-parallel shears that focused fluid flow along lithological contacts (ultramafic-volcaniclastics) and permeable felsic volcaniclastic layers. D_2-related shear zones in the hinge area cut the BIF at low to high angles, and these are the loci of intense alteration and mineralization. Hydrothermal alteration consists of auriferous cummingtonite-biotite amphibolitization of the iron formation, with which sulphidation and replacement of the oxides with pyrrhotite-pyrite is associated. Weakly auriferous to barren BIF has been affected by grunerite-hornblende-stilpnomelane amphibolitization, which may be related to regional metamorphism. Mineralized felsic volcaniclastics at the Third Portage deposit are altered to an epidote-tourmaline-carbonate assemblage, whereas at the Vault deposit, sericitic alteration (characterized by sericite-quartz-carbonate-pyrite) is predominant. Ultramafic volcanics near the mineralized BIFs have been affected by two types of alteration; 1) amphibolitization with calcic amphibole-biotite/phlogopite-carbonate, and 2) carbonate alteration with talc-chlorite-calcic amphibole-dolomite-calcite-biotite-quartz. The metallic signature of the bulk of the ore is Au-Ag-As-Cu. According to Armitage *et al.* (1995), mineralization is of epigenetic origin.

4062 Meliadine West (Wesmeg) is an Early Proterozoic iron formation-hosted vein and disseminated (Homestake-type) deposit with a total gold resource of 140 metric tons. It is located in the Keewatin district of the Rankin Subprovince, Churchill Province, Northwest Territories, Canada. The ESE-trending, ductile to brittle, dextral Pyke Fault Zone, considered to be an Archean thrust reactivated during the Archean to the Proterozoic, and an ESE-dipping F_1 homocline refolded by a shallow SE-plunging F_2 syncline are the dominant regional tectonic structures in the area. Quartz-carbonate veins and disseminated sulphides are hosted by lower to mid-greenschist grade, deformed sulphide facies(?) iron formation and pillowed basalts of the Late Archean to Early Proterozoic Rankin Inlet Group. Quartz and carbonate are the dominant gangue minerals. Sulphide minerals occur in and around the veins hosted by the iron formation, and consist of dominant arsenopyrite, with lesser pyrrhotite, chalcopyrite, pyrite, sphalerite and galena. Mineralization is structurally controlled by the Pyke Fault Zone itself, and by the Wesmeg Cross Fault, a W-trending, ductile-brittle, dextral strike-slip fault splay of the Pyke Fault Zone. EW-oriented, moderately-plunging folds formed in response to dextral shearing on the fault and affected the iron formation host. Quartz-carbonate veins are preferentially located in shears in, or near, iron formation contacts with metabasalts. Hydrothermal alteration consisting of iron-rich dolomite-ankerite carbonate alteration, chloritization, muscovite-biotite alteration and silicification has affected the iron formation and the metabasalts. The iron formation has also been affected by amphibolitization (with grunerite). The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Zn-Pb. Alignment of muscovite and biotite alteration minerals within the S_2 foliation suggests that alteration/mineralization is syn- to late-D_2 deformation (Miller *et al.*, 1995).

4122 Hoyle Pond is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 62 metric tons. It is located in the Timmins District of the Abitibi greenstone belt, Superior province, Ontario, Canada. The Destor-Porcupine fault zone, an ENE- to NE-trending, steeply-dipping sinistral zone of shearing and ductile deformation focussed mainly within ultramafic flows and intrusions is the main regional tectonic structure in the area. Quartz veins and associated disseminated sulphides are hosted by massive to pillowed, variolitic Mg-rich tholeiitic basaltic flows of the Late Archean Tisdale Group. Gangue mineralogy of the veins is dominated by quartz, with lesser albite and tourmaline, and minor calcite, chlorite, sericite, and carbon. Pyrite is the dominant ore mineral, with minor amounts of sphalerite, chalcopyrite and scheelite. Stratigraphy in the mine area defines an ESE-trending F_1 fold with a closure in the 1060 Zone. The main cleavage (S_2) is axial planar to WSW-trending F_2 folds. Quartz veins occur in a variety of settings, they are: 1) folded about the F_2 axial plane, 2) sub-parallel to the S_2 cleavage and 3) shallow-dipping veins perpendicular to the S_2 cleavage (extension veins). This indicates that the veins occured either pre- or syn-D_2 (Pressaco, 1999). Other ore-controlling structural features are the EW-trending shear zones at the contact between the graphitic argillites and the Mg-rich tholeiites, the basalt flow tops which served as loci for dilational fracturing and part of the mineralization, and the fact that the basaltic unit acted as the most competent and brittle unit in the mine area. Late (D_4?) WNW- and NE-trending subvertical brittle dextral-reverse faults cut through the orebodies. Hydrothermal alteration consists of a proximal carbonatization (termed “gray zone”) characterized by an inner assemblage of ankerite-calcite-Fe chlorite-muscovite-carbon-quartz-pyrite±paragonite± rutile. This grades into an outer gray zone of ankerite-chlorite-paragonite-calcite-quartz-carbon± albite. Farther away, the host basalts are affected by propylitic alteration (chlorite-clinozoisite-actinolite-quartz-dolomite-calcite±sphene± rutile). Sericitic alteration (sericite-pyrite assemblage) is also associated with mineralized veins in the 1060 Zone. Ultramafic rocks are affected by ankerite-carbonate-fuchsite-pyrite carbonate alteration. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Cu-Ni-W-Ba-Te-Bi-Hg.

4123 Dublin Gulch is a Late Cretaceous porphyry gold deposit with total gold resources of 47 metric tons. It is located in the Selwyn Basin (or fold belt) in the northern Canadian Cordillera, Yukon Territory, Canada. Regional structure is dominated by the NE-trending, high-angle dextral strike-slip Tintina fault system which bounds the Selwyn Basin to the south, and by the Robert Service Thrust, related to Early Cretaceous nappe thrusting. Two important phases of folding affected the area: the Lynx Creek antiform is an EW-oriented, W-plunging, broad and open D_2 fold which might have controlled intrusion emplacement. Quartz veins, quartz stockworks and related disseminated sulphides are hosted by the Late Cretaceous Dublin Gulch granodiorite stock (part of the Tombstone intrusive suite), and by adjacent Late Proterozoic to Early Cambrian hornfelsed sedimentary rocks (quartzite and phyllite). Gangue mineralogy consists of K-feldspar, quartz, and lesser albite. Arsenopyrite and pyrite are the dominant ore minerals, with subordinate pyrrhotite, chalcopyrite, bismuthinite, tetradymite, tellurobismuthite, native Bi, and rare molybdenite and scheelite. Silver-bearing base metal veins occur in quartzite and phyllite peripheral to the deposit; e.g. the Rex and Peso No. 1 veins, composed of quart, siderite, pyrite, jamesonite, arsenopyrite and scorodite. Mineralization is structurally controlled by a NE-trending system of en echelon to sub-parallel faults and fissures which crosscut the granodiorite and sedimentary rocks. The northern contact of the Dulbin Gulch stock is particulalry favorable to NE-trending, steeply-dipping veins. Late NS-oriented normal faults displaced the Dublin Gulch stock and the mineralized fractures. Hydrothermal alteration consists of a potassic K-feldspar±sericite assemblage associated with the early mineralization stage, and of sericitic alteration (sericite-sulphide assemblage) along selvages of the later veins. Local skarns (with associated tungsten mineralization) occur near the Dublin Gulch granodiorite stock. The metallic signature of the bulk of the ore is Au-Ag-Bi-As-W-Mo. Thompson and Newberry (2000) have associated the Dublin Gulch deposit to the "reduced intrusion-related gold deposit" class, along with Fort Knox and other deposits in the Fairbanks district, Alaska.

4173 Horne is a Late Archean, Au-Cu-Ag volcanogenic massive sulphide (VMS) deposit with a total gold content of 331 metric tons. It is located in the Rouyn-Noranda district of the Abitibi greenstone belt, Superior Province, Quebec, Canada. The nearby Cadillac-Larder Lake faut zone is the major regional tectonic structure in the area. Massive to semi-massive sulphide lenses, disseminated sulphides and sulphide-rich veinlets are hosted by rhyolite flows (of tholeiitic affinity) and felsic pyroclastic rocks of the Late Archean Blake River Group. The deposit occurs in a fault-bounded block between the Horne Creek and the Andesites faults, two dextral strike-slip faults. Otherwise, with the exception of the rocks near the faults and a few local shear zones, rocks around the deposit are only weakly strained and display a weak EW-oriented, subvertical S_2 foliation. Ore mineralogy is dominated by pyrite, pyrrhotite and chalcopyrite, with lesser magnetite, sphalerite and tellurides. Hydrothermal alteration of the rhyolitic rocks is characterized by proximal and intense sericitic alteration (quartz-sericite±pyrite), which grades outward to distal and weak sericitization and silicification. Chloritization is restricted to the immediate footwall and sidewalls of the orebodies. Chloritization (Fe-chlorite) has also affected the sulphide-rich veins selvages, but the deposit lacks a well defined stringer zone and alteration pipe. The metal signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-Te-Se-As. The origin of the gold mineralization is interpreted to be synvolcanic (Poulsen *et al.*, 2000).

4211 Hope Bay is a Late Archean (post-2672 Ma), quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 10 metric tons, and resource of 149 metric tons. It is located in the Hope Bay greenstone belt within the Bathurst Block, Slave Province, Nunavut, Canada. The greenstone belt defines a N- to NNW-trending anticlinorium, at the center of which is the Hope Bay Break, a N- to NNW-trending, steeply-dipping, sinistral strike-slip peak metamorphism shear zone of regional extent. Quartz-carbonate veins and related disseminated sulphides are hosted by Archean, middle greenschist (up to lower amphibolite near a tonalite intrusive), tectonized pillow basalts, and by a tonalite intrusion. Quartz and carbonate are the dominant gangue mineral, with minor chlorite and tourmaline. Ore mineralogy is dominated by arsenopyrite and pyrite, with minor chalcopyrite. Mineralization is structurally controlled by the regional Hope Bay Break, and localized by bends within the break. Quartz veins occur inside N- to NNW-trending, steeply-dipping, pre-intrusion sinistral strike-slip shears splaying from the Hope Bay Break, and in later NE-trending, steeply-dipping, post-intrusion dextral strike-slip brittle faults. Sub-horizontal tension gashes associated with the first shear generation also contain mineralized veins. Lithological contacts such as the metabasalt-tonalite and metabasalt-graphitic shale contacts have also localized deformation and mineralization. Hydrothermal alteration consists of intense carbonate alteration with ankerite and Fe-dolomite along shears and faults. Pyritization affected quartz veins selvages, and local silicification also occurs. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-B.

4215 Kemess is an Early Jurassic, intrusion-related porphyry Au-Cu-Ag deposit with a total gold content of 104 metric tons. It is located in the Kemess-Toodoggone district of the Stikine Terrane, Intermontane Belt, Canadian Cordillera, north-central British Columbia, Canada. The dominant regional tectonic structure in the area is the N-trending, dextral strike-slip Finlay-Ingenika fault system. Quartz stockworks and associated disseminated sulphides are hosted by porphyritic quartz monzonite to quartz monzodiorite sills of the Early Jurassic Maple Leaf Intrusion at Kemess South, and by the surrounding felsic volcaniclastic ash-flows and crystal tuffs (associated with quartz monzodiorite dykes) of the Late Triassic to Early Jurassic Takla Group at Kemess North. Quartz is the dominant gangue mineral of the stockwork. Hypogene ore mineralogy is dominated by pyrite and chalcopyrite, with minor molybdenite, magnetite and hematite, and trace amounts of bornite, pyrrhotite and tetrahedrite. A zone of supergene ore (20% of the deposit) with high Cu grades in the upper portion of the deposit is composed of chalcocite, native Cu, bornite, hematite and goethite, with rare jarosite. The primary ore control is lithological, with mineralization confined to the SE-trending, shallowly-dipping tabular body of the Maple Leaf quartz monzonite sill. SE-trending, high-angle normal faults (such as the Kemess and Duncan faults) define large valleys and ridges in the area. The E-trending, steeply-dipping, sinistral-normal North Block Fault bounds the deposit to the north, whereas the N-trending, dextral strike-slip (unmineralized) 10-180 Fault cuts and displaces the orebody. SE-trending asymmetric folds have also affected the sedimentary and volcaniclastic rocks. Hydrothermal alteration consists of intense potassic alteration (K-feldspar-sericite-calcite-magnetite) in the groundmass and along stockwork selvages, grading downward to pervasive biotitization at the bottom of the intrusion and in the underlying volcanic rocks. Pervasive sericitic alteration (sericite-quartz-pyrite) is the dominant alteration type outside the potassic zones and upward in the intrusion, and have also affected the volcaniclastic rocks hosting the Kemess North deposit. In the upper part of the deposit, sericitic alteration is overprinted by a clay-carbonate-silica-hematite argillic alteration assemblage formed during supergene weathering. Distal, unmineralized propylitic alteration (epidote-chlorite-calcite) has affected the volcanic rocks of the Takla Group. Patchy grey silicification is also locally present. The metallic signature of the bulk of the ore is Au-Ag-Cu-Mo.

4223 Copper Rand is a Late Archean, intrusion-related Au-Cu-Ag sulphide-rich vein deposit with a total gold content of 42 metric tons. It is located in the Doré Lake mining camp of the Chibougamau District, Chibougamau-Matagami greenstone belt, Abitibi Belt, Superior Province, Québec, Canada. The Chibougamau anticline, a regional EW-oriented D_2 anticline, and the Lac

Sauvage Fault, an EW-oriented, steeply-dipping reverse shear zone, are the dominant tectonic structures in the area. Sulphide-rich veins and veinlets and disseminated sulphides are hosted by greenschist grade anorthosite of the Late Archean Doré Lake Complex. Two types of veins are present; 1) quartz-pyrite-chalcopyrite-pyrrhotite-sphalerite-galena veins, and 2) siderite-pyrite-chalcopyrite-magnetite-hematite veins. Mineralization distribution is structurally controlled by SE-trending, moderately- to steeply-dipping reverse shears such as the Doré Lake Fault and other subsidiaries of the Lac Sauvage shear system. Ore lenses are typically located at, or near, the contacts with Late Archean diorite to QFP dykes. The dykes mark a competency contrast that has resulted in large, ore-filled dilation zones at their contacts. Hydrothermal alteration consists of proximal chlorite alteration (chlorite-chloritoid-sericite) and carbonatization, especially intense in mafic dykes, grading outward to a distal sericitic alteration (sericite-chlorite-chloritoid). The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Zn-Pb. The complex structural and magmatic history of the area has led authors to suggest various models for the origin and timing of the emplacement of the Copper Rand deposit. Veins occur mostly as crosscutting porphyry dykes related to the Chibougamau Pluton and thus are syn- or post-dyke emplacement, but occurrences of dykes crosscutting the veins are also known. The latter are deformed by D_2, and thus predate shearing. Daigneault and Allard (1990) proposed an early, pre-metamorphic event for the setting of the vein mineralization in the Doré Lake Complex, a conclusion similarly reached for the Copper Rand deposit by Magnan and Blais (1995). The presence of chloritoid also indicates metamorphism of a previous aluminous alteration zone (Pilote and Guha, 1998). Porphyry-style mineralization has been found at Clark Lake (among others) in the Doré Lake Complex (Sinclair *et al.*, 1994) and is thought to predate shear deformation. This porphyry-style mineralization is also associated closely in time with the Chibougamau Pluton. Magnan and Blais (1995) suggested that ore deposition took place in synvolcanic extensional structures associated with the intrusion of the Chibougamau Pluton into the Doré Lake Complex. This was afterward remobilized or reworked during regional metamorphism and shear deformation (Pilote and Guha, 1998). The short time period between emplacement of the dykes associated with both the vein-style and porphyry-style mineralization strongly suggests that the two types of mineralizations are products of the same district-scale magmatic-hydrothermal event (Pilote and Guha, 1998).

4258 Donald J. LaRonde 3 (Penna Shaft) is a Late Archean, gold-rich volcanogenic massive sulphide Au-Ag-Cu-Zn-Pb deposit with a total gold content of 184 metric tons. It is located in the Bousquet district of the Abitibi greenstone belt, Superior Province, Quebec, Canada. The EW-oriented D_2 Cadillac-Larder Lake fault zone is the dominant regional tectonic structure in the area. Stacked semi-massive to massive sulphide lenses and sulphide stringers (stockworks) are hosted by upper greenschist grade to lower amphibolite basaltic andesites and rhyodacites of the Bousquet Formation, part of the Late Archean Blake River Group. Ore mineralogy is dominated by pyrite, with abundant sphalerite, chalcopyrite, pyrrhotite and galena. An EW-oriented D_2 high-strain zone is superposed on, and spatially coincident with, rocks affected by quartz-sericite-aluminous alteration. Penetrative S_2 foliation related to the high-strain zone deformed and has transposed the orebodies. Two generations of folds associated with the high-strain zone also affected the mineralization. Hydrothermal alteration at the 20N lens consists of zones of quatz-garnet (Mn-rich)-biotite-chlorite alteration in the footwall and of biotite-rutile/titanite-pyrrhotite-pyrite alteration in the hanging wall. To depth, these alteration zones grade into aluminous quartz-kyanite-pyrite±Au-bearing chalcopyrite, which is thought to be the metamorphosed equivalent of an advanced argillic alteration assemblage typically associated with gold-rich VMS

(Dubé *et al.*, 2001). This aluminous alteration is surrounded by an assemblage of quartz-staurolite (Zn-rich)-sericite-garnet-biotite-pyrite. Hydrothermal alteration at the 20S lens consists of a zone of green micas-sericite-titanite-pyrrhotite-pyrite in both the footwall and hanging wall. The metallic signature of the bulk of the ore is Au-Ag-Zn-Cu-Pb-As-Sb-Sn-B-Bi. Gold and base metals are syn-volcanic, and have been remobilized and concentrated during deformation (Dubé *et al.*, 2001). The deposit is thought to be, at least in part, genetically related to the rhyodacitic to rhyolitic calc-alkaline domes and to the presence of gabbroic to dioritic high-level sills and dikes in its hanging wall, which may have acted as a less permeable cap (Dubé *et al.*, 2003). The mineralogical variations in alteration and ore styles with depth suggest a transition from a "low-sulphidation" VMS in the upper levels to a "high-sulphidation" VMS at depth (Dubé *et al.*, 2003). Relative proximity of the precipitation site from the hydrothermal fluid and head sources were implicated, at least in part, in these variations.

4259 Holloway is a Late Archean, non-carbonate-hosted stockwork-disseminated deposit with a total gold content of 37 metric tons. It is located in the Harker-Holloway district of the Abitibi greenstone belt, Superior Province, Ontario, Canada. The EW-oriented Porcupine-Destor fault zone and a similarly oriented synclinorium are the major regional tectonic structures in the area. Quartz vein stockworks are hosted by mafic and ultramafic flows of the Late Archean Kidd-Munro assemblage, Stoughton-Roquemaure Group. Sulphide veinlets and stringers and disseminated sulphides ("Lightning Zone-type mineralization"), and later, minor (though higher grade) gold bearing quartz veins, are hosted mainly by a variolitic, brecciated to hyaloclastic high-Fe tholeiitic basalt-dacite-rhyolite sequence. Pyrite is the dominant ore mineral, with minor arsenopyrite and chalcopyrite, and trace amounts of sphalerite, scheelite and pyrrhotite. Gangue mineralogy of the veins is dominated by quartz, with lesser albite and ankerite, and minor chlorite and sericite. Mineralization is structurally controlled by E- to ENE-trending, steeply-dipping anastomosing brittle or ductile-brittle D_1 reverse shear zones that are splays of the Destor-Porcupine fault zone. Those are contempareous with deposit-scale tight and isoclinal EW-oriented F_1 folds (steeply-plunging to the E) with penetrative S_1 foliation subparallel to lithological contacts but steeper than bedding. W-striking, shallowly W-plunging asymetric F_2 folds with non-penetrative S_2 cleavage have affected the orebodies. Mineralization occurs mainly along zones of competency contrasts such as those zones structurally prepared and hardened by albitization-silicification and at the basalt-basaltic komatiite contact. It is also lithologically controlled by the variolitic, Fe-rich tholeiithic units which channeled fluid flow. Gold-bearing extension quartz veinlets (D_2?) crosscut the orebodies. The deposit is crosscut by ENE-trending, steeply-dipping dextral strike-slip D_3 faults and by N-striking, subvertical D_4 faults. Hydrothermal alteration consists mainly of pervasive and widespread (Fe)dolomite-ankerite replacement. Early and intense albitization and silicification, characterized by a quartz-albite-pyrite-sericite assemblage, have affected the variolitic basalts and the basalt-ultramafics contact and associated with the bulk of the ore. Patchy zones of early hematite alteration also occur throughout the deposit. This alteration grades outward to a low-grade sericitic alteration zone of sericite-(fuchsite in komatiites)-ankerite-pyrite, and to distal, barren propylitic chlorite-calcite-epdote alteration. A 2672±2 Ma (lamprophyric?) intermineral dyke cutting the Lightning Zone-type mineralization has been affected by intense chlorite alteration. The metallic signature of the bulk of the ore is Au-Ag-Cu-As-W-Rb-Ba-Cs-Sb. Robert (2001) suggested Holloway is an intrusion-related, syenite-associated deposit model similar to the nearby Holt-McDermott deposit, but in a more distal setting due to the lack of intrusions in the deposit area.

4173 Quémont is a Late Archean, Au-Cu-Ag-Zn volcanogenic massive sulphide (VMS) deposit with a total gold content of 66 metric tons. It is located in the Rouyn-Noranda district of the Abitibi greenstone belt, Superior province, Quebec, Canada. The regional ENE-trending, steeply-dipping reverse-oblique Cadillac-Larder Lake fault zone is the dominant tectonic structure in the area. Massive to semi-massive sulphides lenses and disseminated sulphides are hosted by brecciated rhyolite, and porphyritic rhyolite and rhyodacite flows (of tholeiitic affinity) of the Late Archean Blake River Group. Ore mineralogy is dominated by pyrrhotite and pyrite, with lesser sphalerite and chalcopyrite, and trace amounts of molybdenite and selenite. The deposit occurs in a fault bounded block between the NE- to ENE-trending, steeply-dipping to subvertical reverse-sinistral Horne Creek fault, and the W-trending, steeply-dipping to subvertical revere-sinistral Andesite fault. Otherwise, with the exception of the rocks near the faults and a few local shear zones, rocks around the deposit are only weakly strained and display a weak EW-oriented, subvertical S_2 foliation. Sulphide lenses occur along the lithological contact between the Amulet rhyolite and the rhyolite-andesite flows of the Horne sequence. Hydrothermal alteration consists of intense chloritization (with a chlorite-carbonate assemblage) of the hanging-wall rhyolite, particularly of the brecciated rhyolite matrix. Sericitization is widespread throughout the mine felsic volcanics and also within the intrusive rocks. It is associated tyo silicification (especially within breccias and vesicular flows) and is characterized by an assemblage of sericite-quartz-albite-epidote-chlorite. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-Te-Se-As.

CHILE

581 Andacollo is a Late Cretaceous, intrusion-related, non-carbonate-hosted stockwork-disseminated gold deposit with a total gold content of 17 metric tons. It is located in the Andacollo district, Andacollo Basin, Andean Cordillera, Chile. A NE- to ENE-striking, steeply-dipping normal fault set forms the dominant regional structural trend in the area. Sulphide-rich veins and disseminated sulphides are hosted by zeolite to greenschist facies andesite and dacite flows and flow breccias of the Early to Late Cretaceous Quebrada Marquesa Formation. Gangue minerals of the veins are principally quartz and calcite, with minor barite, chlorite and hematite. Ore mineralogy is simple and dominated by pyrite, with lesser chalcopyrite, sphalerite and galena. The orebodies are strongly controlled by NW- to EW-trending, steeply-dipping to subvertical faults and brittle shears which were the primary conduits for hydrothermal fluids and gold deposition. Lithological control is important, as mineralization is typically stratabound, i.e., restricted to the porous and permeable andesite and dacite flow breccia units of the Cerro Toro and Andacollo Members. Veins were also emplaced along dyke-volcanic rock contacts. Finally, late, post-mineral, NS-trending normal faults such as the Runco and Andacollo faults dislocated the orebodies. Hydrothermal alteration associated with mineralization included potassic alteration (adularia-hematite quartz) which was accompanied by chloritization of the andesites and dacites up to 8 m beyond the orebodies. These have been overprinted by an argillic alteration assemblage of kaolinite-sericite and extensive, fine-grained carbonatization. The so-called regional propylitic alteration (chlorite-epidote-calcite-zeolite) corresponds in fact to the regional zeolite to greenschist facies metamorphic assemblage. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Cu-Zn-Pb. The Andacollo deposit has been classified as a manto deposit by Reyes (1991); however, Oyarzun *et al.* (1996) considered that its relationship to the nearby Andacollo porphyry Cu deposit is unclear and that the copper mineralization might actually be younger than the “mantos”. The latter attributes the mantos to a deeper intrusion, with upward fluid transport to the sites of deposition. The deposit is classified in this database as non-carbonate-hosted stockwork-disseminated but it may represent a transitional type between the nearby Andacollo porphyry copper deposit and an epithermal low-sulphidation deposit.

1448 El Guanaco is a Middle Eocene, high-sulphidation epithermal Au-Ag-Cu deposit with a total gold content of 44 metric tons. It is located in the Antofagasta region of the Domeyko Cordillera, Andean Cordillera, northern Chile. The deposit is situated on the western border of the Cachinal caldera, the main regional tectonic structure in the area. Quartz vein, disseminated sulphide and minor (but high-grade) hydrothermal breccia mineralization is hosted by Early Tertiary andesites, dacite and felsic tuffs. Quartz and barite are the main gangue minerals. Ore mineralogy consists mainly of pyrite, enargite, luzonite and arsenopyrite, with minor chalcopyrite. The intersection of two NE-trending strike-slip (both dextral and sinistral) fault sets, oriented N040^o and N070^o, is the principal structural control on the distribution of the mineralization. Lithological control is exerted by the tuffaceous units which are more permeable. The mineralized volcanic rocks are pervasively silicified (fracture-controlled) near the mineralization. This silicification is surrounded by a halo of sericitic alteration, and an irregular halo of advanced argillic alteration (quartz-alunite-kaolinite-dickite). The latter grades outward to propylitic alteration. The hydrothermal breccias have been affected by silicic alteration which characterized by vuggy silica. The metallic signature of the bulk of the ore is Au-Ag-Cu-As-Zn-Pb.

1758 Marte is a Middle Miocene, intrusion-related porphyry gold deposit with a total gold content of 1 metric ton and a resource of 58 metric tons. It is located in the Eastern metallogenic sub-belt of the Maricunga precious metal belt, Andean Cordillera, northern Chile. N- to NNE-trending high-angle reverse faults are the dominant regional tectonic structures in the area. Quartz stockwork mineralization is hosted by Middle Miocene porphyritic diorite to microdiorite intruded in andesite lavas. Hydrothermal and intrusive breccias are present but generally sub-economic. Quartz is the dominant gangue mineral. Ore mineralogy is dominated by pyrite, with minor chalcopyrite, bornite and molybdenite, and traces of galena, enargite and tennantite. A NW-striking, steeply-dipping extensional faulted zone seems to have controlled the mineralized stockwork emplacement and distribution. The Marte deposit itself is located at the intersection of the NW-trending faults and the NNE-trending regional faults. A later, NNE-striking, moderately-dipping normal graben fault helped preserve the deposit from erosion. Remnants of potassic alteration (biotite-albite-magnetite) are evident at depth in the diorite. The potassic alteration overprinted by an intermediate argillic alteration assemblage of sericite-chlorite-kaolinite-smectite-gypsum-hematite- magnetite-pyrite which is zoned, sericite becoming more important relative to chlorite toward the edge of the deposit. Volcanic rocks hosting the intrusion display propylitic alteration (chlorite-epidote-calcite). Porphyritic andesites which form a cap above the intrusion have been affected by pervasive advanced argillic alteration (quartz-alunite-kaolinite-diaspore-rutile-pyrite). The hydrothermal and intrusive breccias, and also the diorite at depth, are chloritically altered to an assemblage of chlorite-quartz-pyrite-hematite-magnetite-sulphides. Supergene oxidation produced jarosite-kaolinite-covellite-chalcanthite-various sulfates. The metallic signature of the stockwork ore is Au-Ag-Cu-Zn-Mo-Pb-As-Bi-Hg-Tl. The As-Hg components of the metallic signature have been derived from the sulphides of the advanced argillic cap, which is interpreted as shallow acid-leach alteration generated above the paleowater table in proximity to the paleosurface (Vila *et al.*, 1991).

Appendix 2

1759 Lobo is a Middle Miocene, intrusion-related porphyry gold deposit with a total gold resource of 125 metric tons. It is located in the Eastern metallogenic sub-belt of the Maricunga precious metal belt, Andean Cordillera, northern Chile. N- to NNE-trending high-angle reverse faults are the dominant regional tectonic structures in the area. Mineralization consists of quartz stockworks and veinlets hosted by Middle Miocene porphyritic diorite to microdiorite intruded into andesitic lavas. Late, mineralized hydrothermal breccias are also present. The gangue mineralogy of the stockworks and veins is mostly quartz, with magnetite and specularite. Pyrite and chalcopyrite are the dominant ore minerals, with minor bornite and molybdenite, and traces of sphalerite. Structural control on the mineralization is exerted by NW- and NE-striking steep fractures which host the Au-bearing veinlets. Mineralized breccias are distributed along a NW-trending linear pattern which also displays the effects of faulting. Hydrothermal alteration associated with the gold mineralization consists of concentrically zoned halos. An inner halo of potassic alteration (biotite-K-feldspar) is at the core, and is weakly overprinted by an intermediate argillic alteration (quartz-chlorite-sericite-clay). The intermediate argillic alteration is surrounded by an outer halo of propylitic alteration (chlorite-epidote-calcite-pyrite) which extends into the andesitic lavas that host the mineralized breccias. The late hydrothermal breccias themselves are altered, the principal alteration types being silicification, advanced argillic alteration (alunite-kaolinite), and sulphidation (represented principally by pyrite and small amounts of native sulfur and covellite). The breccias were considered by Vila and Sillitoe (1991) to be telescoped roots of the overlying epithermal system. The metallic signature of the bulk of the ore is Au-Cu-Mo-Zn.

1761 Refugio is an Early Miocene, intrusion-related porphyry Au-Ag deposit with a total gold content of 109 metric tons. It is located in the Maricunga district of the Franja de Maricunga belt, Andean Chain, Chile. Two large N-S reverse faults which forms the boundaries of the major lithologic units are the dominant regional structures in the area. Quartz stockworks, sheeted quartz veins and disseminated sulphides are hosted by Late Oligocene to Early Miocene subvolcanic porphyritic tonalite, microdiorite and intrusive breccia. The gangue mineralogy is dominated by quartz, with lesser calcite, magnetite and hematite (specularite). Pyrite is the dominant ore mineral, with minor chalcopyrite, bornite, sphalerite, galena, arsenopyrite and acanthite. The distribution of the ore is structurally controlled by an EW-trending subvertical fault set and, to a lesser degree, by a NS-trending subvertical secondary fault set. Hydrothermal alteration is concentrically zoned in the intrusive host rocks, and consists of a pervasively silicified core of quartz and amorphous silica and a surrounding potassic alteration zone of K-feldspar-biotite-magnetite. This grades into unmineralized propylitic alteration (mainly chlorite) which forms the outermost alteration halo. Barren intermediate argillic alteration (kaolinite-montmorillonite-sericite-smectite-pyrophyllite) overprints the potassic-propylitic assemblage. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-As-Zn-Pb.

1763 El Indio is an Early to Middle Miocene, high-sulphidation epithermal Au-Cu-Ag deposit with a total gold content of 152 metric tons. It is located in the El Indio district of the El Indio belt, Andean Chain, Chile. The Banos del Toro Fault is a major N-S trending, high-angle reverse (15 Ma) fault at the boundary between the granitoid basement and Tertiary graben, and is the dominant regional structure in the area. According to Jannas (1990), the deposit also seems to be located on the border of a cauldron. The El Indio deposit is comprised of two styles of mineralization, an early, high-sulphidation system of Cu-rich veins related to emplacement of subvolcanic intrusions during the waning episodes of an evolved volcanic system, and later, sulphide-poor, high-grade Au-bearing quartz veins that crosscut the Cu-rich veins. Both styles of mineralization are hosted by altered and in places brecciated intermediate to felsic ignimbrites and rhyodacite lapilli tuffs of the Late Oligocene to Early Miocene Dona Ana Formation. Quartz and chalcedony are the main gangue minerals in both type of veins, with some alunite. The Cu-bearing veins are made up of 35 to 90% sulphides and sulphosalts, with enargite and pyrite as the dominant ore minerals, subordinate chalcopyrite, tennantite and marcasite and minor sphalerite, galena, bornite, huebnerite, emplectite and chalcocite-digenite. The ore mineralogy of the Au-bearing veins consists of tennantite (after enargite), chalcopyrite, pyrite with lesser galena, sphalerite, calaverite, hessite, petzite, altaite, tetradymite, weissite, goldfieldite, native tellurium and various sulphosalts. Two NE-striking, steeply-dipping faults, the Inca Norte (believed to be a splay of the regional Banos del Toro Fault) and Inca Sur faults, bound the main mineralized block. It appears that the first deformation phase was initally reverse-dextral during emplacement of Cu-bearing veins, and then oblique-normal for the formation of the younger crosscutting Au-rich veins. Post-ore normal-dextral faults cut and displace the orebodies. All Au-bearing veins are sub-parallel to the NE-striking faults, whereas Cu-bearing veins are localized mainly in dilational jogs related to the apparent dextral motion. Early argillic alteration (sericite-kaolinite) is related to intrusion emplacement. Advanced argillic alteration (sericite-kaolinite-pyrophyllite-quartz) occurs in the pyroclastic wallrocks around the Au-bearing veins, along with silicification which is ubiquitous in the entire mineralized block. The advanced argillic alteration grades into a propylitic alteration assemblage of chlorite-montmorillonite-kaolinite-epidote-calcite which has affected volcanic and pyroclastic rocks distant from the mineralized structures. The pyroclastic wallrocks of the Cu-bearing veins have been altered to an intermediate argillic alteration assemblage of kaolinite-alunite-sericite-quartz which grades outward to distal argillic alteration consisting of sericite-kaolinite. The metallic signature of the bulk of the ore is Au-Ag-Cu-As-Sb-Bi-Zn-Pb-Te.

1773 Pascua-Lama is a Late Miocene, high-sulphidation epithermal Au-Ag deposit with a total gold content of 526 metric tons. It is located at the northern end of the El Indio precious metal belt, Andean Cordillera, and straddles the border between Chile and Argentina. The Pascua Fault is a NNW-SSE-trending fault of regional extent, and the dominant tectonic structure in the area. Quartz vein, stockwork and hydrothermal breccia mineralization is hosted by Miocene rhyolite, felsic tuff and dacite, and by Paleozoic basement granite. The ore is strongly structurally controlled by NNW-trending faults parallel to the regional Pascua Fault, and their intersections with N-S oriented faults such as the Central Fault. Hydrothermal alteration consists of an inner core of silicification and quartz-alunite alteration, with superimposed supergene steam-heated opal-kaolinite-alunite-sulphur alteration. This is surrounded by an argillic alteration halo of kaolinite-sericite which grades outward into the regional propylitic alteration.

1774 Cerro Casale (Aldebaran property) is a Middle Miocene Au-Cu-Ag-bearing intrusion-related porphyry gold and high-sulphidation epithermal deposit with a total gold resource of 882 metric tons. It is located in the Maricunga precious metal belt, Andean Cordillera, Chile. The major regional tectonic structures in the area are NNE-trending high-angle reverse faults which were active during an Early to Middle Miocene compressional event. Porphyry-style quartz stockworks, disseminated sulphides and mineralized hydrothermal breccias are hosted by Middle Miocene, multiphase porphyritic diorite intrusions. The porphyry-style mineralization grades westward and upward into a zone of epithermal-style high-sulphidation quartz veins hosted by

Early to Middle Miocene andesites and andesitic tuffs and breccias. Gangue mineralogy of the stockwork and breccia is dominated by quartz, with lesser biotite, albite, specular hematite (abundant as breccia cement) and magnetite. Pyrite is the dominant ore mineral, with minor chalcopyrite, bornite, molybdenite and sphalerite. Copper oxides such as malachite, covellite and chalcocite are abundant in the supergene oxide zone. The epithermal vein mineralogy is mostly quartz (as chalcedony) with pyrite, enargite, luzonite and tetrahedrite-tennantite. No structural control is readily apparent for the distribution of porphyry-style mineralization. The epithermal quartz veins are, however, localized in WNW-striking, steep structures. Intense potassic alteration consisting of quartz-biotite-albite-gypsum-magnetite is centred on the diorite intrusion. This grades outward and is partly overprinted by weak intermediate argillic alteration (chlorite-clay-sericite), which in turns grades outward to propylitic alteration (chlorite-calcite-epidote-pyrite). Advanced argillic alteration consisting of (vuggy)silica-alunite-kaolinite-pyrite occurs in association with the epithermal quartz veins and as a cap overlying the deposit. Supergene oxidation is intense and pervasive and extends to depths of 250 feet below surface. The metallic signature of the porphyry-style mineralization is Au-Cu-Mo-Ag-Pb-Sb. The epithermal, high-sulphidation vein mineralization has a metallic signature of Ag-Pb-Zn-Cu-Sb-Au-Hg-As.

4119 La Coipa is an Early Miocene, epithermal high-sulphidation Au-Ag deposit with a total gold content of 109 metric tons. It is located in the Maricunga district of the Maricunga precious metal belt, Domeyko Cordillera, Andean Chain, Chile. Tertiary volcanic rocks in the district are located mainly at the intersections of regional N- to NNE-trending reverse faults and smaller, NW-SE trending normal faults. Quartz veins, stockworks and disseminated sulphides are hosted by carbonaceous black shales and arkosic sandstones of the Triassic La Ternera Formation, and by Late Oligocene to Early Miocene andesitic to dacitic tuffs, breccias and flows. Tonalite porphyries intruded near the deposit bear a close spatial and age relationship to the mineralization and are thought to be genetically related. Gangue mineralogy of the veins and stockworks consist of mainly quartz and alunite, with some scorodite. Ore mineralogy is dominated by cerargyrite, native Ag, embolite, iodargyrite, argentojarosite and electrum and various silver sulphosalts. Sulphides such as bornite, chalcopyrite, chalcocite, covellite, enargite, tetrahedrite, tennantite, galena, sphalerite, pyrite, arsenopyrite and melnikovite are found in deeper unoxidized zones as veinlets in weakly altered Triassic shale. There are strong structural and lithological controls on the mineralization. At Ladera-Farellon, structural control is provided by a set of N-S to NNE-trending, subvertical (probably normal) faults in the porous pyroclastic units which have resulted in mushroom-shaped orebodies characterized by high silver grades. At Coipa Norte, a set of NE-trending subvertical (probably normal) faults cutting a weakly- to non-porous sedimentary unit (shales) have controlled the formation of steep, semi-tabular, high-grade gold orebodies. Vuggy silica resulting from acid-leach is present in the upper parts of the Ladera zones, whereas silicification is more common at Coipa Norte. Advanced argillic alteration (alunite-kaolinite-dickite-quartz) is found in stockworks and around the mineralized bodies; this alteration is closely associated with high gold grades, particularly at Can Can where grades in the alunite veins and breccias are as high as 76 grams of gold per ton. This advanced argillic alteration grades outward to peripheral intermediate argillic alteration (illite-smectite±sericite). Supergene jarosite-goethite±gypsum±barite is found in vugs near surface and in deeper, highly fractured areas. The metallic signature of the bulk of the ore is Au-Ag-As-Pb-Hg-Cu. There are also some indications of porphyry-related mineralization at depth (Dubé, 1995).

4121 Tambo is a Middle Miocene, high-sulphidation epithermal Au-Ag deposit with a total gold content of 49 metric tons. It is located in the El Indio mining district (near the El Indio mine) of the El Indio precious metal belt, Andean Cordillera, Chile. The major regional tectonic structure in the area is the Banos del Toro Fault, a N-S trending, high-angle reverse fault active about 15 Ma ago at the boundary between the granitoid basement and Tertiary graben. Hydrothermal alunite-rich breccia and quartz vein-style mineralization is hosted by rhyodacitic tuff of the Late Oligocene to Early Miocene Dona Ana Formation. At depth, the breccias become narrow in places and merge into veins. The gangue mineralogy of the veins is mainly quartz, barite and alunite, with minor rodalquilarite. Ore mineralogy is dominated by calaverite, iodargyrite, pyrite and native tellurium, with trace krennerite, galena, sphalerite and sulphosalts. The barite-alunite assemblage of the veins abruptly changes in places at depth to vuggy silica-enargite. Hydrothermal breccias are mineralized where they are cut by NE-striking brittle shears, otherwise they are devoid of ore. The veins are structurally controlled by NE-trending subvertical faults such as the Indigena Norte and Indigena Sur faults. An early hydrothermal alteration phase of argillic alteration (sericite-kaolinite) is associated with intrusive emplacement. Intense and pervasive silicification is present in the breccia and in the wallrocks surrounding the veins. The Cerro Elefante mountain corresponds to a diatreme with vuggy silica in the upper part and mineralized and silicified breccia in the lower part. Advanced argillic alteration (kaolinite-sericite-dickite-pyrophyllite-montmorillonite) affected the tuff unit in a wider halo. Zones of hypogene alunite-jarosite-barite are widespread. The metallic signature of the bulk of the ore is Au-Ag-Ba-As-Sb-Te-Cu- Pb-Zn.

4146 El Peñon is a Late Paleocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 94 metric tons. It is located in the Atacama desert of the Domeyko Cordillera, Andean Cordillera, Northern Chile. Banded and crustiform quartz vein and stockwork mineralization is hosted by Late Cretaceous to Late Paleocene rhyolite domes and brecciated rhyolites of the Augusta Victoria Formation. Gangue mineralogy is mostly quartz, with lesser adularia and amethyst. Ore mineralogy of the oxidized zone (down to 250-280 m depth) is dominated by silver halides such as cerargyrite, with native silver and electrum. The ore mineralogy of the unoxidized zone is made up of pyrite, chalcopyrite, sphalerite, galena, covellite and chalcocite. There is a strong structural control of the orebodies. SSE-trending, steeply-dipping, normal dip-slip faults and SSW-trending, moderately- to steeply-dipping, normal dip-slip faults (Quebrada Orito and Quebrada Colorada faults) form a horst-graben system, with the former faults the most mineralized. Hydrothermal breccias, which prepared the brittle rhyolite host to vein emplacement, also helped control ore deposition. Low-angle, post-mineral reverse faults offset the orebodies. Proximal alteration consists of quartz±adularia around the veins, which grades away to the distal sericitic assemblage of quartz-sericite-illite. Weak hematization is present in the volcanic domes. The metallic signature of the bulk of the ore is Au-Ag-Hg-As-Sb-Pb-Zn-Cu-Mo.

CHINA

2000 Jiapigou is an Early Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold resource of 30 metric tons. It is located in the Jiapigou gold belt (Changbaishan gold province) of the Jiapigou-Mudanshan terrane, North China Craton, Jilin province, People's Republic of China. The major regional structure in the area is the Huifahe fault zone, which is part of a ductile NW-trending tectonic belt. Quartz veins and associated disseminated sulphides are hosted by amphibolite grade tholeiites and hornblende-plagioclase gneisses of the Archean Anshan Group. The gangue mineralogy of the veins consists mainly of quartz with lesser chlorite, sericite and calcite. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, marcasite, galena, sphalerite, magnetite, pyrrhotite, scheelite, wolframite, bismuthinite, calaverite and sylvanite. Quartz veins are related to NE-trending and EW-trending subvertical ductile shear zones and their intersections. Hydrothermal alteration consist or propylitic alteration halos (represented by the assemblage chlorite-epidote-actinolite-sericite-quartz-calcite) surrounding the quartz veins. Silicification and pyritization are closely associated with gold mineralization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-W-Bi-Te.

2017 Wulong is an Early Cretaceous, batholith-associated quartz vein (Korean-type) gold deposit with a total gold content of 46 metric tons. It is located in the Wulong district of the Yingkou-Kuandian Uplift, North China Platform, Liaoning province, People's Republic of China. The Dandong shear zone is the main regional tectonic structure in the area. Quartz veins and associated disseminated sulphides are hosted by amphibolite grade biotite-plagioclase gneiss, mica schist, magnetite quartzite and marble of the Proterozoic Liaohe Group and Mid-Jurassic to Early Cretaceous diorite dykes of the Sangulia granitic complex. Quartz is the main gangue mineral, with rare K-feldspar, calcite, fluorite, sericite and chlorite. Ore mineralogy is dominated by pyrite and pyrrhotite, with accessory chalcopyrite, sphalerite, galena, bismuthinite and native Bi, and rare arsenopyrite and scheelite. The NNE-trending Wulong ductile shear zone displays mylonitization. NS- and NW-trending fractures host mineralized quartz veins and are probably splays of the Wulong shear zone. Hydrothermal aleration along the Wulong shear zone consists of silicification, sericitization, carbonatization and pyritization. Where the diorite dykes are hosting ore, they are affected by biotitic and chloritic alterations. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Bi-Cu-Pb-Zn-As-W.

2018 Sidaogou is an Early Cretaceous, probable non-carbonate, stockwork-disseminated type(?) gold deposit with a total gold content of 38 metric tons. It is located in the Wulong district of the Yingkou-Kuandian Uplift, North China Platform, Liaoning province, People's Republic of China. The Tan-Lu continental fault zone and the Yalujiang Break are the main regional tectonic structures in the area. Stratabound layers and lenses of disseminated sulphides and irregular sulphide-rich veins are hosted by amphibolite grade sandstone, graphitic siltstone and quartz-sericite schist of the Early Proterozoic Liaohe Group. Gangue minerals are mainly quartz with lesser sericite, calcite, chlorite and epidote. Ore mineralogy is dominated by pyrite with lesser pyrrhotite, chalcopyrite, sphalerite and rare arsenopyrite and scheelite. Orebodies are localized within the NE-trending Wulong fault zone and its subsidiaries. Drag folds are also important in controlling the distribution of the ore. Intense pyritization, silicification and sericitization affect the host rocks, with minor carbonate alteration. The metallic signature of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-Zn-As-W-Bi.

2019 Weizi is a Mesozoic batholith-associated vein (Korean-type) gold deposit with a total gold resource of 10 metric tons. It is located in the Xiuyan- Xindian gold belt of the Yingkou-Kuandian Uplift, North China Platform, Liaoning province, People's Republic of China. The Xiuyan fault belt is the major regional tectonic structure in the area. Quartz vein mineralization is hosted by granulite grade, Early Proterozoic muscovite and biotite schists and by granulites. Quartz is the dominant gangue mineral, with lesser calcite, biotite, muscovite, sericite and feldspar. Ore mineralogy is dominated by pyrite and pyrrhotite, with lesser galena and sphalerite minor chalcopyrite and rare scheelite and electrum. Orebodies occur in the axial region of the Fanchegou overturned syncline. Veins are localized within NE-striking interstratified and *en echelon* faults and fractures in the axial area of the Fanchegou syncline. Hydrothermal alteration of the schists and granulite rocks around the orebodies consists of silicification, pyritization, sodium metasomatism (albite-oligoclase) and chloritization. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb.

2021 Xiaoyinpan is a Late Jurassic, batholith-associated quartz vein (Korean-type) gold deposit with a total gold content of 30 metric tons. It is located in the Zhangjiakou district at the conjunction of the fold zone of the North China Platform and the Inner Mongolia geosyncline (eastern portion of the Tianshan-Yinshan structural belt), North China Platform, Hebei province, People's Republic of China. The Shangyi-Chongli-Beipiao fault, which is an EW-trending, deep-seated fault system of mylonites, breccias and tectonic lenses, a NW-striking, SW-dipping overturned anticline and other NEE-trending folds are the main regional tectonic structures in the area. Quartz vein mineralization is hosted by amphibolite to granulite grade plagioclase-hornblende gneiss and amphibolite of Archean age. Quartz is the dominant gangue mineral, with lesser plagioclase, ankerite and calcite. Ore mineralogy consists of dominant pyrite, galena and chalcopyrite, with lesser sphalerite, argentite, calaverite, sylvanite and electrum. The mineralization is controlled by three faults or sets of fault; the first is the important NS-trending thrust fault in the limb of the regional fold, the other two are two sets of NS- and NE-trending faults such as the Huangqi-Wulong fault. A late NW-trending set of high-angle normal and reverse faults crosscut and offset the quartz veins. Hydrothermal alteration consists of sericitization, carbonatization, silicification K-feldspathization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-Te. According to Wang (1988), the Xiaoyinpan deposit was formed in a near-surface environment.

2025 Jinchanggouliang is an Early Cretaceous, intrusion-related Au-Cu sulphide-rich vein-type deposit with a total gold content of 80 metric tons. It is located in the Chifeng-Chaoyang district of the Lunurhu Uplift (or Liaoxi Uplift), North China Platform, Inner Mongolia province, People's Republic of China. The Chifeng-Kaiyuan reverse fault zone is the main regional tectonic structure in the area. The deposit is located near the 126 Ma Xiduimiangou Stock. Sulphide-rich quartz veins and veinlets are mainly hosted by amphibolite to granulite grade Archean hornblende-plagioclase and biotite-plagioclase gneisses and migmatites of the Xiaotazigou Formation. Ore mineralogy consists of dominant pyrite and chalcopyrite, with lesser galena, sphalerite, tetrahedrite, electrum, native Ag, bornite, arsenopyrite and binarite, and rare realgar and orpiment. Three sets of faults have controlled the localization of the orebodies. These are NW- and SE-trending faults and N-S subvertical faults. The faults are gouge-filled, brittle faults with early dextral strike-slip movement, reactivated by normal dip-slip movement. Later NE-trending, dip-slip normal faults crosscut the orebodies. Hydrothermal alteration is predominantly chloritic, characterized by a chlorite-sericite-calcite-epidote- pyrite-chalcopyrite assemblage within the faults and adjacent to the veins. Diorite dykes intruded along the faults and associated with the mineralized veins are altered to sericite-carbonate-pyrite up to 10 cm away from the veins. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn. In chapter 4 of Poulsen *et al*. (1990) report on the Sino-Canadian gold project, the Jinchanggouliang deposit is classified as an epithermal low-sulphidation type.

2029 Jinchangyu is a Mesozoic, intrusion-related, batholith associated quartz vein gold deposit with a total gold content of 70 metric tons. It is located in the Jidung district of the Eastern Hebei Uplift (Yanshan fold belt), North China Platform, Eastern Hebei province, People's Republic of China. The regional, EW-trending Xifeng-Qinlong fault defines the northern margin of the uplift's basement core. Thick, ribboned quartz-feldspar veins, stockworks and associated disseminated sulphides are hosted by upper amphibolite grade, deformed amphibolites and gneisses of the Archean Badaohe Formation, Qianxi Group. Gangue mineralogy of the veins consists of quartz and albite with lesser ankerite, calcite and minor chlorite and sericite. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, bornite, chalcocite, malachite, molybdenite, magnetite, pyrrhotite, argentite, hessite and calaverite. The veins occur within schistose SSW-striking, anastomosing, ductile retrograde shear zones (of which the Jinchangyu fault) containing chlorite and sericite schists after amphibolite and gneiss. NNE- and WNW-trending reverse and strike-slip faults offset earlier faults and the orebodies. Proximal sericitic alteration consisting of quartz-sericite-pyrite grades outward to an extensive propylitic alteration characterized by a chlorite-carbonate-albite-epidote assemblage. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-Mo-Bi. The exact classification of the Jinchangyu deposit is still controversial. The deposit presents several characteristics of the quartz-carbonate shear-zone-related deposits (Poulsen and Mortensen, 1993), but is clearly Mesozoic in age and possibly related spatially and temporally to the Mesozoic Qinshankou granitic intrusions. However, according to Nie (1997), several processes could have been involved, with early quartz-carbonate shear-zone-related mineralization during the Archean times, reactivation of structures and mineralization during the Paleozoic and also during the Mesozoic, with alteration related to granitoid emplacement.

2036 Yu'Erya is an Early Cretaceous, intrusion-related porphyry gold and associated carbonate replacement manto-style deposit with a total gold content of 20 metric tons. It is located in the Yuerya district of the Jidong Uplift, North China Platform, eastern Hebei province, People's Republic of China. The SW-trending Tandaoha-Lingyuan fault zone is the main regional structure in the area. Porphyry-style disseminated sulphides, quartz veins and stockworks are hosted by granodiorite of the Early Cretaceous Yuerya granite, whereas manto-style replacement mineralization is hosted by the surrounding Proterozoic limestone and dolomite of the Gaoyuzhang Formation. Gangue mineralogy is mainly quartz, with lesser sericite, carbonate, albite, kaolinite and chlorite. Ore mineralogy is dominated by pyrite and sphalerite, with subordinate chalcopyrite, galena, bornite, chalcocite, malachite, molybdenite, tetrahedrite, tennantite, azurite, bismuthinite, scheelite, pyrrhotite, electrum and calaverite. Veins are controlled by the SW-striking brittle faults, but tend to die out rapidly once outside the granodiorite. The intrusive contact between the granodiorite and the carbonate sediments is also an ore controlling structure. Some veins follow diorite dykes (which may be fault-intruded). An inner alteration halo of potassic alteration (K-feldspar-biotite) within the granodiorite grades outward to propylitic alteration (chlorite-albite-epidote-calcite-quartz). Sericitization and silicification are present near the ore localized in the carbonated sediments. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Zn-Pb-Mo-Bi-W-Te.

Appendix 2

2048 Wenyu is a Late Cretaceous, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 33 metric tons. It is located in the Xiaoqingling gold district of the Qingling orogenic belt, North China Platform, Henan province, People's Republic of China. The main regional tectonic structures in the area are the EW-trending Xiaohe and Taiyao-Wendi faults, which define the southern and northern boundary of the Xiaoqinling area, and the EW-striking Laoyacha-Jinluoban anticline. Quartz vein mineralization is hosted by amphibolite to granulite grade, banded and brecciated amphibolite and gneiss of the Lujiayu Fromation, part of the Taihua Group of Late Archean age. Quartz is the dominant gangue mineral, with lesser sericite and dolomite. Ore mineralogy is dominated by pyrite and galena, with subordinate chalcopyrite, sphalerite, magnetite, pyrrhotite, wolframite, scheelite and calaverite. The deposit is located on the limb of the Laoyacha-Jinluoban anticline, and vein distribution is controlled by ESE-trending reverse fault. Hydrothermal alteration is more intense toward the mineralized zones, and consists of sericite-pyrite alteration in the upper parts of the deposit, grading downward to a quartz-K-feldspar alteration in the middle parts, to a biotite-chlorite-epidote alteration in the deeper parts. Carbonate alteration also occurs. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-Pb-Te-Zn-W.

2050 Sanshandao is an Early Cretaceous, batholith-associated quartz vein (Korean type) gold deposit with a total gold content of 100 metric tons. It is located in the Zhao-Ye gold belt of the Jiaodong Uplift, North China Platform, Shandong province, People's Republic of China. The main tectonic structure in the area is the regional, N-trending ductile Yishu fault zone. Disseminated sulphides and quartz veins are hosted by quartz monzonite of the Late Jurassic to Early Cretaceous Linglong Granite intruding the Archean amphibolite-facies greenstones of the Jiadong Group. Ore mineralogy consists of pyrite, pyrrhotite, sphalerite, chalcopyrite, galena, arsenopyrite and hematite in a gangue of quartz, sericite and carbonate. Electrum is the main gold mineral. Mineralization is structurally controlled by the Cangshang-Sanshandao fault, a NNE-trending, shallowly- to moderately-dipping brittle thrust fault cutting across the Linglong granite and marking the granite-amphibolite contact. Qiu *et al.* (2002) propose a syn-ore normal movement on the Cangshang-Sanshandao fault based on the pinch-and-swell structures of the gold lodes and alteration halos. Ore occur in phyllic alteration zones of quartz-sericite-pyrite near the fault. This alteration extends outward into a silicification zone. Carbonatization and potassic alteration zones (with K-feldspar) are also present along the Cangshang-Sanshandao fault in the Linglong granite and adjacent amphibolitic rocks. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb.

2051 Jiaojia is an Early Cretaceous, batholith-associated quartz vein (Korean type) gold deposit with a total gold content of 111 metric tons. It is located in the Zhao-Ye gold belt of the Jiaodong Uplift, North China Platform, Shandong province, People's Republic of China. The Yexian-Huangxian shear zone and the Tan-Lu fault are the main regional tectonic structures in the area. Disseminated sulphides and stockworks are hosted by altered and deformed quartz monzonite of the Late Jurassic to Early Cretaceous Linglong granite, and by the faulted contact of the Linglong granite with amphibolite rocks (from greenstones) of the Archean Jiaodong Group. Electrum is the main gold mineral. Sulphide mineralogy is dominated by pyrite, with minor chalcopyrite, galena, sphalerite and arsenopyrite disseminated in a quartz and sericite gangue, with minor plagioclase and calcite. Magnetite and hematite also occur. The SW-trending, moderately-dipping Jiaojia-Xincheng fault and its subsidiaries are important ore-controlling structures.

Orebodies mainly occur within the cataclased footwall of the Jiaojia fault (and its subsidiaries) rather than the fault itself. Movement along the brittle and gougy Jiaojia fault consists of an early reverse-oblique movement, followed by a normal movement which the main-stage mineralizing event is associated with. Later movement on the fault is minor and of undetermined sense and direction. Ore-bearing sericite-pyrite altered zones near the faults extend into an outer silicified halo. Carbonatization and potassic (K-feldspar) alteration zones are also present along the Jiaojia fault, in the Linglong granite and adjacent amphibolitic rocks. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb.

2059 Linglong-Dakaitou is an Early Cretaceous, batholith-associated quartz vein (Korean type) gold deposit with a total gold content of 124 metric tons. It is located in the Zhao-Ye gold belt of the Jiaodong Uplift, North China Platform, Shandong province, People's Republic of China. The N-trending, ductile Yishu fault zone is the regionally dominant structure in the area. Quartz veins and disseminated sulphides are hosted by sheared, Late Jurassic biotite quartz monzonite batholith of the Linglong granite intruding the Archean amphibolite-facies greenstones of the Jiadong Group, and by Early Cretaceous porphyritic granite dykes. Quartz is the dominant gangue mineral, with lesser sericite and carbonates. Ore mineralogy consists of pyrite, chalcopyrite, sphalerite, galena, pyrrhotite, hematite and magnetite. The NNE- to NE-trending, ductile-brittle Zhaoping and Potouqing faults are 1st order faults localized at the contact between the Linglong and Luanjiahe plutons. The structural history of the Potouqing fault is complex, Qiu *et al*. (2002) suggest an early phase of ductile, sinistral-reverse movement (D_2), followed by ductile, dextral-normal movement (early D_3). Mineralization is controlled by adjacent, parallel and steeply-dipping 2nd and 3rd order faults. These are transected by the more brittle, NE-trending, sinistral strike-slip Linglong fault. Quartz veins are located along dilatant zones in the footwall of the Linglong fault, created by a local extension regime during the strike-slip movement. Rocks of the Jiaodong Group were affected by carbonate and potassic alteration during early intrusion of the Linglong granite. Hydrothermal alteration associated with the orebodies consists of proximal silicification and sericitization, which grades away to a sericite-only zone. Pyritization is closely associated with silicification and disseminated sulphide mineralization. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb.

2060 Jiuqu is an Early Cretaceous, intrusion-related, batholith-associated quartz vein (Korean-type) gold deposit with a total gold content of 55 metric tons. It is located in the Linglong district of the Zhao-Ye gold belt, Jiaodong Uplift, North China Platform, Shandong province, People's Republic of China. The N-trending, ductile Yishu fault zone is the main regional tectonic structure in the area. Quartz veins and associated disseminated sulphides are hosted by the quartz monzonite phase of the Late Jurassic to Early Cretaceous Linglong granite, which intrudes rocks of the Archean amphibolite-grade Jiaodong Group. Gangue mineralogy is dominated by quartz, with lesser sericite, plagioclase and calcite. The main gold mineral is electrum. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, galena, sphalerite and hematite. The NNE- to NE-trending, ductile-brittle Zhaoping and Potouqing faults are 1st order faults localized at the contact between the Linglong and Luanjiahe plutons. The structural history of the Potouqing fault is complex, Qiu *et al*. (2002) suggest an early phase of ductile, sinistral-reverse movement (D_2), followed by ductile, dextral-normal movement (early D_3). Mineralization is controlled by adjacent, parallel and steeply-dipping 2nd and 3rd order faults. Quartz veins occur within dilatant structures created by local extension within the faults. Carbonatization and potassic alteration (with K-feldspar) affected the rocks of the Jiaodong Group during early intrusion of the Linglong granite. Proximal sericitization is associated with shear zone movement and mineralization. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb.

2065 Yingezhuang is an Early Cretaceous, batholith-associated quartz vein (Korean-type) gold deposit with a total gold content of 24 metric tons. It is located in the Linglong district of the Jiaodong Uplift, North China Platform, Shandong province, People's Republic of China. The NE-striking Yishu fault zone is the main regional tectonic structure in the area. Disseminated sulphides and quartz veins are hosted by quartz monzonite of the the Late Jurassic to Early Cretaceous Linglong granite. Gangue mineralogy is mainly quartz, with lesser sericite, feldspar and calcite. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, galena, sphalerite and hematite. Electrum is the main gold mineral. Mineralization is located in the footwall of the NE- to ENE-trending, shallowly- to moderately-dipping Zhaoyuan-Pingu (or Zhaoping) fault, which marks the contact between the Linglong granite and the rocks of the Jiaodong Group. Carbonatization and potassic alteration affected the rocks of the Jiaodong Group during early intrusion of the Linglong granite. Proximal sericite-pyrite alteration is associated with the mineralization. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb.

2075 Getang is a Middle Jurassic to Late Cretaceous, sediment-hosted micron gold (Carlin type) Au-Sb deposit with a total gold content of 23 metric tons. It is located in the Xinren gold district within the Qinglong-Anlong tectonic deformation region of the Yangtze Craton, South China Platform, Guizhou province, People's Republic of China. The Quinglong-Anlong structural deformation zone is the major regional tectonic structure in the area. The deposit is located on the eastern limb of the Getang anticline, a 50 km long, NW-trending anticline. Disseminated sulphides and minor quartz veinlets are hosted by brecciated (karst collapse breccia or sedimentary breccia) limestone, dolomite and shale of the Late Permian Maokou and Longtuan formations. Mineralization consists of abundant pyrite (locally strongly oxidized) and minor stibnite, marcasite, arsenopyrite, realgar, cinnabar, orpiment, pyrrhotite, sphalerite and molybdenite in a gangue of quartz, illite, calcite, dolomite, fluorite and barite. A bedding-parallel thrust fault may be superposed on the breccia, giving the latter a partly tectonic origin. High-angle, post-mineralization reverse and normal faults crosscut the orebodies. A strong lithological control is provided by the favorable limy host units. Hydrothermal alteration consisting of silicification and argillic alteration (kaolinite-illite/montmorillonite in mixed layers) affected the brecciated limy units of the Maokou Formation, and also the units above and underneath. Jasperoid alteration is present within the breccia and within the overlying beds. Minor fluoritization was noted. The metallic signature of the bulk of the ore is Au-As-Sb-Hg-Tl.

2077 Maoling is a Late Triassic to Early Jurassic, intrusion-related, non-carbonate stockwork-disseminated gold deposit with a total gold content of 190 metric tons. It is located in the Maoling district of the Yingkou-Kuandian Uplift, North China Platform, Liaoning province, People's Republic of China. Crosscutting NE-trending and NW-trending ductile fault zones are the main regional structures in the area. Disseminated sulphides and quartz veins are hosted by amphibolite grade schists, phyllites and sandstones of the Early Proterozoic Gaixan Formation. Gangue mineralogy consists mainly of quartz and sericite, with lesser chlorite, biotite, K-feldspar, plagioclase, tourmaline and calcite. Ore mineralogy is dominated by pyrrhotite, arsenopyrite, pyrite and marcasite, with lesser magnetite, chalcopyrite, sphalerite, galena and scheelite. The intersection of the two regional sets of faults seems to have been a focus for hydrothermal fluids at Maoling. NNE-trending, high-angle, ductile shears (splays of the regional faults) predominantly control the ore strike. Numerous NE- and EW-trending faults offset mineralization. An intense and pervasive silicification halo of quartz-carbonate-pyrrhotite is present within and adjacent to the ore zones. An outer halo of potassic metasomatism is formed by a biotite-chlorite-sericite assemblage. The metallic signature of the bulk of the ore is Au-Ag-As-Pb-Sb-Co-Ni. The mineralization event seems to be broadly coeval with emplacement of the 208±2 Ma porphyritic biotite adamellite of the Maoling Stock. Cheng *et al*. (1994) compare the Maoling deposit to a deeper crustal level, higher temperature equivalent of the Carlin type deposits in Nevada, United States.

2078 Paishanlou is a Middle Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 50 metric tons. It is located in the Paishanlou district of the Liaoxi Uplift, North China Platform, Liaoning province, People's Republic of China. The main regional tectonic structure is the EW-trending, ductile Paishanlou-Hougiyingzi shear zone. Quartz vein mineralization is hosted byn amphibolite to granulite grade, Archean hornblende-plagioclase gneiss, biotite-plagioclase gneiss, amphibolite and granulite of the Jianping Group. Gangue minerals consist of quartz, calcite and sericite. Ore mineralogy consists of pyrite, chalcopyrite, pyrrhotite, magnetite, ilmenite, galena, sphalerite, chalcocite, millerite, limonite, electrum and calaverite. Mineralization is structurally controlled and occur within mylonite to ultra-mylonite shear zones, subsidiaries of the regional Paishanlou-Hougiyingzi shear zone. Hydrothermal alterations associated to mineralization and shear zones are silicification, carbonatization, K-feldspathization, sericitization, chloritization and kaolinitization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-Ni-Te.

2079 Changkeng is an intrusion-related, sediment-hosted micron gold (Carlin type) Au-Ag deposit with a total gold content of 100 metric tons. It is located in the Changkeng district of the Linnan orogenic zone, South China Platform, Guangdong province, People's Republic of China. The main regional tectonic structure in the area is the Conghua-Enping. Disseminated to massive sulphides bodies are hosted by Early Carboniferous brecciated limestones. Ore mineralogy consists of pyrite, stibnite, realgar and orpiment in a gangue of quartz, barite, fluorite and clay minerals. Orebodies occur in brecciated zones within the limestones (which may be the result of decarbonatization), along the gently dipping "stratabound" detachment Changkeng fault which separates Triassic terrigenous sediments from the host limestone. Hydrothermal alterations present are silicification, carbonatization and argillic alteration. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Hg.

2081 Jinya is an Early to Late Cretaceous intrusion-related, sediment-hosted micron gold (Carlin type) deposit with a total gold content of 71 metric tons. It is located in the Jinya district of the West Guangxi depression basin and Beice fold belt, South China Platform, Guangxi province, People's Republic of China. The Zhongtin-Jinya-Genxin fault is the main regional tectonic structure in the area. Disseminated sulphides bodies are hosted by sandstones, dolomitic mudstones, siltstones and turbidites of the Middle Triassic Banna Group. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser stibnite, sphalerite, chalcopyrite, galena, tetrahedrite, pyrrhotite, realgar and orpiment. Gangue minerals consists of quartz, carbonates (dolomite and calcite), illite, kaolinite and chlorite. Orebodies are structurally controlled by the PinLe-Jinya fault and its subsidiaries, and by folds related to the PinLe-Jinya fault. The main alteration types are sulphidation (pyrite-arsenopyrite-stibnite) and carbonatization. Minor, uncommon silicification is also noted. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-As-Sb-Cu-Hg-Tl. Xiao and Zhang (1999) showed that organic matter contributed to Au precipitation from hydrothermal fluids.

2083 Dongbeizhai is a syn- to post-Late Triassic intrusion-related, sediment-hosted micron gold (Carlin type) deposit with a total gold content of 53 metric tons. It is located in the SongPang-Mingjiang fault belt (Songpan-Ganzi basin) of the Western Qinling belt, South China Platform, Sichuan province, People's Republic of China. The main regional tectonic structure is the Songpang-Mingjiang fault belt, which consitutes a series of faults related to the emplacement of a NS-trending thrust nappe. Disseminated sulphides and minor quartz veins are hosted by brecciated and faulted carbonaceous phyllites and limestones, and by limy/dolomitic slates, sandstones and siltstones of the Carboniferous Xuebaoding Group and Late Triassic Gaokang Group. Ore minerals consist of arsenopyrite, pyrite, realgar and stibnite, with lesser orpiment, cinnabar, chalcopyrite, tetrahedrite, pyrrhotite, sphalerite scheelite and marcasite. Quartz, dolomite and calcite are the main gangue minerals, with lesser sericite, kaolinite and montmorillonite. The Kuashiyan fault, a S-trending, steeply-dipping reverse fault part of the regional fault system, is the main ore-controlling structure. Breccias located along the fault zones carry most of the ore. Some degree of lithological control is provided by the limy sedimentary rocks. Hydrothermal alteration consists of early and pervasive silicification (jasperoid alteration), argillic alteration, and pyritization of the limy/dolomitic units, related to the main-stage mineralization and associated with abundant carbonate veining. Late carbonate alteration is associated with realgar and stibnite mineralization. The metallic signature of the bulk of the ore is Au-As-Sb-Hg-Tl.

2084 Zhimudang is a Mesozoic (?), intrusion-related sediment-hosted micron gold (Carlin type) deposit with a total gold content of 48 metric tons. It is located in the Zhengeng-Xinren district of the Reactive fold belt of the South China fold system, South China platform, Guizhou province, People's Republic of China. The Qinglong-Anlong structural deformation zone is the major regional tectonic structure in the area. Disseminated sulphides bodies are hosted by folded Late Permian to Early Triassic limestones, claystones, siltstones and dolomites. Ore mineralogy consists mainly of arsenopyrite and pyrite with lesser cinnabar, stibnite, realgar, molybdenite, marcasite, chalcopyrite, galena and sphalerite. Gangue minerals are pyrite, calcite and illite, kaolinite and sericite. Most of the ore occur within an hydraulic breccia zone. Limy lithologies were also an important ore control. Rocks near the orebodies are silicified, sulphidized (arsenopyrite-pyrite) and carbonatized. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Tl.

2085 Lannigou is an Early to Late Cretaceous intrusion-related, sediment-hosted micron gold (Carlin type) Au-As-Sb-Hg deposit with a total gold resource of 51 metric tons. It is located in the Wangmo district of the Youjiang fold system, South China Platform, Guizhou province, People's Republic of China. The Cheheng-Wangmo deformation zone is the main regional tectonic structure in the area. Disseminated sulphide mineralization is hosted by Middle Triassic beds of brecciated dolomitic sandstone, argillaceous limestone and silty mudstone. Ore mineralogy consists of pyrite, arsenopyrite, stibnite, cinnabar, realgar, orpiment, molybdenite and bismuthinite, set in a gangue of quartz, calcite, dolomite, sericite, illite and kaolinite. The deposit occurs along a NNW-trending, high-angle fault transecting the eastern limb of the Laiziashan dome (anticline), orebodies are spatially associated to fractures and breccia zones. Ore-related alteration types are silicification, sulphidation (pyrite-arsenopyrite) and carbonatization. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Tl.

2086 Laowangzhai is a syn- to post-Cenozoic, undetermined style of epithermal gold mineralization with a total gold content of 173 metric tons. It is located in the Ailaoshan district of the Three River fold belt, Tethys orogenic zone, South China Platform, Yunnan province, People's Republic of China. NW- and EW-trending faults are the main regional structures in the area. Quartz vein mineralization is hosted by greenschist grade Mesozoic carbonaceous slates and Cenozoic tuff breccia, and by serpentinized peridotite, lherzolite and pyrolite of an ophiolitic suite. Gangue mineralogy consists of quartz, ankerite and sericite. Ore mineralogy is mainly pyrite, arsenopyrite and stibnite with lesser scheelite, chalcopyrite, tetrahedrite, galena and calaverite. Quartz veins occur within subsidiary faults of the NW- and EW-trending regional faults and also occur at the intersections of the NW- and EW-trending regional faults and subsidiaries. Hydrothermal alteration of the host volcanic rocks consists of silicification, sericitization and carbonatization. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-W.

4178 Axier is a Late Carboniferous, epithermal low-sulphidation gold deposit with a total gold resource of 70 metric tons. It is located in the Axi district of the Tulasu volcanic basin, Yili microplatform, Talimu platform (Tien Shan), Xinjiang province, People's Republic of China. NW-trending (Keshi River fault zone) and NS-trending faults are the dominant regional structures in the area. Quartz veins, stockworks, breccias and associated disseminated sulphides are hosted by Early Carboniferous porphyrytic andesites, basalts, dacites, felsic volcanics, dacitic volcaniclastic rocks and agglomerates (Dahalajunshan Formation), and by sedimentary rocks. Gangue mineralogy consists mainly of quartz (chalcedony, commonly laminated and sinter-like) with lesser sericite, calcite, siderite and adularia. Ore minerals are pyrite, electrum, marcasite, arsenopyrite, hematite, galena, limonite, sphalerite, chalcopyrite, bornite, naumannite and tetrahedrite. Orebodies are related to the NW- to N-trending, steeply-dipping faults, and controlled at a local scale by radiating and circular faults of a caldera. Ore-related hydrothermal alteration has affected both volcanic rocks and sediments. Zones of potassic (K-feldspar), phyllic (sericite-quartz-pyrite), propylitic (chlorite-carbonate) and argillic alterations surround the orebodies. Silicification is extensive in stockworks and breccias. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Bi-Mo-Hg-Se.

4179 Baguamiao is a Late Triassic quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 100 metric tons. It is located in the Qingling orogenic zone of the North China Platform, Shanxi province, People's Republic of China. The deposit occurs inside a complexly faulted and folded zone between the WNW-trending Lixian-Shanyang and the Shangdan regional thrust faults. Quartz vein mineralization is hosted by lower greenschist grade, deformed siltstone, phyllite, slate and limestone of the Middle Devonian Xinghongpu Formation. Gangue mineralogy of the veins is mainly quartz, with subordinate sericite, calcite, ankerite and chlorite and minor biotite, albite and tourmaline. Ore mineralogy consists of dominant pyrite and pyrrhotite, with minor to trace marcasite, limonite, chalcopyrite, bismuthinite, molybdenite, and rare sphalerite and galena. Quartz veins are mainly controlled by the WNW-trending, steeply-dipping brittle-ductile Erlihe-Baguamiao shear zone. Quartz veins also occur within NE-trending slip faults and joints. Intense shearing and sericitization transformed the siltstone to a sericite phyllite. Hydrothermal alteration consists of a proximal silicification zone of quartz-pyrite(sulphides), grading outward into a broad bleaching zone of ankerite and sericite. Chloritization also occurs, biotite, albite and tourmaline are locally developed. The metallic signature of the bulk of the ore is Au-Bi-Zn-Cu. Mao *et al.* (2002) proposed a two-stage formation model of the mineralization, with 1) early shearing and folding with deposition of gold in deformed quartz veins and fractured wallrocks, and 2) later brittle deformation with quartz veins and bleached zones within and surrounding joints.

4180 Erjia is a Proterozoic(?), quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 55 metric tons. It is located in the Erjia-Bumo gold belt of the West Hainan tectonic belt, North China Platform, Hainan province, People's Republic of China. The main tectonic structure in the area is the NE-striking, ductile-brittle Zhenguo shear zone. Quartz veins are hosted by amphibolite grade schists and gneisses of the Proterozoic Baoban Group. Quartz is the main gangue mineral, with minor sericite. Ore mineralogy consists of arsenopyrite and pyrite, with minor galena, sphalerite, chalcopyrite and electrum. The mineralized quartz veins occur within the Zhenguo shear zone and its subsidiaries. Silicification and sericitization are associated with the mineralization. The metallic signature of the bulk of the ore is Au-Ag-As.

4181 Qiyiqiu No. 1 (or Hatu) is a quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 75 metric tons. It is located in the Yiqiqiu district of the Dalabute-Kelamaili back-arc belt (Western Junggar), Talimu Platform, Xinjiang province, People's Republic of China. The Dalabute fault, a NE-trending dextral strike-slip fault zone, and the Zhayier synclinorium are the main regional tectonic structures in the area. Quartz veins and disseminated sulphides are hosted by lower greenschist grade pyroclastic rocks, basalts, tuffs and tuffaceous sandstones of the Early Carboniferous Tailegula Formation. The gangue mineralogy of the veins is composed of quartz, sericite and calcite. Ore mineralogy consists of pyrite, arsenopyrite, chalcopyrite, sphalerite and marcasite. The veins are structurally controlled by NE-trending reverse splays of the Dalabute fault, such as the Anqi shear zone and the Hatu fault. Hydrothermal alteration of the volcanic rocks near the veins consist of silicification, sericitization, chloritization and carbonatization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Zn.

4182 Lingnan (or Taishang) is an early Cretaceous, batholith-associated vein (Korean-type) gold deposit with a total gold content of 36 metric tons. It is located in the Linglong district of the Jiaodong Uplift, North China Platform, Shandong province, People's Republic of China. The NNE- to NE-trending Zhaoyuan-Pingdu (Zhaoping) shear zone is the main regional tectonic structure in the area. Disseminated sulphides and stockworks are hosted by brecciated and ductilely deformed biotite gneiss and biotite granite of Archean age. Gangue minerals are quartz, sericite and calcite. Ore mineralogy consists of pyrite, electrum, galena, sphalerite, arsenopyrite, chalcopyrite, pyrrhotite, hematite and magnetite. Mineralization occurs in the NE- to ENE-trending, shallowly- to moderately-dipping Potouqing fault, a 1st order faults localized at the contact between the Linglong and Luanjiahe plutons and marking in the area the boundary between biotite gneiss and biotite granite. The structural history of the Potouqing fault is complex, Qiu *et al.* (2002) suggested an early phase of ductile, sinistral-reverse movement (D_2), followed by ductile, dextral-normal movement (early D_3). Hydrothermal alteration associated with the orebodies consists of sericitization, silicification, potassic (K-feldspar) alteration and carbonatization. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn.

4183 Baiyun is a probable Mesozoic batholith-associated quartz vein (Korean-type) gold deposit with an unknown gold content. It is located in the Baiyun area of the South Liaoning terrane, North China Platform, Liaoning province, People's Republic of China. An EW-trending shear zone is the main regional tectonic structure in the area. Quartz vein mineralization is hosted by amphibolite to granulite grade, strongly fractured Proterozoic biotite schist, biotite granulite and marble, and is associated to Mesozoic monzonite, diorite and lamprophyre intrusions. Quartz is the dominant gangue mineral, with minor sericite and calcite. Ore mineralogy consists of pyrite, pyrrhotite, chalcopyrite, arsenopyrite, native silver, electrum, hematite, magnetite, galena, bornite and limonite. The veins are structurally controlled by the regional EW shear zone and its subsidiaries. Hydrothermal alteration of the gneissic rocks consists of sericitization and silicification, with K-feldspathization, chloritization and carbonatization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Zn-Pb.

4184 Dongfengshan is a Proterozoic(?) iron formation hosted vein and disseminated (Homestake type) gold deposit with a total gold content of 40 metric tons. It is located in the Dongfengshan area at the edge of the Jiamusi Uplift, North China Platform, Heilongjian province, People's Republic of China. Massive sulphides, quartz veinlets and disseminated sulphides are hosted by a Proterozoic, greenschist grade, banded, brecciated and ductilely deformed silicate facies iron formation. The BIF occurs within granulite grade schists and slates of the Dongfenshan Group. Ore mineralogy is dominated by pyrrhotite and pyrite, with arsenopyrite, maucherite, pentlandite, galena, nickeline, limonite, sphalerite, chalcopyrite, marcasite, magnetite, ilmenite, and hematite. Mineralization is synchronous with folding. The main lithological control over the mineralization is the low metamorphic grade favorable strata of silicate facies iron formation. Proximal hydrothermal alteration consists of silicification, sericitization and pyritization, with distal propylitic (chlorite-epidote-calcite) alteration. The metallic signature of the bulk of the ore is Au-Fe-Co-Ni-As-Sb-Mn.

4185 Hougou is an Early Cretaceous, intrusion-related probable porphyry gold deposit with a total gold content of 31 metric tons. It is located in the Zhangjiakou district at the conjunction of the fold zone of the North China Platform and the Inner Mongolia geosyncline, North China Platform, Hebei province, People's Republic of China. The main regional tectonic structure in the area is the Shangyi-Chongli-Beipiao fault, which is an EW-trending, deep-seated fault system of mylonites, breccias and tectonic lenses. Quartz veinlets and disseminated sulphides are exclusively hosted by amphibolite grade, Early Cretaceous syenite of the Wanquan granite, emplaced in Archean gneisses. Gangue mineralogy is dominated by quartz and microcline, with lesser sericite and calcite. Pyrite is the dominant ore mineral, with lesser chalcopyrite, chalcocite, bornite, galena, sphalerite and specular hematite. The mineralization is structurally controlled by NNE-striking faults and fractures. The syenite is affected by intense potassic alteration. Other alteration types present are sericitization, silicification, pyritization and carbonatization. The metallic signature of the bulk of the ore is Au-As-Sb- Bi-Cu-Pb.

4186 Dongping is an Early Permian, intrusion-related (alkalic) porphyry gold deposit with a total gold content of 40 metric tons. It is located in the Zhangjiakou district at the conjunction of the fold zone of the North China Platform and the Inner Mongolia geosyncline, North China Platform, Hebei province, People's Republic of China. The main regional tectonic structure in the area is the Shangyi-Chongli-Beipiao fault, which is an EW-trending, deep-seated fault system of mylonites, breccias and tectonic lenses. Sheeted K-feldspar-quartz stockworks and veins, and associated disseminated sulphides, are hosted by the shallowly-emplaced Carboniferous Shuiquangou aegirine-augite syenite and monzonite complex intruding high metamorphic grade Archean rocks. Gangue minerals are mainly K-feldspar and quartz, with lesser sericite, chlorite, epidote, albite and calcite. Ore mineralogy is dominated by pyrite, galena and chalcopyrite, with lesser sphalerite, magnetite, specularite, electrum, calaverite and altaite. The mineralization is structurally controlled by NW- and NS-trending faults and shears such as the Zhongshangou-Shanshuiquan and Dongheping faults, the former is a discontinuous brittle-ductile splay of the Shangyi-Chongli-Beipiao fault going straight through the Dongping deposit. Gold-bearing veins are located in NE-trending en echelon tensional fractures. Hydrothermal alteration inside the Shuiquangou complex is zoned around the mineralized veins and stockworks. Proximal, intense and pervasive, potassic alteration (microcline-quartz-magnetite) and silicification zones with important sulphidation (commonly pyrite and chalcopyrite as disseminated sulphides) grades outward to a sericitic alteration zone (quartz-sericite-pyrite) and to an outer propylitic alteration zone (chlorite-magnetite-epidote-calcite-pyrite). The metallic signature of the bulk of the ore is Au-As-Cu-Sb-Bi-Cu-Pb-Te.

4187 Hadamengou is a Late Proterozoic, batholith-associated (Korean type) vein gold deposit with a total gold content of 20 metric tons. It is located in the Hadamengou district in the Daqingshan granulite belt, North China Platform, Inner Mongolia province, People's Republic of China. The EW-trending, deep-seated Daqingshan-Wulashan fault is the main regional tectonic structure in the area. Quartz-feldspar veins and disseminated sulphides are hosted by diverse Late Archean gneisses, granulites, migmatites and amphibolites of the Wulashan Group metamorphosed from the upper amphibolite to granulite grade. Gangue minerals consists of K-feldspar (microcline, orthoclase, perthite) and quartz. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, galena, magnetite, calaverite, electrum and petzite. The quartz-feldspar veins and disseminated sulphides are structurally controlled by early, ductile shear zones which acted as conduits for the mineralizing fluids. More importantly, late EW-trending, brittle-ductile shears and faults controlled the shape and direction of the mineralized lodes. Late, brittle faults affected the orebody with small displacements. Potassic alteration (K-feldspar), silicification and pyritization are closely related to the mineralization and occur adjacent to the orebodies. Late carbonatization and chloritization along brittle fractures do not appear to be related to the gold mineralization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Te. Gan *et al*. (1994) suggested that a 660 Ma granitic body in the mine area served as a heat source for driving the hydrothermal fluids produced by shearing and retrograde metamorphism. The hydrothermal fluids are thought to have scavenged most of the gold from the metamorphosed banded iron-formation sequences whereas the granitic body is tought to have provided an estimated 27% of the gold (Gan *et al.*, 1994).

4188 Hetai is a Late Paleozoic to Early Mesozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 31 metric tons. It is located in the Hetai district of the Yunkai metamorphic terrane, Linnan orogenic zone, South China Platform, Guangdong province, People's Republic of China. The deposit is located inside the N-to NE-trending, crustal-scale, ductile dextral strike-slip Wuchuan-Sihui fault zone, at its intersection with the NE-trending Luoding-Ganglin ductile fault zone belt. Brecciated quartz veins, disseminated sulphides and sulphide veinlets are hosted by mylonites and phyllonites derived from migmatitic granite and low-grade schists of Late Proterozoic age. Quartz is the dominant gangue mineral, with lesser sericite, siderite and calcite. Ore mineralogy is dominated by chalcopyrite and pyrite, with minor pyrrhotite, arsenopyrite, galena and sphalerite. Mineralization occurs exclusively within NE-striking, steeply-dipping, reverse-dextral shear zones such as the Baoyatang-Kengwei fault. According to Wang *et al.* (1997), early ductile shearing formed phyllonites and ultramylonites and related early-stage gold quartz veins and disseminated sulphides. The shears were reactivated as brittle-ductile and brittle shears synchronously with the emplacement of the Wucun monzonitic granite, which contributed to late-stage gold quartz vein mineralization. Zhang *et al.* (2001) proposed a model where ductile shearing is devoid of gold mineralization but prepared the ground for a later brittle and extensional phase, which would be responsible for mineralization emplacement along ENE-striking, steeply-ipping, brittle and (broadly) foliation-parallel normal faults. The sulphide-rich veinlets are mostly hosted by the quartz-rich microlithons of the mylonite, due to the competency contrast with the mica-dominated microlithons. Weak silicification, sericitic, pyritic, carbonate, and chloritic alterations affect the mylonites. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-As-Pb-Zn.

4189 Shuangwang is a Late Triassic to Early Jurassic carbonate replacement (manto) gold deposit with a total gold content of 50 metric tons. It is located in the Shuangwan-Ertaizi district of the Indo-Sinian fold belt in the eastern part of the Qinling orogenic zone, North China Platform, Shannxi province, People's Republic of China. The W-trending, deep-seated Lixian-Shanyang fault, the WNW-trending Shangdan fault and the Xiba anticlinorium are the main regional tectonic structures in the area. Hydrothermal albitite breccias and lesser quartz veins and sulphide lenses are hosted by brecciated, Middle Devonian, marine calcareous sandstones, silty slates, siltstones and argillaceous limestones. Albite, ankerite and calcite are the main gangue minerals, with lesser quartz, fluorite, gypsum and barite. Ore mineralogy is dominated by pyrite, with minor pyrrhotite, chalcopyrite, arsenopyrite, digenite, tetrahedrite, native Bi, polydimite, calaverite, tellurobismuthite, hessite, millerite and violarite. The main controlling structures are brecciated zones or cavities(?) developed in limestones and limy units along the WNW-trending, steeply-dipping Wangjialeng and Xiushiya splay faults. SW-trending, sinistral strike-slip faults offset the orebodies. Albitization, silicification, pyritization and dolomitization are the major products of hydrothermal alteration. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Bi-Cu-Pb-Te. Late Triassic monzonite and quartz diorite of the Shuangwang granite occur near the deposit, but no genetic link has been established. According to Xu *et al.* (2002), radiometric age data and isotopic composition of lead, hydrogen and oxygen of the Shuangwang orebody and the nearby Xiba adamellite are compatible. Xu *et al.* (2002) proposed a model where large volume of hydrothermal fluids resulting from the emplacement of the Xiba adamellite were concentrated along the NW-SE fold axes. The pressure of those fluids exceeded the strenght of the wall rocks and confining stresses and formed a hydraulic cryptoexplosion breccia. The breccia then became a preferential channelway for ore-forming fluids. However, Mao *et al.* (2002) classified Shuangwang as an orogenic lode gold deposit.

4190 Jiguanzui is an Early Cretaceous, intrusion-related Au-Ag-Cu skarn deposit with a total gold content of 30 metric tons. It is located in the Yangtze River district of the Yangtze River rift, South China Platform, Hubei province, People's Republic of China. The main regional tectonic structures in the area are the NE-trending Yangtze River rift and the late, intersecting and superimposed NNE-oriented deep fractures. Semi-massive sulphides, massive sulphides and sulphide-rich veinlets are hosted by Early Triassic, brecciated dolomitic limestone. Ore minerals consist of chalcopyrite, pyrite, magnetite, bornite, chalcocite, electrum, tellurobismuthinite, pyrrhotite, sphalerite, molybdenite, wehrlite, umangite, bellidoite and tetradymite. The limestone host was altered to a prograde skarn assemblage consisting of garnet (grossularitic), diopside, phlogopite, orthoclase and tremolite. Retrograde skarn is composed of quartz, calcite, sericite, chlorite and serpentine. Skarns occur at the contact zone between Yenshanian diorite (and quartz diorite) intrusions and limestones. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-Mo-Bi-Te.

4191 Jilongshan is a Late Jurassic, intrusion-related Au-Ag-Cu skarn deposit with a total gold content of 30 metric tons. It is located in the Yangtze River district of the Yangtze River rift, South China Platform, Hubei province, Peoples Republic of China. The main regional tectonic structures in the area are the NE-trending Yangtze River rift and the late, intersecting and superimposed NNE-oriented deep fractures. Skarns occur at the contact between the 138 Ma Jilongshan granodiorite porphyry (intruded along the axis of a syncline) with the host limestones and dolomites. Sulphide-rich veinlets, semi-massive sulphide pockets and disseminated sulphides are hosted by skarnified Middle Triassic limestone and dolomite. Ore mineralogy consists of chalcopyrite, bornite, pyrite, sphalerite, galena, arsenopyrite, orpiment, realgar, electrum, magnetite, molybdenite, calaverite, tetrahedrite and tennantite. The limy host unit was altered to a prograde skarn assemblage consisting of (grossularitic) garnet, diopside, wollastonite, scapolite and orthoclase. Retrograde skarn is composed of quartz, epidote, calcite, sericite, chlorite, serpentine and rhodocrosite. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-As-Zn-Pb-Hg-Mo-Te.

4192 Shanggong is a probable Middle Proterozoic quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 30 metric tons. It is located in the Shanggong district on the eastern rim of the Luoning-Lushi fault basin, Qinling orogenic zone, North China Platform, Henan province, People's Republic of China. The EW-trending Machaoying shear zone and the Huashani-Longbao anticline are the main regional tectonic structures in the area. Disseminated sulphides and quartz veins are hosted by highly metamorphosed, brecciated and banded andesites, tuffs and vitric tuffs of the Middle Proterozoic Xiong'er Group. Quartz is the main gangue mineral, with lesser sericite and ankerite. Ore mineralogy consists of pyrite, sphalerite, galena, electrum, chalcopyrite, molybdenite, chalcocite, bornite, pyrrhotite, wolframite, tetrahedrite, calaverite and scheelite. The orebodies are structurally controlled by SW-striking faults forming intensely altered and brecciated zones, which are secondary faults adjacent to the Jintonggou fault. The latter is itself part of the NE-trending, ductile-brittle Kangshani-Qiliping fault zone, located on the southern limb of the regional anticline. Early hydrothermal alteration consists of proximal silicification and sericitization (sericite-ankerite-pyrite). The same minerals are deposited again in a second alteration stage concomittant with base metal sulphides and tellurides deposition. This grades outward into a post-ore, propylitic alteration halo (quartz-ankerite-chlorite-albite-pyrite), with sericitization, tourmalinization and fluoritization which formed veinlets along the fracture zones and outward into the wallrocks. This in turn grades outward to a distal propylitic alteration halo of chlorite-calcite. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-Te-Bi-Mo-As-Ni-Mn-W.

4193 Tuanjiegou is an Early Cretaceous, intrusion-related porphyry gold deposit with a total gold content of 30 metric tons. It is located in the Tuanjiegou district of the Jiamusi Uplift, North China Platform, Heilongjiang province, People's Republic of China. The Wulaga fault basin is the dominant tectonic structure in the area. Quartz veins and associated disseminated sulphides are hosted by Early Cretaceous, porphyritic and brecciated granite porphyry emplaced into a caldera (itslef located at the intersection of NNE- and EW-trending structures), and by adjacent Proterozoic crystallized schists. Gangue minerals are mainly quartz and K-feldspar. Ore mineralogy consists of pyrite, marcasite, stibnite, electrum, galena, sphalerite, native Hg, cinnabar, realgar and orpiment. The quartz veins are associated to a NE-trending brecciated zone localized at the contact between the granite porphyry and the schists. Hydrothermal alteration consists of three, probably concentrically zoned, alteration types. An inner potassic alteration zone (K-feldspar-quartz) grades to a zone of argillic alteration (kaolinite-sericite) and to an outer zone of phyllic alteration (quartz-sericite-pyrite). The metallic signature of the ore (inferred from its mineralogy) is Au-Ag-Sb-Cu-Pb-Zn-Hg.

4194 Woxi deposit is a turbidite-hosted (Bendigo type) quartz-carbonate vein Au-W-Sb deposit of unknown age with a total gold content of 30 metric tons. It is located in the Western Hunan district of the Xuefeng Uplift, Yangtze Platform, Hunan province, People's Republic of China. The Guzhang-Anhua fault zone is the main regional tectonic structure in the area. Quartz-carbonate veins are hosted by greenschist grade slates of the Middle Proterozoic Banxi Group. Quartz and carbonate are the dominant gangue minerals, with lesser illite and sericite. Ore mineralogy consists of pyrite, wolframite, scheelite, stibnite, arsenopyrite, sphalerite, galena, chalcopyrite and tetrahedrite. Orebodies are structurally controlled by the Woxi fault, with veins trending NE and EW. Hydrothermal alteration of the slates consists of sericite-illite alteration, calcite-chlorite alteration, silicification and pyritization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-W.

4195 Wulashan is a Late Carboniferous to Early Triassic, batholith-associated (Korean type) vein gold deposit with a total gold content of 30 metric tons. It is located in the Wulashan gold district north of the Daqingshan gold province (Baotou-Bayan Obo zone), western Inner Mongolia Axis, North China Platform, Inner Mongolia province, People's Republic of China. The deposit is located at the intersection of the Daqingshan-Wulashan deep-seated fault (consisting of mylonites, tectonic lenses and breccias) where the last known movement is reverse (during the Variscan-Yenshanian orogeny at 290-180 Ma), and the Dahuabei-Laoyanghao-Obo fault, a buried NE-trending deep-seated fault formed during Late Paleozoic to Early Mesozoic times. Quartz-feldspar veins are mainly hosted by Late Carboniferous, fault-intruded syenite dykes, and by lower amphibolite to granulite grade garnet-biotite-plagioclase gneiss, hornblende-plagioclase gneiss and amphibolite of the Archean Wulashan Group. The most abundant gangue minerals are quartz and K-feldspar, with lesser siderite, sericite, chlorite, hornblende, pyroxene and calcite. Pyrite is the dominant gangue mineral, with lesser chalcopyrite, galena, specularite, hematite and limonite, minor magnetite, bismuthinite, sphalerite, arsenopyrite, electrum, calaverite, altaite, petzite and melonite. Quartz-feldspar veins are structurally controlled by NE-trending fault zones such as the Dahuabei-Hejiao-Damao fault, and their intersections with the Baotou-Huhhot EW-trending faulted shear zone. Orthoclase-microcline-perthite potassic alteration and silicification are closely associated with mineralization. Sericitization, pyritization and carbonatization are also present. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-Bi-As-Te.

4196 Xinqiao is a Middle Jurassic, intrusion-related Au-Ag-Cu manto and skarn deposit with a total gold content of 20 metric tons. It is located in the Yangtze River district of the Yangtze River rift, Maanshan-Guichi uplift, South China Platform, Anhui province, Peoples Republic of China. The main regional tectonic structures in the area are the NE-trending Yangtze River rift and the late, intersecting and superimposed NNE-oriented deep fractures. The deposit is localized at the intersection of the Dachengshang anticline and the Shengchong syncline. Massive or banded sulphide lenses, semi-massive sulphide pockets, disseminated sulphides and sulphide veinlets of the manto orebody are hosted by the Gaolishan siltstone, whereas skarn mineralization is hosted by the Carboniferous Huanglong, Chuanshan and Qixia limestones and dolomitic limestones. Ore mineralogy consists of pyrite, chalcopyrite, arsenopyrite, magnetite, sphalerite, electrum, galena, pyrrhotite, wittichenite, tetrahedrite, native Ag and bismuthinite. The limy host unit was altered to a prograde skarn assemblage consisting of (grossularitic) garnet-diopside-wollastonite. Retrograde skarn is composed of quartz-calcite-dolomite-epidote-chlorite-sericite-siderite. Skarns occur at the brecciated contact between a 168-110 Ma Yenshanian diorite-quartz diorite intrusive and the host limestones. Manto orebodies are partially controlled by NNE-striking, open, symmetric buckled D_2 Shengchong syncline, where the orebody is parallel to the axis of the syncline. NNE-striking sinistral strike-slip ductile faults related to D_2 folding are also present. The most important structural control on the occurrence and geometry of the orebodies are NNE-trending, D_3 listric normal faults and decollements in the limbs of D_2 folds. Formation of collapse fold accompanied the development of the listric normal faults. NW-SE-trending, D_4 normal-sinistral faults crosscut the previous structures and the orebodies. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-As-Zn-Pb-Bi. Origin of the stratiform “manto” orebodies is controversial, varying from epigenetic (manto) to syngenetic (reworked VMS) models. Xu and Zhou (2001) proposed a two-stages model with initial formation of exhalite and sedimentation in a continental rift basin, followed by multi-staged deformation and magmatism related to the Yanshanian orogeny. Hydrothermal solutions from the pluton would have circulated along D_3 faults, with infilling and replacement of the fault zones by new sulphide formation and modifying of pre-existing sulphide beds (Xu and Zhou, 2001).

4197 Zijinshan is an Early Cretaceous, epithermal high-sulphidation Cu-Au deposit with a total gold content of 10 metric tons. It is located in the Zijinshan district on the rim of the Wuyi Uplift, South China Platform, Fujian province, People’s Republic of China. The presence of a volcanic dome of Cretaceous age along a NW-striking regional extensional structure is inferred from the disposition of the different volcanic lithofacies, explosion breccias, and ring and radial faults. Quartz veins, hydrothermal breccias and disseminated sulphides are hosted by Early Cretaceous dacitic volcanics and cryptoexplosion breccias (within the volcanics). Orebodies are also hosted by an intruding pipe-like tonalite porphyry and by a Late Jurassic granite body. The tonalite changes at depth to a granodiorite porphyry body that hosts porphyry-style Cu mineralization. The Au and Cu orebodies are distinct, but may be genetically related (So *et al.*, 1998). Gangue mineralogy of the mineralized hydrothermal matrix of the breccias is composed mainly of quartz and alunite. Ore mineralogy consists of pyrite, covellite, enargite and digenite, with minor to rare galena, bornite, chalcopyrite, scheelite, tetrahedrite, molybdenite and tennantite. Hydrothermal breccias, veins and related alteration zones occur within or in close association with NW-striking fissures. The unconformity interface between the Shimashoan Group volcanics and the Late Jurassic granite is a lesser ore controlling structure. Hydrothermal alteration consists of an innermost (proximal) zone of silicic alteration, with disseminated sulphides and veining, which grades outward to an inner advanced argillic zone (alunite-quartz-pyrite), an outer advanced argillic zone (dickite-quartz-pyrite-zunyite-barite-kaolinite), and an outermost phyllic alteration zone (sericite-quartz-illite-rutile-chlorite). Funnel-shaped hydrothermal breccia and vein mineralization is restricted to the silicic and alunite alteration zones and pinches out in the advanced argillic and phyllic zones. Within the granodiorite body, the phyllic alteration grades at depth into a potassic alteration assemblage of K-feldspar-biotite-quartz-albite-anhydrite. Early, widespread silicification is present in the Jurassic granite. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-As-Mo. A potassically-altered granodiorite with porphyry copper mineralization occurs at depths of about 800 metres (So *et al.*, 1998).

4198 Duolanasayi is a Late Carboniferous to Early Permian quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 150 metric tons. It is located in the Duolanasayi district of the Kalba Narym sector (Southern Altay Shan), Altay Shan, Xinjiang province, People’s Republic of China. The regional NW-trending, ductile dextral strike-slip Irtysh fault system is the main tectonic structure in the area. Quartz veins and disseminated sulphides are hosted by Devonian mylonites, phyllites, graywackes and limestones, and by 290 Ma tonalite, granodiorite and plagiogranite of the SaRewuzen intrusives. Quartz and sericite are the main gangue minerals. Ore mineralogy consists of pyrite, hematite, chalcopyrite, bornite, scheelite, tellurides and pyrrhotite. The mineralization is structurally controlled by the Maerkakuli and Habahe faults, which are 2nd order dextral strike-slip fault parallel to the regional trend. The lithological contact between the limestones and the clastic sediments localized deformation and mineralization. Hydrothermal alteration consist of a sericitic (quartz-sericite-pyrite) alteration, with carbonatization and chloritization. In places where the lodes cut limestones, skarn-like calc-silicate alteration occasionnaly occurs. The metallic signature of the bulk of the (inferred from its mineralogy) is Au-Ag-Cu-W-Te.

4199 Zhuanshanzi is an Early Cretaceous(?) deposit of probable intrusion-related, Au-Cu sulphide-rich vein affinity with a total gold content of 15 metric tons and a resource of 50 metric tons. It is located in the Chifeng-Chaoyang district of the Nulurhu Uplift, North China Platform, Inner Mongolia province, People’s Republic of China. The Chifeng-Kaiyuan fault zone is the main regional tectonic structure in the area. Quartz vein mineralization is hosted by sheared and brecciated plagioclase amphibolite and plagioclase-amphibole gneiss of Archean age. Gangue mineralogy is dominated by quartz, with lesser chlorite, calcite and sericite. Sulphides make up over 98% of the vein material, where pyrite is the dominant ore mineral, with lesser chalcopyrite, galena, sphalerite, magnetite and bismuthinite. The ore is structurally controlled by faults and breccias. Related hydrothermal alterations are chloritization, sericitization, carbonatization and silicification. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-Bi.

4266 Liba is an Early to Late Jurassic sediment-hosted micron gold (Carlin type) gold deposit with a total gold content of more than 30 metric tons. It is located in the Liba area of the Qinling fold belt, North China Platform, Gansu province, People's Republic of China. The W-trending, deep-seated Lixian-Shanyang fault (part of the West Quinling transform zone) is the dominant tectonic structure in the area. Disseminated sulphides and minor stockworks are hosted by Middle Devonian phyllites, silty phyllites and siltstones of the Shujiaba Group. Host rocks have undergone contact metamorphism adjacent to the nearby Zhongshuan granite; intrusive rocks host some minor mineralization, but a direct connection between gold mineralization and igneous activity is lacking (Li and Peters, 1998). Gangue mineralogy consists of muscovite, sericite and quartz, with lesser feldspar, chlorite, biotite, carbonates, graphite, and minor tourmaline, zircon, apatite, zeolite and clay minerals. Ore mineralogy is dominated by pyrite (oxidized to limonite), with subordinate chalcopyrite, arsenopyrite, sphalerite, galena, pyrrhotite, rutile and native gold, with minor bornite, magnetite, marcasite and electrum. The deposit sits on the southwest limb of the WNW-trending Ding-Mawu anticline, part of the regional Shijiaheba anticlinorium. Mineralization is structurally controlled by the ESE-trending, steeply-dipping F_1 fault and its parallel subsidiaries, as well as by SE-trending, steeply-dipping faults. Intersections of the two fault trends are the location of thicker and higher grade orebodies. Hydrothermal alteration consists of proximal, ore-related sericite-pyrite, grading away to a sericite-only zone, and to a distal chlorite zone. Silicification and carbonatization also occurs throughout the deposit. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-As-Sb-Cu-Zn-Pb. According to Liu (1994), orebodies are present in the sericitization zone, and their grade and thickness correlate directly with the intensity of sericitization.

4267 Jinlongshan is a sediment-hosted micron gold (Carlin type) gold deposit of unknown age, with a total gold content of more than 30 metric tons. It is located in the Zhenan district of the Ding-Ma Au belt, East Qinling fold belt, North China Platform, Shaanxi province, People's Republic of China. The Ding-Ma belt lies south of the E-striking regional Fengzhen-Shangzeng suture zone, and is bounded to the north and south by the EW-oriented Zhenan-Banyan and Milianchuan-Anjiamen faults (part of the West Quinling transform zone). Disseminated sulphides, breccia ores and sulphide-rich veinlets are mainly hosted by turbiditic siltstone, silty shale, sandstone and biolimestone of the Late Devonian Nanyangshan unit. Other host rocks include medium to thick ferruginous and calcareous quartz sandstone of the Middle Devonian Dafanggou and Yanglinggou units, and calcareous shale and calcareous siltstone of the Early Cambrian Yuanjiagou unit. Quartz, calcite, sericite, barite and clay minerals are the maing gangue minerals, Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser stibnite, sphalerite and chalcopyrite. Minor sulphide-rich veinlets consists mainly of As-rich pyrite and are considered as a secondary ore stage (Peters *et al.*, 2002). Mineralization is dominantly stratabound and occurs in the axial area and on the limbs of the EW-oriented, upright Jinlongshan anticline, parallel to the regional structural trend. Orebodies are preferentially distributed along bedding and lithological contacts, and inside favorable lithologies; i.e. calcareous rocks and impure limestone susceptible to decalcification. E-striking, brittle-ductile compression zones in the core and the limbs of the Jinlongshan anticline, as well as a conjugate set of NE- and N-striking fractures and their intersections with the shear zones, localized high-grade orebodies. Hydrothermal alteration consists of early decalcification of the limy units, followed by ore-related proximal jasperoid alteration and vein-stockwork silicification. Late stage carbonate alteration as quartz-calcite veinlets, locally sulphide bearing, and local agillic alteration (dickite-fluorite) also occur. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-F-Cu-Pb-Co-Ni. Peters *et al.* (2001) suggested that early stratabound mineralized layers may have been remobilized by late brittle-ductile shearing. Late post-ore quartz veins are synchronous with Sb introduction (Peters *et al.*, 2001).

4268 Gaojiaao is a possible sediment-hosted micron gold (Carlin type) deposit of unknown age, with a total gold content of 30 metric tons. It is located in the southern part of the Yangtze Platform, Hunan province, People's Republic of China. The intersection of two regional structures; the Baimashan-Longshan magma-structural zone and the Taojiang-Chengbu rift, defines the NW-trending Lianhuazhai-Baiyunchunong dome, the major structure of the deposit area. Disseminated sulphides are hosted by quartz sandstone, siltstone and silty argillite of the Middle Devonian Banshan unit. Ore mineralogy consists of pyrite, native gold, marcasite, arsenopyrite, stibnite, sphalerite, galena, scheelite, argentite and limonite, in a gangue of jarosite, sericite, alunite, quartz, clay minerals, barite and tourmaline. Mineralization is structurally controlled by WNW- to NNW-trending faults 800 m long and 30 m wide, and by NE-trending faults. Hydrothermal alteration consists of silicification, pyritization and barite alteration. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Zn-Pb-W-Ba-B.

4270 Ertaizi is a sediment-hosted micron gold deposit (Carlin type) of unknown age, with a total gold content of 30 metric tons. It is located in the Shuangwan-Ertaizi district (Dingjiashan-Majiagou Au-Hg-Sb belt) of the Indo-Sinian fold belt in the eastern part of the Qinling orogenic zone, North China Platform, Shaanxi province, People's Republic of China. The WNW-trending, deep-seated Lixian-Shanyang and Shangdan thrust faults and the Xiba anticlinorium are the main regional tectonic structures in the area. Disseminated sulphides are hosted by Middle Devonian dolomitic limestone, marble and slate. Gangue mineralogy consists of ankerite, calcite, quartz, sericite, barite, rutile and carbon. Ore mineralogy consists of (in no particular order) native gold, native silver, tennantite, cinnabar, siegenite, pyrite, marcasite, chalcocite and chalcopyrite. Mineralization is structurally controlled by breccia zones and the intersections of EW-oriented and NE-trending fault sets. Hydrothermal alteration consists of silicification, pyritization, carbonatization and albitization, the latter closely associated with gold mineralization. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Ti.

4271 Cangshang is an Early Cretaceous, batholith-associated quartz vein (Korean type) gold deposit with a total gold content of over 57 metric tons. It is located in the Zhao-Ye gold belt of the Jiaobei Terrane, Jiaodong Uplift, North China Platform, Shandong province, People's Republic of China. The N- to NNE-trending sinistral Tan-Lu fault zone is the main regional tectonic structure in the area. Quartz veins and associated disseminated sulphides are hosted by granodiorite of the Middle to Late Jurassic Linglong granite suite, and by amphibolite of the Late Proterozoic Fenzishan Group. Quartz is the dominant gangue mineral, with subordinate sericite, feldspar, calcite, ankerite, siderite, barite and chlorite. Ore mineralogy is dominated by pyrite, with lesser sphalerite, galena, chalcopyrite and arsenopyrite. Electrum is the main gold mineral, although native gold also occurs in minor amounts. The NE-trending, shallowly- to moderately-dipping Cangshang fault and its subsidiaries are important ore-controlling structures. Orebodies are located mainly within the cataclased footwall of the Cangshang fault, which follows the contact between the Linglong Granite and the amphibolites of the Fenzishan Group. The Cangshang fault is part of the larger and deeper Cangshang-Sanshandao ductile fault zone, on which is superimposed younger brittle components. Movement along the fault is reverse-oblique (dextral). Qiu *et al.* (2000) have suggested that this reverse-oblique movement at the nearby

Sanshandao deposit was followed by a normal movement with which the main-stage mineralizing event is associated. Hydrothermal alteration consists of strong proximal sericitization and sulphidation in the footwall granodiorite (characterized by a pyrite-sericite-quartz assemblage), grading to a weaker potassic alteration of K-feldspar-sericite-quartz. Pervasive, proximal alteration in the hangingwall amphibolite consists of a sericitic alteration assemblage of sericite-quartz-chlorite. A mafic dyke cutting the mineralization is affected by pervasive sericitic alteration. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb-Cu-As.

COLOMBIA

583 Frontino (El Silencio) is an Eocene(?) batholith-associated quartz vein Au-Ag deposit (Korean-type) with a total gold content of 131 metric tons. It is located in the Segovia district of the Central Cordillera, Andean Cordillera, Colombia. The dominant tectonic structures in the area are a series of regional, crustal-scale, N-S-trending sinistral strike-slip faults forming the Otu-Bagre fault system. Quartz vein mineralization is hosted by Paleocene to Early Eocene granodiorite of the Antioquia Batholith, and by fine-grained diabase dykes intruding the granodiorite. Quartz is the dominant gangue mineral, with minor chlorite and sericite. Ore mineralogy is dominated by pyrite, with lesser sphalerite and galena, and minor pyrrhotite at depth. The ore is structurally controlled by NNE-trending, shallow-dipping shears which host the "El Silencio" vein, and by less well-developed NW-trending, shallow-dipping shears which are conjugated to the NNE-trending set and host the "Marmajito" vein. Gouge frequently occurs in the shears, which may have behaved as brittle faults. The nearby NW-striking, steeply-dipping shear zone named the “Vertical Series” is host to two small gold mines. The contact between a narrow, fine-grained mafic dyke and the surrounding granodiorite is another controlling structure, as it is frequently used by the shears and veins. Two sets of late NNE- and ENE-trending, steeply-dipping, strike-slip faults have dislocated the orebodies. Hydrothermal alteration is restricted to within 60 cm of the veins, and consists of sericitization accompanied by quartz and pyrite. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb.

COSTA RICA

4054 Bellavista is an Early to Late Pliocene low-sulphidation epithermal Au-Ag deposit with a total gold content of 20 metric tons. It is located in the Miramar district of the Gold Belt of Costa Rica, Cordillera, Puntarenas province, Costa Rica. Large, NNW-trending, steeply-dipping district-wide normal faults (such as the Panama Fracture Zone) with a late dextral strike-slip component are the dominant regional structures in the area. Crustiform and banded quartz veins and stockworks are hosted by Miocene to Pliocene basaltic andesite and pyroclastic tuff breccia of the Aguacate Group. Gangue mineralogy is dominated by quartz, with lesser adularia, calcite and chalcedony. Pyrite is the dominant ore mineral, with minor galena, sphalerite, chalcopyrite, arsenopyrite and electrum. Mineralization is related to a N-striking, steeply-dipping anastomosing shear zone, and is best developed at intersections of NE- to E-trending dilational faults and tensional fractures with bounding shears. Intrusive contacts of rhyolite dykes are also an ore-controlling structure. Hydrothermal alteration consists of proximal phyllic alteration (quartz-sericite-pyrite-illite), grading to a distal and regional propylitic alteration assemblage of quartz-pyrite-sericite-chlorite-epidote-calcite. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Cu-Pb-Zn. Boiling was the main precipitation mechanism, and stable isotopes indicate a primarily meteoric source for ore-forming fluid, with a small probable, magmatic component (Laguna Morales, 1987).

4055 Cerro Crucitas is a Miocene or younger, low-sulphidation epithermal Au-Ag deposit with a total gold resource of 61 metric tons. It is located in the Sapariqui Belt of the Chortis Block, Nicaraguan depression, Cordillera, Costa Rica. NE-trending strike-slip faults and NW-trending faults are the dominant regional tectonic structures, and felsic dome complexes developed at their intersections. Quartz-feldspar veins and disseminated sulphides are hosted by a Miocene, fine-grained to porphyritic rhyolite and felsic pyroclastic flow dome complex of massive to aautobrecciated flows. Quartz and adularia and the main gangue minerals, pyrite is the dominant ore mineral. Mineralization is structurally controlled by hydrothermal breccia zones localized along pre-existing vents, which controlled doming. Hydrothermal alteration consists of early propylitic alteration characterized by a chlorite-epidote-carbonate-magnetite-hematite assemblage and by an ore-related potassic alteration represented by a quartz-adularia-pyrite assemblage. Silicification constitutes a late overprint of the mineralized zones. Argillic alteration is also present. The metallic signature of the bulk of the ore is unknown.

CUBA

297 Delita is a low-sulphidation epithermal Au-Ag deposit with a total gold content of 31 metric tons. It is located in the Pinar del Rio province of Greater Antilles Deformed Belt, Isla de la Juventud, Cuba. The deposit is located in the periclinal closure of the Victoria anticline, a NW-trending regional anticlinal fold. Quartz veins, hydrothermal breccias and disseminated sulphides are hosted by greenschist grade, quartz-muscovite-biotite schist and quartzite of the Jurassic Canada Formation. Gangue mineralogy is dominated by quartz, with lesser sericite, clay minerals, graphite and rare chlorite and ankerite. Arsenopyrite is the dominant ore mineral, with minor pyrrhotite, sphalerite, galena, boulangerite, stibnite, rare pyrite, tetrahedrite and jamesonite, and trace amounts of pyrargyrite, chalcopyrite, native silver, argentite, zinckenite, greenockite, owyeeite, andorite, diaphorite, fuloppite and tellurides. Mineralization is structurally controlled by NE-trending, moderately- to steeply-dipping, en echelon and branching faults and fractures. Hydrothermal alteration consists of potassic alteration (biotite-sericite). Sulphidation (arsenopyrite-pyrite) occurs adjacent to the veins. The metallic signature of the bulk of the ore is Au-Ag-Cu-As-Sb-Te. Three successive stages of mineralization are recognized by Bortnikov *et al.* (1989), with temperatures progressively decreasing to below 200^{o}C. Gold deposition is thought to be associated with this temperature decreasing and boiling. Bortnikov *et al.* (1989) compare the conditions of ore formations of this deposit to those of the Rotokawa geothermal system (New Zealand).

CZECH REPUBLIC

2096 Mokrsko is an Early Carboniferous intrusion-related porphyry gold deposit with a total gold resource of 90 metric tons. It is located in the Celina-Morksko district of the Psi hory area, which is within the Jilové belt of the Central Bohemian Mobile Zone, Bohemian Massif, Variscan Belt, Czech Republic. The dominant regional tectonic structure is the major NE-trending, deep fault zone separating the low-grade Central Bohemian Mobile Zone from the high-grade Moldanubian Block. Sheeted quartz veins and stockworks are hosted by an Early Carboniferous granodiorite of the Central Bohemian pluton and by intruded felsic to intermediate tuffs of the Late Proterozoic Jilové belt. Gangue mineralogy is dominated by quartz, with minor calcite, plagioclase (microcline) and titanite, and sparse amphibole and biotite. Arsenopyrite is the dominant sulphide mineral, with lesser pyrite, pyrrhotite, molybdenite, scheelite and chalcopyrite, and minor native Bi, bismuthinite, maldonite, hedleyite and joseite. Mineralization is structurally controlled by EW-trending, steeply-dipping to subvertical dilational zones. Competency contrasts localized ore shoots, e.g. in granodiorite at the hornfels contact, and in tuffs at the contact with mafic volcanics. Later NE-, SE- and EW-trending shear zones affect the area. Hydrothermal alteration consists of subtle alteration haloes of microcline-amphibole-biotite around the mineralized veins. Extensive sericitization, kaolinization and hematitization is confined to the younger structures. The metallic signature of the bulk of the ore is Au-As-Bi-Te-Mo-W-Sb-Cu. Moravek *et al.* (1989) proposed a model whereby the granodiorite host is responsible for generating the heat flow driving the hydrothermal fluids which scavenged gold from the surrounding volcanic rocks. In this model, the hydrothermal fluid is mostly of metamorphic origin. Hollister (1992) tentatively associated the "fresh" appearance of the granodiorite to potassic alteration and classified Mokrsko as a porphyry gold deposit. Thompson *et al.* (1999) proposed an intrusion-related porphyry model associated with tungsten-tin provinces and associated a magmatic origin to the carbonic-rich fluid.

DOMINICAN REPUBLIC

2122 Pueblo Viejo is an Early Cretaceous, high-sulphidation epithermal Au-Ag deposit with a total gold content of 169 metric tons. It is located in the Pueblo Viejo mining district of the Hispaniola Range, Central Cordillera, Greater Antilles Platform, Dominican Republic. A SE-striking, shallowly- to moderately-dipping thrust fault is the dominant regional tectonic structure in the area. Sulphide-rich veins and disseminated sulphide bodies are hosted by lower greenschist grade basalt, conglomerate and carbonaceous wacke and mudstone of the Early Cretaceous Los Ranchos Formation. Pyrite is the dominant ore mineral, together with enargite and sphalerite, and minor to trace tetrahedrite-tennantite, galena, argentite, chalcostibite, colusite, electrum, bournonite, zinckenite, boulangerite, geocronite, jordanite, stibnite and calaverite. Gangue minerals, though not as important as sulphide minerals, consist of quartz with lesser barite and minor pyrophyllite. The deposit is structurally controlled by its location on the margin of a maar-diatreme complex, which had a high porosity and permeability. N-striking tensional fractures are the most frequently mineralized structures. Fewer NW- and NE-trending, syn-sedimentary high-angle normal faults are also mineralized. Hydrothermal alteration is divided into two stages. Stage I alteration is a shallow argillic alteration zone in the basalts with a kaolinite-quartz-pyrite-rutile assemblage, and is linked to low-grade, disseminated sulphide mineralization. Stage I alteration extends at depth into stage II alteration, which is represented by unmineralized, advanced argillic alteration (alunite-quartz-pyrite-rutile). Stage II alteration is overprinted by high-level silica caps with quartz and vuggy silica centered on the core of the deposit, with a surrounding advanced argillic alteration zone of pyrophyllite-alunite- kaolinite-diaspore-siderite comprised of mineralized sulphide veins. Widespread, distal propylitic alteration (calcite-chlorite-albite-epidote) is present around the deposit. The metallic signature of the bulk of the ore is Au-Ag-As-Te-Cu-Pb-Zn-Sb-Hg. A controversial model by Nelson (2000) suggests an alternative to the maar-diatreme basin, whereby mineralization is spatially and temporally related to a series of Early Cretaceous dacitic and andesitic volcanic domes. Hydrothermal cells responsible for gold mineralization and emplacement of the volcanic domes are controlled by high-angle faults; however an intrusion at depth is necessary to drive the hydrothermal cells as the domes are too small to accomplish this (Nelson, 2000).

ECUADOR

1768 Portovelo is a Middle Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 133 metric tons. It is located in the Portovelo-Zaruma mining district, Andean Cordillera, southwestern Ecuador. The Pinas Fault is a regional NW-trending, dextral strike-slip (with limited vertical movement) fault zone which marks the boundary between the pre-Mesozoic metamorphic basement and the Cretaceous volcanic rocks. Quartz veins and associated disseminated sulphides are hosted by andesite and rhyolite flows of the Early to Middle Miocene Chinchillo Formation. The gangue mineralogy of the veins is dominated by quartz and adularia, with lesser calcite and chlorite and minor fluorite, magnetite and hematite. Pyrite is the dominant ore mineral, with lesser sphalerite, galena, chalcopyrite, tetrahedrite, tennantite, bournonite, electrum, marcasite, native tellurium and rare bornite. NW-trending, dextral strike-slip faults with minor vertical movement such as the Puente Busa-Palestina fault, interpreted as splay faults of the Pinas regional fault, are the main structural control on the mineralization and localized most of the veins. A conjugate set of NE-trending faults, with limited sinistral strike-slip movement, and NS-trending dilational jogs resulting from NW-trending faults movement also localized orebodies. These dilational jogs are restricted to the andesite flows, which were probably able to sustain fault- and fracture-related dilatant structures over a long period of time. Presence of breccias and conspicuous circular structures indicate a probable caldera in the vicinity of the deposit. Late, post-mineral, W-dipping low-angle faults affected the previous structures and the orebodies, as well as regional vertical block faulting. Silicification and pyritization (the latter as disseminations and veinlets) are closely related to the bulk of the mineralization. Adularia-sericite potassic alteration is well-developed near the major veins. This potassic alteration grades outward to an argillic alteration halo of kaolinite-sericite-illite, and to a distal propylitic alteration (mainly chloritic). The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Pb-Zn-Sb-Te.

1769 Nambija is a Jurassic, intrusion-related gold skarn deposit with a total gold content of 47 metric tons. It is located in the Nambija gold district of the Cordillera de Nanguipa (Cordillera Real), Zamora province, Andean Cordillera, Ecuador. S- to SSW-trending thrust faults are the dominant regional tectonic structures in the area. The deposit is aligned along a NS-trending belt of similar intrusion-related, structurally controlled gold deposits. Quartz veins and stringers, breccias, and associated disseminated sulphides are hosted by the roof pendant (made of andesitic to dacitic flows and tuff, limestone, shale and sandstone named the Piuntza unit), of the Jurassic Zamora batholith. Ore mineralogy is dominated by pyrite, with lesser amounts of chalcopyrite and minor galena, pyrrhotite, sphalerite, scheelite, arsenopyrite, hematite, magnetite, barite and electrum. Mineralization is structurally controlled by NE- to NNE-trending faults and breccias, and NS-trending faults; their intersections localized high-grade ore. Mineralization occurs in skarns, and in quartz veins and zones of quartz flooding (replacement) cutting the skarns. Skarn alteration consists of an assemblage of garnet (grossular-andradite), diopsidic pyroxene, K-feldpar, actinolite, chlorite, quartz, apatite, pyrite and chalcopyrite. Skarn alteration also occurs in places along quartz veins, forming garnet-rich selvages, and indicating a degree of contemporaneity between the two. The lack of retrograde assemblage (epidote) in garnet would indicate that temperature of quartz veining is relatively high and beyond the range of epithermal-type mineralization, however there appears to be a transition between quartz veins with garnet envelopes to (lower temparture?) quartz veins and flooding with no apparent reaction (Meinert, 1998). Intrusions in the area have been affected by K-feldspar-chlorite-sericite potassic alteration. The metallic signature of the bulk of the ore is Au-Ag-Cu-As-W. The structural control of the skarn and their proximity to porphyritic intrusions may indicate that skarn formation is unrelated to granodiorite of the Zamora batholith, but rather associated with younger porphyritic intrusions (Meinert, 1998). Nambija is an example of an oxidized, iron-poor gold skarn with similarities to the McCoy skarn deposit in Nevada.

ETHIOPIA

2103 Lega Dembi is a Late Neoproterozoic quartz-carbonate shear-zone-related deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 80 metric tons. It is located in the Sidamo region within the Megado belt of the Adola greenstone belt, Arabian-Nubian Shield, Southern Ethiopia. The major regional tectonic structure in the area is the Lega Dembi - Aflata (Kumudo) shear zone, a N-S- trending, moderately- to steeply-dipping sinistral strike-slip shear zone related to D_1 deformation. Quartz veins and associated disseminated sulphides are hosted by upper greenschist to lower amphibolite grade Late Proterozoic quartz-feldspar micaschists and carbonaceous mica-quartz schists. Quartz is the main gangue mineral. Ore mineralogy is dominated by pyrite and pyrrhotite, with lesser chalcopyrite, galena, arsenopyrite, sphalerite and cubanite, and minor altaite, hessite, petzite, ullmanite, tetrahedrite, boulangerite, breithauptite and bournonite. Orebodies are structurally controlled by two sets of NS-trending, sinistral and dextral ductile to brittle-ductile D_2 shear zones. These shears are in turn cut by EW- and NE-trending, sinistral and dextral brittle to brittle-ductile D_3 shear zones forming a conjugate system which displaced D_2 shears and mineralization. Hydrothermal alteration of the host schists consists of sulphidation, sericitic and biotitic alteration (with a sericite-calcite-biotite-actinolite/tremolite assemblage) and propylitic alteration (chlorite-calcite-epidote). The metallic signature of the bulk of the ore is Au-Ag-Pb-Zn-Cu-Te-Ni.

FIJI

2180 Emperor is an Early Pliocene, low-sulphidation (alkalic subtype) epithermal Au-Ag deposit with a total gold content of 218 metric tons. It is located on the border of the Tavua caldera, Lau Ridge geological province, Viti Levu island, Fiji. The deposit is located at the intersection of the Viti Levu NE-trending lineament, a major extension fault along which several shoshonitic volcanoes are formed, and the Nasivi Shear Zone, a system of N- to NW-trending, en echelon normal dip-slip (sinistral) faults and shears. The Tavua caldera is developed in the center of the Tavua volcano. Banded, crustiform and vuggy quartz veins and asociated disseminated sulphides are mainly hosted by Early Pliocene absarokite flows. Gangue mineralogy is dominated by quartz, adularia and carbonates (calcite, dolomite, ankerite), with lesser sericite and roscoelite and traces of barite. Ore mineralogy of the veins is dominated by pyrite and tellurides such as sylvanite, petzite, krennerite, hessite and calaverite, with lesser arsenopyrite, marcasite, sphalerite, native tellurium, tennantite, tetrahedrite, chalcopyrite, galena, stibnite and native silver. Mineralized veins are confined to faults and shears, and their intersections with one another. Of foremost importance is the Nasivi Shear Zone and its N- to NW-trending, subvertical to steeply-dipping normal-sinistral dip-slip shear subsidiaries, namely the Shatter and Homeward Bound Shears. The Prince and York Flatmakes are NE-trending shallowly SE-dipping normal dip-slip faults, but others such as the Prince William and the 608W Flatmakes are subsidiary but economically-important shallowly N-dipping normal faults. N-striking, subvertical sinistral-normal oblique-slip faults such as the Hangingwall, President and Dolphin shears also played a role in controlling the distribution of the mineralization. Finally, the SE-striking, moderately- to steeply-dipping faults, and foliated Brewster and 602 Cross Shears displaced the previous structures. Different types of deposits exist in the Tavua caldera with their own respective alteration. Hydrothermal alteration at the Emperor Mine is concentrically zoned on the veins and consists of proximal potassic alteration (quartz-sericite-adularia-roscoelite-pyrite) grading outward to a carbonate alteration zone (ankerite-dolomite-quartz-chlorite-adularia-pyrite). Irregular (low-temperature) propylitic alteration (chlorite-carbonate-quartz-plagioclase-illite-pyrite assemblage) is present throughout the mine and represents a distal product of alteration. The metallic signature of the bulk of the ore is Au-Ag-Te-As-Ba-Hg-Se-Mo-Sb.

FINLAND

4214 Suurikuusikko is an Early Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold resource of 68 metric tons. It is located in the Kuotko-Kiistala-Soretiavuoma area of the Kittila greenstone belt, Central Lapland Belt, Fennoscandian Shield, northern Finland. The deposit lies 2-3 km east of a major regional NNE-trending shear zone, the dominant structure in the area. Quartz-carbonate veins and disseminated sulphides are hosted by Early Proterozoic, greenschist grade mafic tuff breccia and graphitic schist of the Porkonen Formation (Kittila Group) and felsic “albitite” dykes. Quartz is the dominant gangue mineral, with lesser albite, graphite and carbonate. Ore mineralogy is dominated by pyrite and arsenopyrite, with minor chalcopyrite, pyrrhotite, sphalerite, galena, gersdorffite, tetrahedrite, gudmundite, jamesonite, bournonite, rutile, maldonite and native Bi. Mineralization is structurally controlled by the NS-trending Suurikuusikko Shear Zone. Hydrothermal alteration consists of pervasive albitization of the host rocks (albite-chlorite-carbonate-graphite) in tuff breccia, schist and intrusive rocks. Carbonatization (dolomite-ankerite) was especially intense in basaltic rocks. Sulphidation (arsenopyrite-pyrite) occurs along veins and shears. The metallic signature of the bulk of the ore is Au-Ag-As-Bi-Hg-Sb-Se-W.

FRANCE

1783 Salsigne is a Late Carboniferous, probable non-carbonate-hosted, stockwork-disseminated type Au-Ag-As deposit with a total gold content of 124 metric tons. It is located in the southwestern Montagne Noire, southern Massif Central, Variscan Belt, France. A NE- to ENE-trending regional thrust fault separating the Minervois and Salsigne-Fournes nappes is the dominant tectonic structure in the area, and is attributed to D_3 reactivation of transcurrent D_2 shear of the Hercynian orogeny. Quartz vein mineralization is hosted by competent Lower Cambrian sandstones of the North Minervois Unit, whereas stratabound disseminated to massive sulphide ore is hosted by altered Lower Cambrian sandstones and alternating interbedded siltstones and limestones, or by Lower Devonian calcshist. Massive sulphide “reefs” and stockworks are hosted by the greenschist to amphibolite grade “X schists” unit, along or below their tectonic contact with the North Minervois Unit. Gangue mineralogy of the veins is dominated by quartz, with lesser siderite, chlorite and biotite. Ore mineralogy overall is mainly dominated by arsenopyrite, pyrite and pyrrhotite. Chalcopyrite, native Bi, bismuthinite, galena, sphalerite and tetrahedrite are accessory minerals; matildite, kobellite, magnetite, wolframite, loellingite, pyrargyrite, polybasite, gudmundite, bournonite and emplectite are in minor amounts; and maldonite, cosalite, gustavite, scheelite and stannite are rare. Massive to disseminated stratabound sulphide reefs in the X Schists unit are controlled by décollement surfaces along and below the ENE-trending thrust fault which juxtaposed the North Minervois Unit over the X Schists. Stratabound disseminated to massive sulphide mineralization hosted by the Lower Cambrian and Lower Devonian sediments is controlled by structural and lithological traps, such as the favorable sandstone and calcareous lithologies, and low-pressure fold hinge zones. Late D_3 NNE- and NNW-striking, respectively sinistral and dextral strike-slip faults, opened up veins and tension gashes in the more competent sandstone units. An early hydrothermal alteration stage consists of potassic alteration of the favorable sandstones with an orthose-biotite-quartz assemblage, and of sericitization of the schists. The potassic alteration also occurs in vein selvages. Overprinting chloritic alteration is associated with the stratabound mineralization. Local but pervasive potassic alteration with adularia subsequently developed in all previously altered rocks. Carbonate rocks are locally dolomitized and intrusive dolerites are sericitized, but the relationship between these two types of alterations and the mineralization is unclear. The metallic signature of the bulk of the ore is Au-Ag-W-Sb-As-Cu-Bi-Pb-Zn-Sn.

GHANA

309 Ashanti (Obuasi) is an Early Proterozoic, turbidite-hosted, quartz-carbonate vein gold deposit with a total gold content of 1384 metric tons. It is located in the Ashanti district of the Ashanti Structural Belt, West African craton, Ghana. Several regional NNE-trending regional reverse shear zones are present such as the Cote d’Or and the Main Reef fissures, but the most regionally important shear zone is the Obuasi Fissure, along which several gold deposits are aligned. Quartz-carbonate veins and zones of disseminated sulphides are hosted by greenschist grade, Early Proterozoic feldspathic sandstones, basalts and carbonaceous schists. Arsenopyrite, pyrrhotite and pyrite are the dominant ore mineral, with lesser marcasite, galena, bournonite, tetrahedrite, chalcopyrite, sphalerite, boulangerite and rare aurostibite, bismuth tellurides and loellingite. The mineralization exhibits a strong structural control. Lodes occur within NE-striking, moderately-dipping, reverse shear zones with a sinistral or dextral strike-slip component in places. A lithological control is exerted by the carbonaceous schists and micaceous layers, which concentrated the sulphide mineralization. NE-plunging F_1 cylindrical folding strongly affected the area and the shear zones, concentrating fluid flow and mineralization along fold hinges, where the major ore shoots are located. Carbonate alteration is extensive and intense in the metasediments and metavolcanics, particularly along the quartz veins and the shear zones. Sulphidation along vein selvages and shear zones, with arsenopyrite development, accompanied the carbonatization event. The metallic signature of the bulk of the ore is Ag-Au-As-Sb-Cu-Zn-Pb-Se-Cd.

310 Bibiani is an Early Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 124 metric tons. It is located in the Bibiani belt within the Sefwi belt, West African craton, southern Ghana. A major NE-trending D_2 reverse fault zone at the contact of sedimentary and volcano-plutonic units is the main regional tectonic structure in the area. Quartz veins and associated disseminated sulphides are hosted by Early Proterozoic, greenschist grade phyllites of the Lower Birimian sediments. Quartz is the only reported gangue mineral. Pyrite and arsenopyrite are the main ore minerals. The distribution of the mineralization is controlled by NE-trending reverse shears that form the footwall or hanging wall of the orebodies. Bends within the shears resulted in dilation zones, which are especially favorable sites for the development of ore shoots. Hydrothermal alteration consists of sericitization and carbonatization, represented by a quartz-sericite-carbonate assemblage in the vein selvages. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As.

311 Iduapriem is an Early Proterozoic, paleoplacer gold deposit with a total gold content of 81 metric tons. It is located at the southern end of the Tarkwa Basin in the Tarkwa-Prestea Area, West African Craton, Ghana. The Tarkwa Syncline is the main regional structure in the area. Disseminated gold mineralization is hosted by oligomictic conglomerates of the Early Proterozoic Banket Series. Gold is frequently interlocked with iron oxides such as hematite, magnetite and ilmenite, and minor sulphides (pyrite, chalcopyrite, bornite, pyrrhotite). Gangue minerals are rutile, zircon, monazite, carbonate and sericite. Lithological control over the mineralization by the conglomerate reefs is prominent, and the deposit is related to the alluvial paleoplacer deposits. The metallic signature of the bulk of the ore is Au-Fe-Ti-Mn-Zr-Ce.

314 Konongo deposit is an Early Proterozoic(?), turbidite-hosted quartz-carbonate vein gold deposit with a total gold content of 51 metric tons. It is located in the Konongo district of the Ashanti Structural Belt, West African craton, Ghana. The Ashanti Fissure is a regional NNE- to NE-trending fault at the contact of the Birimian and Tarkwaian sequences, along which many gold deposits are aligned. Laminated quartz-carbonate vein mineralization is hosted by greenschist grade quartzites, greywackes, schists and phyllites of the Early Proterozoic Birimian Supergroup. Gangue mineralogy is dominated by quartz and carbonate minerals (dolomite, ankerite, siderite), with minor sericite and graphite or carbonaceous material. Ore mineralogy consists of pyrite, with minor marcasite, sphalerite, chalcopyrite, aurostibite, bornite, bournonite, tetrahedrite, boulangerite, jamesonite and rare pyrrhotite, arsenopyrite and galena. The mineralization is strongly controlled by SW-plunging F_2 folds and parasitic drag folds affected by F_3 folding, which contorted F_2 folds and reoriented them compatibly with deformation and fluid flow. NE-striking shear zones associated with the axial planes of F_2 anticlinal folds are also an important ore control. Hydrothermal alteration consists of carbonatization (mainly Fe-carbonates) and sericitization of the host metasediments. The metallic signature of the bulk of the ore is Au-Ag-Zn-Pb-Cu-As-Sb-Cd.

Appendix 2

318 Marlu is an Early Proterozoic, turbidite-hosted quartz-carbonate vein gold deposit with a total gold content of 99 metric tons. It is located in the Bogosu district of the Ashanti Structural Belt, West African craton, Ghana. The Ashanti Fissure is a regional NNE- to NE-trending fault at the contact of the Birimian and Tarkwaian sequences along which many gold deposits are aligned. Disseminated sulphide mineralization and very minor quartz veins are hosted by greenschist grade, turbiditic sediments and greywackes of the Early Proterozoic Birimian Supergroup, and by crosscutting gabbro and diorite dykes. Ore mineralogy is dominated by pyrite and arsenopyrite (gold being strongly associated with the latter), with lesser pyrrhotite (altered to marcasite near surface), sphalerite, chalcopyrite, aurostibite, bornite, bournonite, tetrahedrite, boulangerite, jamesonite and galena. The deposit is structurally controlled by NNE- to NE-trending, brittle shear zones and is interpreted to be at a higher structural level than the nearby Prestea deposit (Mummin *et al.*, 1996). Hydrothermal alteration consists of sulphidation along the shear zones, and of carbonate and sericitic alteration (ankerite-siderite-sericite-chlorite-quartz), notably in the metavolcanic rocks and mafic dykes, but also occuring to a lesser degree in the metasediments. Graphite is common in the mineralized and altered area. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Pb-Cu-Zn-Ti-Ba.

320 Prestea is an Early Proterozoic, turbidite-hosted quartz-carbonate vein gold deposit with a total gold content of 325 metric tons. It is located in the Prestea-Bogosu district of the Ashanti Structural Belt, West African craton, Ghana. The NE-trending Ashanti Fissure is the main regional tectonic structure in the area. Gold-bearing massive, banded and brecciated quartz veins occur mainly within Early Proterozoic, lower greenschist grade, turbiditic carbonaceous phyllites and schists. Disseminated sulphides are hosted by tholeiitic metavolcanic rocks; however, such orebodies have not yet been exploited. Gangue mineralogy consists of quartz, ankerite, feldspar, chlorite, muscovite, epidote, sericite, tourmaline and fuchsite. Ore mineralogy is dominated by arsenopyrite and pyrite, with lesser chalcopyrite, sphalerite, galena, pyrrhotite, tetrahedrite, bournonite, boulangerite, jamesonite, ullmanite and gersdorffite. The deposit is structurally located on the limb of an overturned fold. Mineralization occurs in dilational zones related to NE-trending, brittle-ductile shearing parallel to the regional trend. The presence of graphitic and carbonaceous matter within the host phyllite appears to have played a role in gold deposition. Hydrothermal alteration is limited to the vein selvages, which show sericitic alteration (quartz-sericite-carbonate-rutile), minor chloritic alteration and sulphidation. Extensive carbonate alteration is ubiquitous in all rock types. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Pb-Cu-Zn-Cd.

325 Tarkwa is an Early Proterozoic paleoplacer gold deposit with a total gold content of 493 metric tons. It is located in the Prestea-Tarkwa district of the Ashanti Structural Belt, West African Craton in Ghana. The Tarkwa Syncline is the main regional structure in the area. Disseminated gold mineralization is hosted by greenschist grade oligomictic conglomerates and well-packed arkosic sandstones of the Banket series, which are part of the Tarkwaian rocks of Early Proterozoic age. Gold is mainly associated with the iron oxides hematite and magnetite, and, to a lesser degree, ilmenite. Pyrite, chalcopyrite, bornite and pyrrhotite are also present. Gangue mineralogy consists of heavy minerals such as zircon, rutile and monazite, with lesser carbonate and sericite. The Sumang fault, a local thrust, affects the host conglomerates, but the dominant control for ore distribution is lithological, i.e., the conglomerate reefs and well packed sandstone beds. Late, barren quartz veins occur throughout the deposit, with sulphidation of the oxides in the first few centimetres of the vein selvages. No hydrothermal alteration is specifically related to the gold mineralization. The metallic signature of the bulk of the ore is Au-Fe-Ti-Mn-Zr-Ce and reflects the genesis of the Tarkwa paleoplacer deposit.

4264 Damang is an Early Proterozoic(?) turbidite-hosted quartz-carbonate vein gold deposit with a total gold content of 82 metric tons. It is located in the Prestea-Tarkwa district of the Ashanti Structural Belt, West African Craton, Ghana. The Tarkwa Syncline is the main regional structure in the area. Sheeted quartz vein stockworks and associated disseminated sulphides are hosted by Early Proterozoic, greenschist grade polymictic conglomerate, quartzite and finer-grained sandstone of the Tarkwaian Group (Banket Series), and by (weakly mineralized) dolerite sills. Quartz is the main gangue minerals. Ore mineralogy consists of pyrite and pyrrhotite. Quartz veins are lenticular, and flat-lying to gently E-dipping. Mineralization is structurally controlled by the Damang Anticline, occuring in the core of the anticline, and on its eastern limb. The anticline is thought to be bounded on both sides by strike faults (Marston and Woolrich, 1997). Orebodies are best developed in metasediments located between less well-mineralized dolerite sills. The metallic signature of the bulk of the ore is unknown. The Damang deposit, despite its location near the Tarkwa and Abosso paleoplacers and similarities of host rocks, is clearly of hydrothermal origin (Marston and Woolrich, 1997).

GREECE

4204 Olympias is an Early Oligocene or younger, intrusion-related, Au-Ag-Pb-Zn manto deposit with a total gold content of 117 metric tons. It is located in the Kassandra mining district of the eastern Chalkidiki Peninsula, Servo-Macedonian massif, Tethyan Belt, northern Greece. Dominant tectonic structures in the area consist of NW-oriented faults bounding tectonomagmatic belts of variable metamorphic grade. Sulphide-rich veins and veinlets and stratabound to stratiform, massive to disseminated sulphides are hosted by calcitic to rhodochrositic marbles of the Paleozoic or older Kerdilia Formation of greenschist to amphibolite grade, and by a dense network of Middle Eocene to Early Oligocene tonalitic to granitic pegmatite-aplite dykes. Gangue mineralogy is dominated by quartz, rhodochrosite and calcite, with minor graphite. Ore mineralogy is dominated by pyrite, sphalerite, galena and arsenopyrite, with subordinate chalcopyrite, tetrahedrite, boulangerite, bournonite, pyrrhotite, marcasite, geocronite and enargite. The distribution of the mineralization is controlled by a lithological contact, where the ore horizon developed along the upper contact of the reactive lower marble horizon with the overlying biotite gneiss. Mineralization is also partly fault-controlled. Hydrothermal alteration consists of silicification and recrystallization of carbonates around the ore zones, along with a decrease in the amount of graphite. The pegmatites and lamprophyre dykes are affected by sericitization (sericite-carbonate-chlorite-sphene), and the nearby Stratoni granodiorite is affected by propylitic alteration (carbonate-chlorite-sericite-epidote-pyrite). The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Pb-Zn-Cu-As-Sb. Kilias *et al.* (1996) suggested that the Olympias fluids show a similarity in terms of salinity-temperature gradients with other Pb-Zn mineralizing fluid gradients formed in “granite”-related, low-*T* distal-skarn, skarn-free carbonate-replacement, and epithermal environments.

4205 Skouries is an Early Miocene, intrusion-related porphyry Au-Cu (Ag, Mo) deposit with a total gold content of 115 metric tons. It is located in the Kassandra mining district of the eastern Chalkidiki Peninsula, Servo-Macedonian massif, Tethyan Belt, northern Greece. Dominant tectonic structures in the area consist of NW-oriented, shallow to moderately dipping faults bounding tectonomagmatic belts of variable metamorphic grade. Quartz veins and veinlets, stockworks and disseminated sulphides are hosted by highly fractured, Early Miocene porphyritic sub-alkaline syenite stocks and associated dykes. Quartz is the dominant gangue mineral, with lesser calcite, K-feldspar and biotite. Ore mineralogy is dominated by bornite and chalcopyrite, with lesser magnetite, pyrite, and sphalerite, and minor galena, molybdenite, chalcocite, covellite, digenite, hematite and electrum. Emplacement of the host syenite was controlled by NE-trending, steeply-dipping normal faults defining an intrusive belt of the same orientation. Hydrothermal alteration is mostly restricted to the host syenite, indicating a largely self-sustaining and unaffected magmatic system. Early and weak actinolite-magnetite alteration is replaced by potassic alteration centered on the syenite body, represented by a K-feldspar-biotite-anhydrite-magnetite assemblage. Propylitic alteration characterized by chlorite-epidote-albite-calcite forms a halo <50 metres-wide around fractures and mineralized veins. Argillic alteration (illite-montmorillonite-sericite) forms penetrative halos around late calcite-pyrite veins. A late stage of strong propylitic alteration characterized by a chlorite-pyrite-specular hematite assemblage is associated with the late, disseminated stage of mineralization. The metallic signature of the bulk of the ore is Au-Cu-Ag-Mo-B-Bi-Co-Se-Te-Pd-Ba-Sr. An alkalic affinity such as discussed in Robert (2001) may be considered for the Skouries deposit.

GUINEA

4261 Siguiri is an Early Proterozoic(?) lateritized deposit with a total gold content of 107 metric tons. It is located in the Siguiri district of the Upper Niger basin area, Kangaba (or Siguiri) belt, West African craton, northeastern Guinea. The major regional tectonic structure in the area is the Senegal-Mali shear zone, a NS-oriented, ductile, sinistral strike-slip shear zone corresponding to the D_2 phase of the Eburnean orogeny. Quartz veins and stockworks are hosted by Early Proterozoic metasediments (flysch sequences of schists, sandstones and greywackes) of the Lower Birrimian Unit. Intense and pervasive weathering affected the rocks down to 140 metres in places. Ore consists mainly of lateritic caps and the underlying saprolite. The deposit shares affinities with turbidite-hosted quartz carbonate vein (Bendigo type) deposits, as suggested by the geologic setting of the rocks in the area and in nearby Mali.

GUYANA

298 Omai is a Late Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 109 metric tons. It is located in the Berbice-Boa Vista area of the Mazaruni greenstone belt, Guyana shield, Amazonian craton, Guyana (South America). The dominant regional tectonic structure in the area are the NW-trending, crustal scale Makapa-Kuribrong and Issano-Appaparu shear zones. Quartz-carbonate veins and stockworks are hosted mainly by quartz monzodiorite, diorite and granodiorite of the 2094±6 Ma Omai stock, and by quartz-feldspar porphyry and rhyolite dykes dated at 2120±2 Ma. A minor part of the ore is hosted by tholeiitic basalts, andesites and metapelites. Gangue mineralogy is dominated by quartz, ankerite, albite and calcite, with lesser rutile, tourmaline, chlorite, sericite, epidote, apatite and monazite. Pyrite and scheelite are the dominant ore minerals, with minor pyrrhotite, magnetite, chalcopyrite, galena, sphalerite and tellurides such as petzite, calaverite, hessite, tellurobismuthite, altaite and coloradoite. The distribution of the veins is structurally controlled by the Wenot shear zone, a WNW-trending, steeply-dipping, brittle/ductile shear zone parallel to regional foliation, and by NE-striking, brittle subhorizontal to shallowly-dipping fractures emplaced between the main shear zones. Late, NS- trending faults such as the Omai River fault, and many others in the Wenot pit, affected the orebodies. Proximal alteration of the felsic and intrusive rocks consists of a sericitic assemblage of sericite-ankerite-calcite-albite. Equivalent alteration in the mafic host corresponds to a propylitic assemblage represented by chlorite-albite-epidote-carbonate. Pyritization is also present in both type of hosts. Distal alteration in all types of host rocks consists of carbonatization, characterized by a calcite-ankerite-dolomite-sericite-chlorite-quartz assemblage. Silicification is also present in places where the veins are closely spaced. The metallic signature of the bulk of the ore is Au-Ag-Te-W-Bi-Pb-Zn-Cu-Hg-Mo.

HUNGARY

4129 Lahoca is a Late Eocene, high-sulphidation epithermal Au-Cu deposit with a total gold content of more than 33 metric tons in combined past production and existing resources. It is located in the Recsk area of the Pannonian Depression, Carpathian-Balkan arc, Carpathian Mountains, Hungary. The deposit lies in the NE- to NNE-trending Darno structural zone, the dominant regional tectonic structure in the area. Quartz vein and disseminated sulphides are hosted by Late Eocene, altered andesites. Gangue mineralogy is dominated by quartz and barite, with minor calcite, zeolites, dolomite, siderite and clay minerals. Enargite, luzonite and pyrite are the dominant ore minerals, with lesser sphalerite, galena, tetrahedrite, famatinite, chalcopyrite, melnikovite, bornite, chalcocite, stannite, emplectite, wittichenite, electrum, covellite, hessite, petzite and fischesserite. Mineralization occurs along NW- and N-trending faults and their intersections. It is also controlled by volcanic breccias. Hydrothermal alteration consists of proximal silicic alteration with vuggy silica in the ore zone, surrounded by advanced argillic alteration (alunite-kaolinite). The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-Zn-Pb-Bi-Se-Te. The epithermal deposit is spatially and genetically related to the large-size Recsk porphyry-skarn-manto Cu-Mo-Zn-Pb system (Baksa *et al.*, 1980; Herrington *et al.*, 2000), containing a total of about 770 Mt @ 0.66% Cu (Herrington *et al.*, 2000).

INDIA

300 Kolar is a Late Archean, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 838 metric tons. It is located in the Kolar Gold Fields area of the central Kolar greenstone belt, Dharwar craton, southern India. N- to NNW-trending folds are the dominant regional tectonic structures in the area. Sheeted quartz-carbonate veins are hosted by middle to upper amphibolite grade, tholeiitic to komatiitic pillowed basalts, gabbro and pyroxenite sills. Stratiform disseminated sulphide lodes are hosted by iron formation. These rocks are part of the Late Archean Gold Field Volcanics Formation. Quartz and calcite are the dominant gangue minerals of the veins, which contributed for about 97% of the ore, with lesser amphiboles, plagioclase, epidote, chlorite, tourmaline, muscovite, apatite and graphite. Ore mineralogy of the veins is dominated by pyrite and pyrrhotite, with lesser arsenopyrite, sphalerite and minor loellingite, pentlandite, galena and tellurides. Sulphide lodes are dominated by pyrrhotite and arsenopyrite, with lesser chalcopyrite, sphalerite and pyrite. Structural control is provided by two major NS-trending, steeply-dipping to subvertical ductile shear zones subparallel to belt boundaries and lithological contacts. Movement along the shears is interpreted as mainly vertical, with some dextral component (Hamilton and Hodgson, 1987). Deformation was localized at the lithological contacts, which in turn localized fluid flow. NNW-trending, steeply-dipping, brittle-ductile shears crosscut the NS-trending shear zones at a low angle, and their intersections are the locii of major ore shoots. Width of the ore zone is controlled by the amount of displacement along the NNW-trending shears. Orebodies are offset by two sets of late brittle conjugate faults; a SE-trending, steep sinistral strike-slip set in the southern part along the Champion Reef (such as the Tennants, Mysore north and Giffords Fault System), and a NE-trending set of steep to subvertical dextral strike-slip faults on the north side of the Champion Reef and in the Nundydroog mine. Hydrothermal alteration associated with the veins consists of a proximal calc-silicate alteration envelope of diopside-garnet-calcite-sericite-chlorite around the veins, grading outward to a dark hornblende zone, and to a distal biotite alteration zone. Biotite alteration is also associated with the sulphide lodes, consisting of proximal alteration a few centimeters thick. The metallic signature of the vein ore (partly inferred from its mineralogy) is Au-Ag-As-W-B-Ni-Cr, and the metallic signature of the sulphide ore is Au-As-Mn-Cd-Co-Cu-Cr-Ni-Pb-Zn.

1784 Hutti is a Late Archean(?), quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 199 metric tons. It is located in the Hutti-Maski greenstone belt of the Dharwar Craton, Raichur district, Karnataka state, India. NW- to NNW-oriented anticlinal folds are the dominant regional tectonic structures in the area. Quartz-carbonate veins and associated disseminated sulphides are hosted by greenschist to lower amphibolite grade, pillowed vesicular basalt flows and chlorite-biotite schists of the Archean Buddinne Formation. Gangue mineralogy is dominated by quartz and ankerite, with lesser calcite, chlorite, biotite, sericite and minor tourmaline. Ore mineralogy is mainly arsenopyrite, pyrrhotite and pyrite, with lesser chalcopyrite, scheelite and sphalerite, and minor galena. Orebodies occur within NNW-, NNE- and NE-trending fracture sets related to a larger N- to NNW-trending, brittle-ductile shear zone more than 40 km long, which is itself related to F_2 regional folding. The intrusive contact between granite and basalts also localized some of the mineralization. Hydrothermal alteration consists of ubiquitous carbonatization of the basalts, and of chloritization, biotitization, silicification and sericitization. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-W-Hg-Bi.

INDONESIA

2143 Cabang Kiri is a Late Pliocene, intrusion-related porphyry Au-Cu deposit with a total gold resource of 79 metric tons. It is located in the Tombulilato district of the Gorontalo region, Sulawesi-East Mindanao Arc, North Sulawesi, Indonesia. EW-trending, moderate to high-angle normal faults, and several randomly-oriented district-scale low-angle thrust faults, are the dominant regional tectonic structures. Disseminated sulphide mineralization at depth and stockworks at higher levels are mainly hosted by an Early to Late Pliocene, porphyritic to equigranular diorite stock. Andesites and rhyolites of the Late Pliocene Motomboto Volcanics host some minor mineralization. Ore mineralogy is dominated by chalcopyrite, pyrite and bornite. No structural control is associated with the deposit. Hydrothermal alteration consists of a well-mineralized central and deep potassic alteration zone of quartz-magnetite-biotite, surrounded by a propylitic alteration zone. Vertical zoning of alteration is emphasized by the upward grading of potassic alteration into an overprinting sodic alteration assemblage of albite-magnetite-chlorite-amphibole-pyrite, to an intermediate argillic alteration zone of sericite-illite-chlorite, and into a late, shallow steam-heated advanced argillic alteration zone of quartz-diaspore-alunite-(pyrophyllite). The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu.

2145 Grasberg is a Late Pliocene, intrusion-related porphyry Au-Cu-Ag deposit with a total gold content of 2078 metric tons. It is the largest know gold-copper porphyry in the world, being the largest lode gold and the second largest copper producer. The Grasberg deposit is located in the Ertsberg mining district within the Irian-Papuan Fold Belt of the Medial Irian Jaya arc, New Guinea-Australia Block, Irian Jaya, Indonesia. The Front Ranges Fault, a NW-trending, high-angle reverse fault (and associated folding) is the dominant tectonic structure in the area. Disseminated sulphides and high-grade stockworks are hosted by spatially coincident Late Pliocene monzodiorite porphyry of the Main Grasberg stock, brecciated and porphyritic dioritic to monzodioritic rocks of the Dalam Diatreme and porphyritic monzonite of the South Kali Dike. Gangue mineralogy is dominated by quartz and magnetite, with lesser anhydrite, biotite and orthoclase. Chalcopyrite and bornite are the dominant ore minerals, with subordinate digenite, chalcocite, covellite and marcasite. The intrusive breccia of the Dalam Diatreme structurally controlled the later emplacement of the monzodioritic intrusions of the Main Grasberg Stock. NW-trending, high-angle reverse faults parallel to the regional trend (such as the Hanging Wall, Fairy Lakes and Yellow Valley Axial Faults) are dominant structural controls on the mineralization and alteration events. The intrusive contacts of the (NW-trending) Kali dykes channeled the hydrothermal fluids and were of prime importance in localizing the mineralization. A later, NE-trending, steeply-dipping, sinistral strike-slip fault set (such as the Carstenz, Grasberg and North Grasberg Faults) offset the earlier NW trend. Hydrothermal alteration may be related to each separate phase of intrusion. Potassic alteration at the Dalam stage is extensive and intensive, characterized by a quartz-orthoclase assemblage with added biotite and magnetite in zones of less intense alteration. The Main Grasberg phase is represented by a dominantly biotitic stage with lesser quartz-orthoclase, and is controlled by stockwork veining. The South Kali dikes potassic alteration is confined to narrow selvages of biotite and K-feldspar along the veinlets and quartz-K-feldspar-biotite-magnetite in the groundmass. Potassic alteration grades into a phyllic alteration assemblage of sericite-quartz-pyrite, which is well-developed at the Dalam stage but rather weak during the two other intrusive stages. Argillic alteration is a shallow alteration characterized by sericite-smectite-montmorillonite-kaolinite-pyrite, and associated to each intrusive phases, but most strongly at the Dalam stage. It is unclear whether this argillic alteration is hypogene or supergene. Minor propylitic alteration is noted in the Dalam volcanic rocks, and skarn development at depth was discovered through drilling. The metallic signature of the bulk of the ore is Au-Cu-Ag-Mo-Pb-Zn-Sn-W. The original model of a multiphase intrusive system of MacDonald and Arnold (1994), in which each igneous phase introduced its own hydrothermal alteration and mineralization, is challenged by Pennington and Kavalieris (1997). The latter have suggested a model whereby the copper-gold mineralization is a late-stage event, independent of rock types that postdates nearly all intrusive phases. They suggested that the distribution of high-grade ore is largely a function of host rock permeability, and that hydrothermal fluids are not exsolved from stocks at current mining levels but from a deeper source (Pennington and Kavalieris, 1997). Timing relationships between the Grasberg Igneous Complex and the Kucing Liar orebody are still controversial, however Widodo *et al.* (1998) suggested that the Kucing Liar orebody may be genetically related to a deeper intrusion underlying the Grasberg Igneous Complex.

2146 Kelian is an Early Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 184 metric tons. It is located in the Kelian district of the Central Kalimantan Arc, Sunda Land cratonic plate, Kalimantan state, Indonesia. The deposit occurs along a NE-trending, 400 km-long belt of Tertiary volcanic-hosted gold deposits. The regional structure is dominated by a broad, N- to NE-trending anticline. Disseminated sulphides, hydrothermal breccias, vuggy and brecciated quartz-carbonate veins and sulphide veins are hosted by Late Eocene felsic tuffs, Late Oligocene to Early Miocene diorites (sub-volcanic andesites) and minor Late Eocene to Late Oligocene sandstones, siltstones and limestones. Gangue mineralogy is dominated by quartz and adularia, with lesser sericite, siderite and rhodocrosite. Pyrite is the dominant ore mineral, with subordinate sphalerite and galena, and minor chalcopyrite, arsenopyrite, stibnite, marcasite, cinnabar, digenite, covellite, argentite, acanthite, and tetrahedrite-tennantite. The West Prampus Fault is a NS-trending (which becomes NE-trending to the north), steeply W-dipping normal fault which structurally controlled the fracturing and veining in the area. Tuffaceous units are much more permeable and allowed for extensive fluid circulation and mineralization/alteration. Hydrothermal breccias at the contact between the andesites and the pyroclastic rocks host the higher grade mineralization. Widespread sericitization (sericite-quartz-pyrite) in the pyroclastic rocks and sediments with propylitic (chlorite-calcite-sericite-pyrite) alteration in the less permeable diorite form the first alteration stage (synchronous with hydrothermal breccia formation). The second stage of alteration (linked with mineralization) is characterized by sericitization and potassic metasomatism of pyroclastic rocks along shear zones and adjacent to veins, and is represented by an assemblage of sericite-quartz-adularia-carbonate. Silicification of the sediments and pyroclastics is also present. A last stage of renewed magmatic activity produced intense hydraulic fracturing and brecciation, with widespread formation of bladed carbonate which indicates intense boiling. In the waning stages of the hydrothermal system, interaction of the hydrothermal system with surficial, steam-heated fluids produced an argillic alteration assemblage of kaolinite-dickite-sericite-siderite-rhodocrosite-pyrite. The metallic signature of the bulk of the ore is Au-Ag-Ba-Cu-Pb-Zn-As-Sb-Hg. Formation temperatures of over 300^{o}C, high salinities, presence of mineralized intrusives and poor development of quartz veins and silicification are thought to indicate that the Kelian deposit represents a transitional stage deposit between a porphyry and an epithermal environment (van Leeuwen *et al.*, 1990).

2147 Mount Muro is a Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 40 metric tons. It is located near the Kelian district in the Central Kalimantan Arc, Sunda Land cratonic plate, Central Kalimantan, Indonesia. The deposit occurs along a NE-trending, 400 km-long belt of Tertiary volcanic-hosted gold deposits; the regional structure is dominated by large NW- and NE-trending lineaments probably corresponding to regional faults. Banded, crustiform and cockade-textured quartz veins and hydrothermal breccias with associated disseminated sulphides are hosted by Oligocene-Miocene porphyritic andesite flows, gabbro (basaltic andesite) intrusions and volcanic breccias (lithic tuffs). Quartz is the dominant gangue mineral, with lesser adularia and subordinate calcite and rhodochrosite. Ore mineralogy is dominated by pyrite, with lesser sphalerite, galena, chalcopyrite, covellite, acanthite, electrum, polybasite and rare native silver. Quartz veins occur in a number of parallel, NNW-trending, moderately- to steeply E- and W-dipping fractures whose direction corresponds to the main extension direction. A second set of WNW-trending, steeply-dipping faults is also mineralized. Mineralized veins are crosscut by the NW-trending regional lineaments. Hydrothermal alteration consists of proximal silicification, surrounded by a predominant halo of sericitic alteration characterized by a quartz-illite-pyrite±albite±chlorite assemblage in the andesites, and a halo of propylitic chlorite-epidote-albite±pyrite±illite±calcite alteration in the tuffs and less permeable gabbro host. Intense sericitic alteration zones are crosscut by potassic metasomatism with stockworks and groundmass replacement of quartz-adularia±calcite±pyrite. A late-stage, steam-heated alteration overprint by descending meteoric fluid produced an argillic alteration assemblage of kaolinite-halloysite, and dissolved adularia and carbonate gangue minerals, allowing oxidation down to depths of 100 metres. The metallic signature of the bulk of the ore is Au-Ag-Zn-Pb-Cu-As-Sb.

2152 Mesel (Minahasa) is a Pliocene, sediment-hosted micron gold (Carlin type) deposit with a total gold content of 60 metric tons. It is located in the Ratatotok district, Ratatotok Basin, Sulawesi-East Mindanao Arc, North Sulawesi, Indonesia. The deposit is located just west of a major NNW-trending magnetic lineament, which is the surface expression of a NNW- to WNW-trending, steeply-dipping sinistral-reverse fault set. Disseminated sulphide mineralization is hosted by altered and brecciated silty limestones and calcareous argillites of the Late Miocene Ratatotok Limestone Formation. Pyrite, arsenian pyrite and marcasite are the main ore minerals, with late-stage realgar, orpiment, cinnabar, stibnite and native antimony in fractures. Quartz occurs in vugs and calcite, gypsum and kaolinite accompanied the late-stage minerals. A NNW-trending high-grade zone in the Mesel central area corresponds to the intersection of a NNW-trending, steeply-dipping, sinistral strike-slip fault and an EW-oriented reverse fault, which produced a dilational jog that focused fluid flow. The diorite-limestone contact served as an important hydrothermal fluid conduit, and constrained the occurrence of orebodies to the favorable reactive limy horizons, capped by a (relatively) impermeable diorite sill. Early decarbonatization of the limestones produced breccias and enhanced the porosity of the host rocks. This alteration is followed by zones of partial dolomitization and intense silicification (especially along faults), to which is associated the main mineralization event. Late-stage calcite veins and dolomite veins are peripheral to, and overprint, the mineralization. Diorite in the wallrock next to the orebody is argillized up to 20 metres away by an assemblage of illite-smectite-kaolinite-dickite-alunite-halloysite. The metallic signature of the bulk of the ore is Au-As-Sb-Hg-Tl.

2153 Gunung Pani is a Miocene or younger, low-sulphidation epithermal Au-Ag deposit with a total gold resource of 10 metric tons. It is located in the Marisa area, Sulawesi-East Mindanao Arc, North Sulawesi, Indonesia. Rocks of the Pani Volcanic Complex are thought to form a probable caldera of 3.5 km in diameter (Kavalieris *et al.*, 1990), which is the dominant regional structure. Hydrothermal breccia, quartz vein and disseminated sulphide mineralization is hosted by Miocene or younger, calc-alkaline porphyritic rhyodacite flow domes, rhyodacite lapilli tuffs and granodiorite dykes. Gangue mineralogy is dominated by quartz and adularia, with lesser anatase. Ore mineralogy is dominated by pyrite, with minor electrum, galena, sphalerite, chalcopyrite and acanthite (the latter in oxidized veins). Mineralization occurs along irregular contacts of silicified rhyodacite intrusions. NE- to NNE-trending structures (faults?) partly controlled the distribution of the mineralization. Silicification of the pyroclastic rocks above the volcanic dome is pervasive. Potassic metasomatism characterized by quartz-adularia replacement of the rhyodacite occurs in the groundmass and lining vugs and fractures. Sericite-carbonate alteration with manganiferous carbonate (rhodochrosite) is widespread throughout the deposit. Propylitic alteration (chlorite-albite-pyrite) is also widespread, but preceded adularia veining. Late, supergene oxidation represented by limonite-hematite-Mn-oxides-barite-goethite is present down to depths of 120 metres. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-As.

2160 Lebong Tandai is a Pliocene(?), low-sulphidation epithermal Au-Ag deposit with a total gold content of 44 metric tons. It is located in the Lebong mining district of the Barisan Mountains, Sunda-Banda Arc, Sunda Land, Western Sumatra, Indonesia. The dominant regional tectonic structure is the Sumatran Fault System, a NW-trending series of dextral strike-slip faults which parallel the Sumatra trench. Breccia veins and hydrothermal fault breccias with cockade textures are hosted by Middle Miocene to Pliocene volcaniclastic polymictic conglomerates, tuffs, agglomerates and andesites. Quartz is the dominant gangue mineral, with abundant chlorite and lesser adularia and calcite. Ore mineralogy consists of pyrite, chalcopyrite, sphalerite, galena, electrum, acanthite, pearceite, polybasite, hessite, cervelleite and late covellite and digenite. Veins and breccias are structurally controlled by E-trending, steeply-dipping sinistral strike-slip faults (and related riedel shears), and also by NW-trending, steeply-dipping dextral strike-slip faults (and related riedel shears) parallel to the regional trend. Hydrothermal alteration consists of a proximal zone of silicification (1 to 2 metres wide) grading outward to an intermediate sericitic alteration zone (15-20 m wide) of sericite-pyrite-illite-smectite, and to a distal propylitic assemblage of chlorite-pyrite reaching as far away as 200 meters. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Cu-Pb-Zn-Te. It is suggested by Jobson *et al.* (1994) that mineralization corresponds to a dip-slip reverse reactivation of the strike-slip faults, where deposition of silica, sulphides and precious metals occurred in response to boiling associated with fluid decompression.

2161 Lebong Donok is a Tertiary, low-sulphidation epithermal Au-Ag deposit with a total gold content of 42 metric tons. It is located in the Lebong mining district of the Barisan Mountains, Sunda-Banda Arc, Sunda Land, Western Sumatra, Indonesia. The dominant regional tectonic structure is the Sumatran Fault System, a NW-trending series of dextral strike-slip faults which parallel the Sumatra trench. Banded quartz veins and veinlets are hosted by Tertiary carbonaceous shales and overlying calc-alkaline volcanic rocks (andesites?). Gangue mineralogy is dominated by quartz and chalcedony, with lesser adularia and calcite, and minor truscottite. Ore mineralogy, with sulphide content <2%, consists of electrum, pyrite, chalcopyrite, galena, sphalerite, As-Sb sulphosalts, Ag-Cu selenides and diverse tellurides. Veins are structurally controlled by steeply-dipping faults. Hydrothermal alteration consists of zones of K-metasomatism (quartz-adularia-pyrite), sericitic alteration (sericite-illite-pyrite) and propylitic alteration (chlorite-epidote-pyrite), probably zoned from the veins outward in that order. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Cu-Pb-Zn-Te.

2162 Gunung Pongkor is a Late Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 82 metric tons. It is located on the northeastern flank of the Bayah dome within the Sunda-Banda Arc, Sunda Land cratonic plate, West Java, Indonesia. The dominant regional tectonic structures in the area are NW- and WNW-trending strike-slip (dextral and sinistral) faults related to subduction, and a nearby volcanic collapse structure. Colloform, cockade and breccia quartz-carbonate veins are hosted by Oligocene to Middle Miocene calc-alkaline andesites, basalts, lapilli tuffs, tuff breccias and intruding diorite. Gangue mineralogy is dominated by quartz, calcite and adularia, with minor illite-smectite, kaolinite, barite, chlorite, albite and rare zeolites. Electrum, argentite manganese oxide and pyrite are the dominant ore minerals, with lesser iron oxides and trace amounts of sphalerite, stibnite, cinnabar, acanthite, aguilarite and polybasite. Quartz-carbonate veins at Pongkor are structurally controlled by NW-trending, steeply-dipping, dextral strike-slip faults. Hydrothermal alteration consists of proximal silicification well developed around the veins and in the tuff units, grading into hundreds of meters of argillic illite-smectite alteration (mostly in the tuff units), and to a distal propylitic assemblage of chlorite-epidote-carbonate-quartz, which is found mainly in the andesites and diorites. The (very weak) metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-As-Sb-Mo-Te-Ti-Ba-Hg.

4142 Kucing Liar is a Late Pliocene, intrusion-related Au-Cu-Ag skarn deposit with a total gold content of 589 metric tons. It is located in the Ertsberg mining district within the Irian-Papuan Fold Belt of the Medial Irian Jaya arc, New Guinea-Australia Block, Irian Jaya, Indonesia. The Front Ranges Fault, a NW-trending, high-angle reverse fault (and associated folding) is the dominant tectonic structure in the area. Disseminated sulphides and sulphide-rich veins and veinlets are hosted by bedded dolomites and quartz sandstones of the Paleocene Waripi Formation, by Jurassic-Cretaceous sandstones of the Ekmai sandstone, and by limestones of the Kembelangan limestone. Ore mineralogy is dominated by pyrite, chalcopyrite and covellite, with lesser pyrrhotite, galena, molybdenite and sphalerite. The role of NW-trending, high-angle reverse faults parallel to the regional trend (especially the Idenberg 1 fault along which the Kucing Liar orebody is found), whether these faults served as a fluid conduit for skarn mineralization or only offset the orebody, is unknown. NE-trending, steeply-dipping, sinistral strike-slip faults such as the Grasberg, Carstensweide and New Zealand Pass faults, displaced the NW trend. Prograde skarn assemblage and alteration began with pyroxene and K-feldspar, followed by quartz stockworks formation and with, in sequence, formation of monticellite, phlogopite, garnet, biotite, epidote and magnetite. Sericitization (quartz-sericite-pyrite) is also associated with the prograde phase. Sulphide replacement followed the widespread magnetite formation event, infiltrating along the fractures in the magnetite host. Retrograde alteration is characterized by formation of tremolite-actinolite and late quartz-anhydrite stockworks. Superimposed hydrothermal breccias and intrusive rocks are pervasively argillized. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-Mo. Timing relationships between the Grasberg Igneous Complex and the Kucing Liar orebody are controversial, however Widodo *et al.* (1998) suggest that the Kucing Liar orebody may be genetically related to a deeper intrusion underlying the Grasberg Igneous Complex.

4202 Batu Hijau is a porphyry Au-Cu deposit with a total gold content of 478 metric tons. It is located in the center of the Sunda-Band arc of the Sunda Land cratonic plate, southern Sumbawa Island, West Nusa Tenggara province, Indonesia. Regional structure is dominated by steep ESE-trending and NE-trending lineaments which may represent arc-parallel and arc-normal faults related to Tertiary subduction. Quartz stockworks (sometimes vuggy) and disseminated sulphides are hosted by a calc-alkaline porphyritic tonalite intrusive complex (an older stock intruded by younger dykes), and by the hornblende diorite and Miocene greenschist grade andesitic wallrocks. Quartz is the dominant gangue mineral, with lesser magnetite and minor chlorite and sericite. Ore mineralogy is dominated by chalcopyrite and bornite, with lesser pyrite, chalcocite and digenite, and minor molybdenite, electrum, sphalerite, galena and tennantite. The intrusive contact between the volcaniclastic succession and the quartz diorite stocks controlled the emplacement of the host tonalites. Veins and small dykes are aligned parallel to NE-trending faults and fractures. NW-trending, moderately- to steeply-dipping en-echelon faults post-date mineralization. Early pervasive potassic alteration (biotite-magnetite-quartz) is formed at the core of the porphyry within the tonalite stock. This translates at lesser depth and distally into aluminous alteration (andalusite-antophyllite). A later, strong propylitic (chlorite-epidote-magnetite-calcite-pyrite) alteration occurs peripheral to the potassic alteration. Late phyllic (quartz-sericite-pyrite) alteration and intermediate argillic (sericite-chlorite-hematite-pyrite-smectite) alteration occur along veins and fractures, and overprint the potassic alteration zone, extending outward into propylitic alteration. Sodic alteration consisting of fracture-controlled albite flooding overprints the potassic, intermediated argillic and phyllic alteration zones. High-level advanced argillic alteration with development of kaolinite-quartz-alunite-pyrophyllite-tourmaline occurs E and W of the potassic alteration zones along linear structures, with argillic alteration characterized by sericite-kaolinite-pyrite surrounding and underlying the advanced argillic zone. Those last two alterations are probably the result of descending meteoric fluids (Meldrum *et al.*, 1994). Low-temperature zeolite alteration, represented by the assemblage stilbite-laumontite±calcite, fills open spaces. Supergene oxidation may be present (especially in the argillized zone) down to 210 metres, and is characterized by the formation of a weak copper enrichment zone in a thin horizon that blankets the top of the deposit. The metallic signature of the bulk of the ore is Au-Ag-Cu-Mo.

JAPAN

3228 Hishikari deposit is a high-grade, Pleistocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 297 metric tons. It is located in the Hokustatsu district of the Kagoshima Graben, Japan Arc, southern Kyushu island, Japan. The deposit lies immediately west of the Kakuto caldera, the main regional tectonic structure in the area. Crustiform and banded quartz veins are hosted by low metamorphic grade (prehnite-pumpellyite) shales and sandstones of the Cretaceous Shimanto Supergroup, and by the unmetamorphosed Pleistocene calc-alkaline andesites and andesitic pyroclastics of the Hishikari Lower Andesites. Quartz is the dominant gangue mineral, with up to 30% adularia, and minor smectite, sericite, chlorite, kaolinite, and rare carbonates, gypsum, truscottite, xonotlite, wairakite and laumontite. Ore mineralogy is dominated by electrum, naumannite-aguilarite, pyrargyrite, chalcopyrite, pyrite and marcasite, with lesser sphalerite, galena, stibnite, tetrahedrite, miargyrite, hessite, Ag-Au selenides, acanthite, greenockite (Cd-sulphide), and hematite. Quartz veins are localized along NE-trending, steeply-dipping normal faults forming pull-apart structures. An important ore-controlling structure is the unconformity between the sedimentary rocks of the Shimanto Supergroup and the andesitic volcanics of Quaternary age, near which extremely high-grade orebodies occur due to a ponding effect induced by the overlying sediments. Hydrothermal alteration consists of concentric halos of proximal chlorite-sericite alteration around the orebodies, grading outward to an intense inner argillic alteration zone of interstratified chlorite-smectite-sericite and an outer argillic alteration zone of quartz-smectite-kaolinite-halloysite. A distal silicification-argillic zone of cristobalite-smectite-kaolinite-halloysite grades into unaltered rocks. Incipient potassic metasomatism in the first two alteration zones is noted by the common presence of adularia. Sporadic alunite-quartz-cristobalite alteration occurs at higher elevations, east of the deposit. The metallic signature of the bulk of the ore is Au-Ag-As-Cu-Pb-Zn-Sb-Se-Hg. Evidence of boiling, as indicated by lamellar quartz and bladed carbonates, is common. Geophysical surveys have shown the probable presence of partially molten rocks at depth, and also the presence of a shallow intrusion beneath the Hishikari deposit.

KAZAKHSTAN

4001 Stepnyak is a Late Ordovician, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold resource of 10 metric tons. It is located in the Stepnyak metallogenic zone of the Stepnyak Synclinorium, Kazakhstan province of the Kazakhstan-North Tien Shan Massif, Kazakh plate, Kazakhstan. Regional structure is dominated by a N-trending (possibly reverse?) strike-slip fault between the Kokshetau Massif and the Stepnyak Synclinorium, and by a NW-trending strike-slip fault. The Stepnyak deposit is located near the intersection of the two regional fault trends, which controlled the emplacement of the host intrusives. Quartz veins, stockworks and associated disseminated sulphides are hosted by granodiorite, tonalite, norite, diorite and gabbro of the Late Ordovician Stepnyak Intrusive Complex, and by intruded Cambrian to Late Ordovician greywacke and clayey siltstone. Quartz is the dominant gangue mineral, with minor carbonates, chlorite and sericite. Ore mineralogy is dominated by pyrite with important galena, scheelite and stibnite, and minor arsenopyrite, pyrrhotite, chalcopyrite, cubanite, bornite, sphalerite, tetrahedrite and tellurides. Vein mineralization is structurally controlled by NE- and NW-trending shear fractures, which are probably splaying from the regional faults, whereas intrusive contacts localized stockworks and disseminated mineralization. Hydrothermal alteration associated with mineralization consists of metre-wide envelopes of phyllic alteration (beresite), represented by quartz-sericite-chlorite-dolomite, and carbonatization (listwenite), characterized by quartz-dolomite. Propylitic alteration (epidote-actinolite-albite-prehnite-orthoclase assemblage or K-propylitic) is associated with the intrusive rocks at depth, and a poorly developed albite-epidote assemblage (Na-propylitic) at shallower levels. Skarn alteration consisting of garnet-wollastonite-magnetite is also found as endoskarns, but these are mineralized only where phyllitized and cut by ore-bearing quartz veins. The metallic signature of the bulk of the ore is Au-Ag-Sb-As-Mo-Cu-Bi. Spiridonov (1996) suggested that mineralization was coeval with the peak of metamorphism, and related to intense fluid flow induced by the metamorphism.

4002 Vasilkovskoye is a Late Ordovician(?), intrusion-related porphyry gold deposit with a total gold content of 4 metric tons and a resource of 369 metric tons. It is located in the Kokchetav Massif area, within the Kazakhstan province of the Kazakhstan-North Tien Shan Massif, Kazakhstan. The NW-trending Dongulashky fault and the NE-trending Vasilkovskoye fault are the dominant regional tectonic structures in the area. Stockworks, quartz veins and associated disseminated sulphides are hosted by Middle Ordovician to Late Ordovician granodiorite and by Late Proterozoic to Late Cambrian gabbro-diorite intrusive complexes. Gangue mineralogy is mainly quartz. Ore mineralogy is dominated by arsenopyrite, with lesser pyrite and minor bismuthinite, chalcopyrite, sphalerite, galena, molybdenite, stibnite, tennantite, scheelite and Bi tellurides. Emplacement of the host intrusions was controlled by the intersecting regional faults.

Hydrothermal alteration consists of a proximal sericitic alteration enveloping the veins and sulphidation (arsenopyrite-pyrite), grading to broad distal zones of feldspar alteration. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-W-Pb-Cu-Bi-Te. Thompson *et al.* (1999) associated the Vasilkovskoye deposit to a class of intrusion-related deposits occurring in tungsten-tin magmatic provinces, along with Fort Knox (USA) and Mokrsko (Czech Republic).

4003 Aksu is a Late Ordovician quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold resource of 94 metric tons. It is located in the Aksu-Zholymbet district, North Kazakhstan metallogenic province province of the Kokchetau-North Tien Shan fold system, Kazakh plate, Kazakhstan. Regional structure is dominated by the Yeshkeul'mes anticlinorium, and by the intersection of the Aqmola Fault, a N-trending, transcrustal strike-slip fault, with a NE-trending strike-slip fault. This intersection controlled the emplacement of the host intrusions. Quartz vein and stockwork mineralization is hosted by granodiorite, gabbro and quartz gabbro of the Late Ordovician Krykkuduk Intrusive Complex, and by intruded Cambrian-Ordovician shales. Quartz is the dominant gangue mineral, with calcite, chlorite and sericite. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, sphalerite, galena, tetrahedrite and pyrrhotite. Telluride minerals (tellurobismuthite, tsumoite, altaite, werhlite, tetradymite, montbrayite, calaverite, krennerite, sylvanite, petzite) are closely associated with gold mineralization. Quartz vein mineralization is structurally located at the contacts of NE-trending, steeply-dipping granodiorite and spessartite dykes of the Krykkuduk Complex. Ore is also controlled by strike-slip faults of the same orientation. Hydrothermal alteration consists of proximal sericitic alteration (beresite), represented by quartz-sericite-chlorite-dolomite, and carbonatization (listwenite), characterized by quartz-dolomite. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Pb-Cu-Zn-Bi-Sb-Hg-Te. Spiridonov (1996) suggested that mineralization formation was coeval with peak metamorphism, and related to intense fluid flow induced by the metamorphism.

4004 Bestobe is a Late Ordovician, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold resource of 81 metric tons. It is located in the Stepnyak metallogenic zone of the Selety Synclinorium, Kazakhstan province of the Kazakhstan-North Tien Shan Massif, Kazakhstan. Regional structure is dominated by a NE- to N-trending, transcrustal strike-slip fault between the Eshqiolmes Anticlinorium and the Selety Synclinorium (parallel to the Aqmola Fault), and by another regional NW-trending strike-slip fault. Quartz-carbonate veins, stockworks, disseminated sulphides and hydrothermal breccias are mainly hosted by granodiorite, tonalite, norite, diorite and gabbro of the Late Ordovician Stepnyak Intrusive Complex (part of the Qryqquduk Intrusive Complex), and also by intruded flysch rocks (greywacke, lithic sandstone, siltstone, mudstone). Quartz is the dominant gangue mineral, with lesser calcite, chlorite and sericite. Ore mineralogy is dominated by pyrite, with lesser pyrrhotite, arsenopyrite, sphalerite and galena, and minor tellurides, scheelite, stibnite, cubanite, bornite, famatinite, geocronite, sulphosalts, native antimony, mackinawite, berthierite, aurostibite, tetrahedrite and miargyrite. Intersection of the two regional faults localized the emplacement of the Stepnyak Intrusive Complex. Mineralized veins and associated disseminated sulphides occur within NW- and NE-trending shears, which are probably splaying from the main structures. The contact between the intrusions and the sediments also localized most of the stockworks and associated disseminated sulphides. Hydrothermal alteration associated with the mineralization consists of metre-wide envelopes of phyllic alteration (beresite), represented by quartz-sericite-chlorite-dolomite, and carbonatization (listwenite), characterized by quartz-dolomite. The metallic signature of the bulk of the ore is Au-Ag-Sb-As-Mo-Cu-Bi. Spiridonov (1996) suggested that mineralization was coeval with the peak of metamorphism, and related to intense fluid flow induced by the metamorphism.

4005 Zholymbet is a Late Ordovician quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold resource of 81 metric tons. It is located in the Zholymbet-Aksu district, Stepnyak Synclinorium, Kazakhstan province of the Kazakhstan-North Tien Shan Massif, Kazakh plate, Kazakhstan. Regional structure is dominated by the Aqmola Fault, a N-trending, transcrustal strike-slip fault, and by other NE-trending strike-slip faults. The Zholymbet deposit is located at the intersection of the Aqmola Fault with a NE-trending fault, which controlled the emplacement of the host intrusive rocks. Quartz vein mineralization and associated disseminated sulphides are hosted by granodiorite, tonalite, norite, diorite and gabbro of the Late Ordovician Stepnyak Intrusive Complex, and by intruded Cambrian-Ordovician greywacke and clayey siltstone. Quartz is the dominant gangue mineral, with minor carbonates. Ore mineralogy is dominated by pyrite, together with important galena, scheelite and stibnite, and minor pyrrhotite and tellurides such as altaite, tellurobismuthite, melonite, and less common krennerite, sylvanite, petzite, hessite, calaverite and montbrayite. Quartz vein mineralization is structurally controlled by NE- and NW-trending shear fractures which are probable splays of the regional faults. Hydrothermal alteration associated with mineralization consists of metre-wide envelopes of phyllic alteration (beresite), represented by quartz-sericite-chlorite-dolomite, and carbonatization (listwenite), characterized by quartz-dolomite. Propylitic alteration (epidote-actinolite-albite-prehnite-orthoclase assemblage or K-propylitic) is associated with the intrusive rocks at depth, and a poorly developed albite-epidote assemblage (Na-propylitic) at shallower levels. Skarn alteration consisting of garnet-wollastonite-magnetite is also found as endoskarns, but these are mineralized only where phyllitized and cut by ore-bearing quartz veins. The metallic signature of the bulk of the ore is Au-Ag-Sb-As-Mo-Cu-Bi. Spiridonov (1996) suggested that mineralization was coeval with the peak of metamorphism, and related to intense fluid flow induced by the metamorphism.

4006 Abyz is a Devonian volcanogenic massive sulphide Au-Ag-Cu-Zn deposit with a total gold content of 29 metric tons. It is located in the Predchingiz zone of the West Kalba area, Zaisan foldbelt (Bozshakol-Chingiz fold system), Kazakh-Mongol magmatic arc, Kazakh plate, Karaganda province, Kazakhstan. The NS-oriented Central Kazakhstan deep fault and the Predchingizie synclinorium are the dominant tectonic structures in the area. Massive to disseminated (at depth) sulphide lenses are hosted by Devonian tuffaceous andesites and greywacke. Gange mineralogy consists of quartz, with lesser sericite, barite, chlorite, and minor calcite and zircon. Pyrite, sphalerite, chalcopyrite and galena are the dominant ore minerals, with subordinate tennantite and tetrahedrite, minor to rare gold, electrum, hessite, altaite, pyrrhotite, magnetite and hematite, and very rare kustellite, aikinite, native Te, coloradoite, tellurobismuthite, tetradymite, petzite, polybasite, proustite, pyrargyrite, stephanite, molybdenite, arsenopyrite, bornite, enargite and cubanite. Mineralization is located in a wedge-shaped horst bounded by the NS-oriented West Abyz and East Abyz faults. Hydrothermal alteration consists of beresite (sericitic) alteration characterized by a sericite-quartz assemblage, which grades at depth to a quartz-only silicification assemblage. The metallic signature of the bulk of the ore is Au-Ag-Ba-Cu-Zn-Pb.

4008 Bakyrchik is a Carboniferous non-carbonate-hosted, stockwork-disseminated gold deposit with a total gold content of 125 metric tons. It is located in the Kalba-Narymsk structural zone (Kalba gold belt) of the Kalbinsky Synclinorium, Zaisan Foldbelt, Kazakhstan-North Tien Shan, Kazakh Plate, northeastern Kazakhstan. The Kabinsky Fault Zone and the Northeast Fracture are two NW-trending, parallel, regional thrust fault zones and the dominant tectonic structures in the area. Disseminated sulphides and quartz veins are hosted by carbonaceous siltstones, sandstones, mudstones and claystones of the Early Carboniferous Kokpecty Formation. Pyrite and arsenopyrite are the main ore minerals, whereas quartz is the dominant gangue mineral. Mineralization is structurally controlled by (and localized within) W-trending, shallowly- to moderately-dipping (35^{o}) shears (such as the Kyzyl Shear) linking the two regional faults. Hydrothermal alteration of the host sediments consists of silicification, sericitization and carbonatization, characterized by an assemblage of quartz-chlorite-carbonate-albite-pyrite-arsenopyrite. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Pb-Zn-Te-Se.

4010 Akbakay is a Middle to Late Devonian(?) Possible quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 70 metric tons. It is located in the Akbakai district of the Zhalair-Naiman zone, Kokchetau-North Tien Shan fold system, Zhambyl, Kazakhstan. The deposit is localized at the intersection of three regional deep faults: the NW-trending Zhalair-Naiman fault, the EW-oriented, steeply-dipping Beskempir fault, and a NE-trending fault. Quartz veins and veinlets are hosted by Late Silurian to Early Devonian granodiorite of the Kzylzhartass massif, and by Ordovician sandstone and siltstone. Gangue mineralogy consists of quartz, adularia, and dolomite. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser bournonite, jamesonite, boulangerite, chalcopyrite, tetrahedrite, galena, sphalerite, bismuthinite, linneite, stibnite, electrum and native Sb. Mineralization is structurally controlled by a large EW-oriented, steeply-dipping subsidiary of the Beskempir fault, and several other smaller, moderately- to steeply-dipping shears oriented ENE or ESE. Hydrothermal alteration consists of proximal beresite (sericitic) alteration near the veins characterized by a quartz-albite-carbonate-sericite assemblage. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Cu-Pb-Zn. Presence of adularia and sulphide mineralogy may indicate a possible low-sulphidation epithermal setting for the mineralization.

4011 Arkarly is a Middle Triassic, low-sulphidation epithermal Au-Ag deposit with a total gold content of 56 metric tons. It is located in the Tien Shan of southwestern Dzhungaria, Kazakhstan. Regional structure is dominated by an E-trending, steeply-dipping, dextral strike-slip fault controlling the distribution of dikes and stocks, and by a NE-trending, steep to subvertical oblique-sinistral fault separating Mesozoic-Cenozoic basin from Paleozoic rocks, and which forms the southern boundary of the ore field. Quartz vein mineralization is hosted by Permian andesites, and by tuffs and ignimbrites of trachytic to dacitic composition. Quartz is the dominant gangue mineral, with adularia and chalcedony. Ore mineralogy is dominated by pyrite, with lesser galena, chalcopyrite and sphalerite. Mineralization is structurally controlled by three sets of WNW-trending dextral shears, EW-trending sinistral shears and NE-trending shears, all splays of the regional faults. Hydrothermal alteration consists of propylitic and argillic assemblages. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-

Ag-Pb-Cu-Zn. Ages of both host rock and mineralization differ from various sources; Safonov (1997) suggested a Devonian age for the mineralization, however Loskutov (1974) dated adularia from gold-bearing vein at 236 Ma and considered the host rocks to be of Upper Paleozoic age. Poulsen (1995) suggested a Permian age for both the host and the ore.

4249 Suzdal is an Early Carboniferous or younger, non-carbonate-hosted, stockwork-disseminated gold deposit with a total gold content of 26 metric tons, and a resource of 46 metric tons. It is located in the Zharma-Saur zone of the East Kazakhstan metallogenic province, Irtysh-Zaissan fold system, Kazakh plate, Semipalatinsk, Kazakhstan. The deposit is localized at the intersection of the NW-trending Gornostaevsky thrust fault and the NE-trending Suzdalsky fault, the two dominant regional tectonic structures in the area. Disseminated sulphides and gold mineralization are hosted by limestones and sandstones of the Early Carboniferous Arkarlyk Formation, and locally by Triassic rhyolite and tonalite porphyries. Gangue mineralogy consists of quartz, fluorite, barite and carbonate. Ore mineralogy consists of pyrite, pyrrhotite, arsenopyrite, chalcopyrite, tetrahedrite, cinnabar and scheelite. Mineralization is structurally controlled by the NE-trending, steeply-dipping Suzdalsky fault, and occurs in shatter zones within the fault. NW-trending small-scale faults locally controlled part of the ore. The siltstones and shales overlying the host limestones have acted as impermeable barriers to hydrothermal fluids. Hydrothermal alteration consists of silicification (jasperoid alteration) of the limestones in the shatter zones of the Suzdalsky fault, and of carbonatization (quartz-carbonate-pyrite) of the mineralized volcanic and intrusive rocks. A supergene weathering crust is an economically important part of the deposit. Gold in the weathered crust is associated with kaolinite and clay material, magnetite and oxidized pyrite, with hematite and goethite. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Hg-W.

4253 Akbastau-Kosmurun is a Middle to Late Ordovician Au-Cu-Zn volcanogenic massive sulphide deposit with a total gold content of 64 metric tons. It is located in the Akbastau district of the Baidaulet-Akbastau magmatic arc, Bozshakol-Chingiz fold system, Semipalatinsk, Kazakhstan. The Chingiz-Akchatau anticlinorium is the dominant tectonic structure in the area. The deposit is localized on the borders of the Akbastau-Kosmurun caldera, which is on the bend of a regional structure. Massive to disseminated sulphide lenses and quartz stockworks are hosted by Middle to Late Ordovician andesite and dacite flows and breccias, tuffs and tuffaceous sandstones and siltstones. The deposit is divided in zones, with a primary hypogene ore zone at the bottom, a supergene-enriched sulphide zone, and a supergene oxide zone at the top. Quartz and barite are the dominant gangue minerals in the primary ore zone, opal and quartz are dominant in the enriched zone. Primary ore consists of dominant pyrite, chalcopyrite and sphalerite, with lesser galena and tennantite, and minor to rare molybdenite, enargite, bornite, petzite, altaite, native gold, electrum, pyrargyrite, arsenopyrite, linneite, marcasite, pyrrhotite, bournonite, tetradymite, hessite, magnetite, hematite and greenockite. The sulphide enrichment zone consists of covellite and chalcocite, with minor galena, pyrite, chalcopyrite and sphalerite, and rare stromeyerite, bordosite, acanthite and native Au and Ag. Mineralization is structurally controlled by synvolcanic faults and fissures: NE-trending, moderately-dipping radial faults and fissures at Kosmurun, and W-trending moderately-dipping arcuate faults and fissures at Akbastau. Shatter zones at flow contacts and lithological contacts are also important ore controlling structures. Hydrothermal alteration consists of silicification, chloritization and sericitization. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-As-Co-Se-Te-Bi-Tl-Mo.

4254 Sayak is an Early to Late Carboniferous Cu-Mo-Au-Ag-Co-Bi-Te skarn deposit with a total gold content of 63 metric tons. It is located in the Sayak district of the Kazakh-Mongol magmatic arc, Junggar-Balkhash fold system, Kazakhstan. The deposit is confined to a local curve in the Sayak graben-syncline, at the interserction of EW-oriented and NW-trending regional faults. Sayak IV is the main gold-bearing orebody, other orebodies are dominantly Cu-Mo skarns. Replacement ore of semi-massive to massive sulphides is hosted by Early to Late Carboniferous shallow marine limestone and sandstone of the Tastykudukskaya suite. Boron-silicate garnet skarns are located in the exocontact haloes of porphyritic diorite plutons. Skarn mineralogy consists of pyroxene, garnet, calcite, chlorite and quartz, with boron silicates such as danburite, aksinite and datolite. Ore mineralogy is mainly pyrite, loellingite, chalcopyrite, magnetite, bornite, arsenopyrite, cobaltite, gersdorffite, glaucodot, pyrrhotite and danaite, with rarer smaltite, linneite, safflorite, polydimite, nickelite and ullmanite. Mineralization is structurally controlled by the diorite intrusion contacts with the carbonated sediments, by the contacts between limestones and sandstones, and by anticlinal folds and joints associated with NE- and NW-trending faults. A prominent ore zone of quartz-calcite-chlorite may represent a retrograde skarn assemblage. Epidotization also occurs. The metallic signature of the bulk of the ore is Au-Ag-Cu-Mo-Pb-As-Co-Bi-Te-Hg-Se-Tl.

KYRGYZSTAN

2183 Kumtor is a Carboniferous (?) non-carbonate-hosted stockwork-disseminated Au-Ag-Pt deposit with a total gold content of 228 metric tons. It is located in the Akshiirak Range, Central Tien Shan, eastern Kyrgyzstan. Regional structure is dominated by the Akshirak geanticline and the Nikoleav lineament, the latter of which represents a Carboniferous collision suture and the boundary between the northern and central Tien Shan. Quartz-carbonate stockwork veins, hydrothermal breccias and disseminated sulphides are hosted by lower greenschist grade carbonaceous phyllites, shales and siltstones of the Late Proterozoic Dzhetymtan unit. Gangue mineralogy is dominated by quartz, calcite and ferroan dolomite, with lesser albite and K-feldspar, and minor sericite, chlorite and hematite. Pyrite is the dominant ore mineral, with minor to trace amounts of chalcopyrite, scheelite, galena, sphalerite, petzite and calaverite. Mineralization is structurally controled by the Kumtor Fault Zone (a probably splay off the Nikolaev Lineament) and its subsidiaries, a 50+ km-long NE-trending, brittle-ductile to brittle, moderately-dipping fault with a complex deformational history. Hydrothermal alteration consists of strong quartz-carbonate alteration and also albitization. Pyritization also occurs. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-As-Cu-W-Pb-Zn-Te.

4012 Jerooy is a Paleozoic non-carbonate-hosted, stockwork-disseminated gold deposit with a total gold content of 74 metric tons. It is located in the Ala-Tau range of the northern Tien Shan, north-central Kyrgyzstan. The NW-trending Talas-Fergana regional dextral strike-slip fault is the dominant tectonic structure in the area. Quartz veins and stockworks and associated disseminated sulphides are hosted by a Cambrian-Ordovician quartz diorite and quartz syenite complex. Quartz is the dominant gangue mineral. Ore mineralogy (total sulphide content < 1%) is dominated by pyrite, bismuthinite and tetradymite, and minor tellurides such as calaverite and krennerite. Mineralization is structurally controlled by WNW- to NW-trending faults of the

Ichkeletau-Susamyrsky Fault System. However, a strong control on high grade siliceous zones and adjacent stockworks is provided by NNE-trending structures. Hydrothermal alteration consist of silicification. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Bi-Te.

4244 Taldybulak Levoberezhnyi is a Carboniferous to Early Mesozoic Au-Ag-Cu sulphide-rich vein deposit with a total gold content of 39 metric tons. It is located in the Aktyuz-Boordu ore district (Kokjon area) of the Northern Tien Shan, Kokchetau-North Tien Shan fold system, Kyrgyzstan. The Boordu volcanic dome is the dominant regional structure in the area. Quartz stockwork, veins, and associated disseminated sulphides are hosted by Early Devonian greenschist grade schists and amphibolites (after mafic volcanics and greenstones). Gangue mineralogy consists of quartz, muscovite, tourmaline, sericite and carbonate, with rare chlorite, fuchsite, barite and apatite. Ore mineralogy consists mainly of pyrite, with subordinate chalcopyrite, galena, tetrahedrite and arsenopyrite, and minor tetradymite and tennantite. Mineralization is structurally controlled by the SE-trending Taldybulak shear zone, a zone of inter- and intraformational shears and thrusts accompanied by tectonic melange and intrusions, and its intersection with the NNE-trending Rudny, Bezymyanny, and Geokhimichesky faults. E-trending, steeply-dipping faults (Kyzylbulak and Kokjon faults) cut the area in E-W blocks. Hydrothermal alteration consists of early potassic (biotite-orthoclase) alteration of intrusions, and pre-ore carbonatization and sericitization (listwaenites and beresites) of schists and amphibolites, represented by quartz-carbonate-fuchsite and quartz-sericite-carbonate-albite assemblages. The main stage of gold mineralization is associated with tourmalinization (quartz-tourmaline-pyrite) and potassic alteration (K-feldspar-sericite). The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-As-B-Bi. The high abundance of pyrite in quartz-tourmaline rocks, stringer style of mineralization, intense pre-ore phyllic alteration, spatial relationship of ore to minor intrusions, great vertical extent of mineralization and occurrence of basic volcanics as host rocks has led many authors to classify Taldybulak Levoberezhnyi as a porphyry gold deposit. Malyukova (2001) associates this deposit with the Klyuchevskoe deposit in Russia and the shear-zone-related (orogenic) gold deposits of Canada, Australia and Brazil.

4245 Makmal is an Early Permian gold skarn deposit with a total gold content of 40 metric tons. It is located in the Naryn zone of the Akshiirak Range, Middle Tien Shan, South Tien Shan fold system, Narynskaya oblast, Kyrgyzstan. The NW-trending Talasso-Fergansky deep fault is the dominant regional tectonic structure in the area. Semi-massive to massive sulphide replacement ore is hosted by Early Carboniferous limestone and dolomite beds. Disseminated sulphides and associated quartz veins are hosted by Early Carboniferous limestone and dolomite beds, and by Late Carboniferous to Early Permian leucogranite, granite and diorite of the Chaartash pluton. Greisen-style Sn-W mineralization also occurs as veins and disseminations in the Chaartash pluton. There are three types of skarns at Makmal: 1) diorite-related skarns, 2) granite-related magnesian skarns, and 3) granite-related calcareous skarns. Diorite-related skarns occur as strips up to 10 m in width that mimic the morphology of the contact surface. Proximal skarn assemblages consist of garnet±scapolite, which grades outward to garnet-wollastonite, and to distal wollastonite skarn. Granite-related magnesian skarn consists of a proximal (heavily mineralized) assemblage of garnet-magnetite-hematite-pyrite-pyrrhotite-bismuthite, which grades progressively outward to vesuvianite-garnet, phlogopite-vesuvianite±garnet, phlogopite-diopside±vesuvianite, and ultimately a distal phlogopite-magnetite skarn. Superposed on the magnesian skarn is a later calcareous proximal garnet skarn, which grades outward to andradite-

Fe pyroxene, pyroxene-wollastonite, to a distal wollastonite skarn. Ore mineralogy of the skarns consists of dominant pyrite, pyrrhotite, magnetite and sphalerite, with subordinate chalcopyrite, galena, hematite, native Au and Ag, tetrahedrite, freibergite, arsenopyrite, bismuthite, native Bi, boulangerite, hessite, petzite, tetradymite and cosallite. Gangue minerals are mainly quartz, garnet, pyroxene, serpentite, epidote, actinolite, tremolite and barite. Disseminated sulphides and quartz veins consist of abundant pyrite, and subordinate pyrrhotite, chalcopyrite, molybdenite, galena, sphalerite, jamesonite, boulangerite, bismuthinite and native Bi. Mineralization is structurally controlled by lithological contacts of the Chaartash pluton and associated dykes with the reactive carbonate lithologies. Orebodies are in parallel or en echelon extension fractures caused by the doming during the pluton emplacement. EW-oriented and NW-trending, steeply-dipping zones of fractures located at intrusion and dike contacts are also important ore controls. Hydrothermal alteration associated with the disseminated sulphides and quartz veins consists of sericitic (beresite) alteration represented by quartz-sericite-carbonate-pyrite along faults and dykes, as well as quartz-plagioclase alteration (silificiation) of the granites and diorites. Greisen alteration of the pluton occurs as veins and disseminations of quartz-muscovite-topaz-fluorite-cassiterite-molybdenite. The metallic signature of the skarn ore consists of Au-Ag-As-Pb-Zn-W-Sn, whereas disseminated/vein ore is characterized by Au-As-Sb-Bi. Greisen mineralization has a Mo-W-Sn signature.

4250 Taldybulak is a Devonian breccia pipe Au-Cu deposit with a total gold content (including resources) of 270 metric tons. It is located in the Aktyuz-Boordu ore district (Kokjon area) of the Northern Tien Shan, Kokchetau-North Tien Shan fold system, Kyrgyzstan. The Boordu volcanic dome is the dominant regional structure in the area. Quartz stockwork and associated disseminated sulphides are hosted by intrusive and eruptive breccias concentrically emplaced in Late Ordovician to Early Silurian porphyritic quartz diorite. Quartz and tourmaline form the cement of the breccias. Mineralization is structurally controlled by the concentric breccias and associated radial fractures, and by NW-trending faults and dykes. Hydrothermal alteration consists of pervasive potassic alteration (quartz-orthoclase) in the pipe, surrounded by sericitic alteration zones (quartz-sericite) in periphery. This grades away to a distal propylitic alteration assemblage of albite-epidote-chlorite in the surrounding volcanics and sediments. Argillic alteration, characterized by quartz-sericite-kaolinite-montmorillonite-chlorite locally developed at the contacts of quartz diorite and breccia pipe. The metallic signature of the bulk of the ore is Au-Ag-Cu-Mo-Bi.

4256 Solton-Sary is an Early to Middle Devonian gold deposit with affinities to the non-carbonate-hosted, stockwork-disseminated type, and a total gold content of 20 metric tons. It is located in the Solton-Sary district of the Northern Tien Shan, Kokchetau-North Tien Shan fold system, Kyrgyzstan. Regional structure is dominated by the broadly EW-oriented, strike-slip Nikolaev Lineament, which is a suture zone of the Carboniferous collision between the Northern and Central Tien Shan. Gold-bearing quartz veins are mainly hosted by an Early Devonian swarm of porphyritic syenite dykes of the Altyntor complex, and by Cambrian-Ordovician sandstone and siltsone of the Joljilg suite. Quartz is the main gangue mineral. Pyrite and gold are the dominant ore minerals, with minor tetrahedrite and rare chalcopyrite, sphalerite, galena and electrum. Mineralization is lithologically controlled by the W- to NW-trending, steeply-dipping, sub-concordant syenite dykes that host most of the veins, and structurally controlled by E- to SE-trending, steeply-dipping strike-slip faults. Hydrothermal alteration consists of silicification of the syenite dykes. Muscovite alteration also occurs. The metallic signature of the bulk of the ore is Au-Ag±Cu±Pb±Zn. The genetic relationship between the syenite dykes and the gold-bearing quartz veins is uncertain. The syenite dykes may be the major host because of their competency contrasts with the enclosing sediments; however, the close timing between dyke emplacement at 400-395 Ma and the formation of hydrothermal muscovite at 395-390 Ma suggests a genetic link between the two.

MALI

313 Kalana is an Early Proterozoic, turbidite-hosted quartz-carbonate vein gold deposit with a total gold content of 3 metric tons. It is located in the Boure district of the Moni-Baoulé Shield, West African craton, southern Mali. The major regional tectonic structure in the area is the Senegal-Mali shear zone, a N-S trending, ductile, sinistral strike-slip shear zone corresponding to the D_2 phase of the Eburnean orogeny. Quartz-carbonate veins and veinlets are hosted by greenschist grade, flyschoid sandstones, greywackes, siltstones and schists of the Early Proterozoic Birrimian Supergroup, and by diorite and granodiorite bodies. Quartz and carbonates are the dominant gangue minerals, with minor chlorite, sericite and muscovite. Arsenopyrite and pyrite are the main ore minerals, with lesser sphalerite, galena and pyrrhotite and rare chalcopyrite, scheelite, tetrahedrite, native Bi, malachite, azurite and matildite. Quartz-carbonate veins occur in late Eburnean brittle NNW- to NNE-trending and NE- to ENE-trending shallowly-dipping faults, and to a lesser degree in NW-trending, steeply-dipping brittle faults. Carbonatization of the schist unit is extensive. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-As-Sb-Pb-Zn-Cu-W-Bi.

315 Loulo is an Early Proterozoic turbidite-hosted quartz-carbonate vein (Bendigo type) gold deposit with a total gold content of 44 metric tons. It is located in the Loulo district of the Kenieba area, Mali-Senegal Inlier, West African craton, southwestern Mali. The major regional tectonic structure in the area is the Senegal-Mali shear zone, a NS-oriented, ductile, sinistral strike-slip shear zone corresponding to the D_2 phase of the Eburnean orogeny. Stockwork mineralization is hosted mainly by fining-upward sandstone beds with thin shale intervals of the Early Proterozoic Lower Birrimian Unit. Gangue mineralogy is dominated by quartz, with lesser dolomite and albite, and minor rutile and monazite. Pyrite is the dominant ore mineral, with subordinate chalcopyrite, sphalerite, arsenopyrite, pyrrhotite and galena, and minor marcasite, magnetite, scheelite, pentlandite, gersdorffite and molybdenite. Mineralization is structurally controlled by upright, NE-trending folds, and by N- to NNE-trending strike-slip faults and their intersections. Orebodies are also controlled by competency contrasts between highly altered and weakly altered sandstones, with mineralization mostly absent in the latter, and by the permeability contrast between the host sandstones (porous) and the overlying pelites. Late, flat-lying or gently-dipping faults with little displacement crosscut the orebodies. Hydrothermal alteration consists of early, intense and pervasive tourmalinization of the host sandstone. Stockwork-related silicification, pyritization and dolomitization also affect the host rocks. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-Zn-As-Pb-W-Ni-Co-B. Dommanget *et al.* (1993) suggested a two-stage model of formation for the Loulo ores. Pre-D_1, syngenetic exhalative formation of gold-bearing sulphides occurred contemporaneously with the Falémé iron ores some 30 km south. Younger conglomerates with tourmaline sandstone clasts would support this hypothesis. The earlier-formed ores were subsequently deformed and remobilized into structural and lithological traps during the D_2 deformation event.

322 Sadiola (or Sadiola Hill) is an Early Proterozoic(?), intrusion-related, gold skarn deposit with a total gold content of 185 metric tons. It is located in the Galam Bambouk district of the Kenieba greenstone belt, West African craton, western Mali. The major regional tectonic structure in the area is the Senegal-Mali shear zone, a NS-trending, ductile, sinistral strike-slip shear zone corresponding to the D_2 phase of the Eburnean orogeny. Disseminated sulphide mineralization is hosted by Early Proterozoic, contact metamorphosed marbles and calcareous sandstones of the Kofi Formation. Ore minerals are dominantly pyrite, arsenopyrite and stibnite. Orebodies are structurally controlled by the Sadiola fracture zone, a major NS-trending, diorite-filled fault. The oblique intersection of the Sadiola fracture zone with a smaller fault also seemed to have controlled the distribution of the mineralization. Oxidation and decalcification of the marble host on and near surface was an important factor in the development of the oxide ore resource, which is the main ore source currently being exploited. The metallic signature of the bulk of the ore is Au-Ag-Sb-As-Mo-W.

323 Syama is a Middle Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 82 metric tons. It is located in the Boure district, along the Syama-Bundiali belt of the Birimian Shield, West African craton, southern Mali. The volcano-sedimentary units are cut by a regionally extensive system of NS-trending reverse faults. Sheeted quartz-carbonate veins and high-grade hydrothermal breccia-stockwork zones are hosted by Early Proterozoic, greenschist grade (at places pillowed) basalt flows and beds of graywacke, shale and argillite, intruded by mafic lamprophyres. Quartz and ankerite are the dominant gangue minerals, accompanied by albite and graphite. Pyrite and its oxidized forms, with electrum, are the main ore minerals. SW-trending, moderately- to steeply-dipping, reverse bedding-parallel faults forming duplexes and stacked thrust fault systems control the distribution of the mineralization, which is mainly found along en echelon ramp faults between the sole and roof faults of a duplex. Also, basalt flows acted as a more brittle and competent unit, hence the flows host most of the mineralization. Bleaching, silicification and pyritization are prominent along the faults and around the orebodies. Intense oxidation caused by weathering is present up to several metres below the surface, and is the source of the lateritic and saprolitic ore. Hydrothermal alteration of the main basaltic host is zoned and consists of a proximal alteration defined by an assemblage of ankerite-albite-quartz-pyrite-leucoxene±sericite, which grades outward to an assemblage of sericite-ankerite-chlorite±albite, and grades to a distal propylitic alteration of chlorite-calcite-albite-quartz-leucoxene±pyrite. The metallic signature of the bulk of the ore is Au-Ag-Sb.

4219 Morila deposit is an Early Proterozoic(?), turbidite-hosted quartz-carbonate vein (Bendigo-type) gold deposit with a total gold content of 188 metric tons. It is located in the Boure district of the Moni-Baoulé Shield, West African craton, southern Mali. The major regional tectonic structure in the area is the Senegal-Mali shear zone, a N-S trending ductile sinistral strike-slip shear zone corresponding to the D_2 phase of the Eburnean orogeny. NNW-trending normal faults bounding a graben also form a predominant structural trend. Quartz-carbonate veins and disseminated sulphides are hosted by Early Proterozoic (Birimian), greenschist grade siltstone, sandstone, quartzose sandstone and greywacke. Arsenopyrite, loellingite and pyrrhotite are the dominant ore minerals, with lesser chalcopyrite, pyrite and ilmenite, and minor galena, molybdenite, tetrahedrite and tennantite. Mineralization is structurally related to shallow-dipping thrust faults. EW- and NW-trending, late normal faults offset the lithologies and orebodies. Hydrothermal alteration consists of intense silica-feldspar alteration of the metasediments near the orebodies. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Pb-Mo.

4260 Yatela is a Late Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 53 metric tons. It is located in the Kayes-Kenieba area of the Mali-Senegal Inlier, West African craton, western Mali. The major regional tectonic structure in the area is the Senegal-Mali shear zone, a NS-oriented, ductile, sinistral strike-slip shear zone corresponding to the D_2 phase of the Eburnean orogeny. Disseminated sulphides are hosted by Late Proterozoic, karstified Birimian metacarbonates (dolomite), and by a (weakly mineralized) diorite intrusion. Mineralization is structurally controlled by a moderately-dipping shear zone along the contact between the dolomite/argillite sequence and the diorite intrusion. The metallic signature of the bulk of the ore is unknown. Kartstification and erosion of the dolomite/argillite sequence has led to the exposure of the mineralized shear zone. The original mesothermal mineralization now forms a residual layer along the flanks and in the bottom of a depression that was subsquently filled up with unmineralized Late Proterozoic sandstones.

MEXICO

585 Tayoltita is a district of Middle Eocene, low sulphidation epithermal Au-Ag deposits with a total gold content of 320 metric tons. It is located in the San Dimas mining district within the Sierra Madre Occidental part of the Cordillera, Durango state, west-central Mexico. The dominant tectonic structures in the area are the Don Porfino, Limoncito and Guamuchil faults, which are NNW-trending regional normal faults dividing the region in eastward-dipping blocks. Complexly-textured quartz vein mineralization is hosted by Late Cretaceous to Middle Eocene andesitic and rhyolitic flows, tuffs and breccias of the Lower Volcanic Group intruded by the Mid-Eocene Sinaola Batholith of granite to diorite to quartz monzonite composition. Gangue mineralogy is dominated by quartz, with subordinate adularia, chlorite and rhodonite, and minor albite, calcite, rhodochrosite and rare magnetite and zeolites. Pyrite, sphalerite, galena and chalcopyrite are the most abundant sulphides, with acanthite the dominant Ag sulphide. Argentite, polybasite-pearceite, jalpaite, electrum and native Ag are also present. The veins are structurally controlled by WSW-trending (almost E-W), steeply-dipping faults and NNE-trending, near-vertical faults. NNW-trending normal faults such as the Arana fault, which are parallel to the regional trend, are usually unmineralized except where they intersect WSW-trending faults. Mineralized veins are constrained to a “favorable horizon” of andesites and rhyolites which probably controlled fracture development and permeability, facilitating hydrothermal fluid circulation. Hydrothermal alteration consists of zoned envelopes, with proximal silicification (quartz±epidote±chlorite) adjacent to the veins, grading outward to a potassic alteration zone (quartz-adularia-sericite-calcite) and to a distal, early and pervasive, propylitic alteration (chlorite-epidote-calcite-albite-quartz-sphene) zone. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Pb-An-Cu-As-Sb-Hg.

Appendix 2

2120 Metates is an Early to Late Cretaceous, probable Au-Cu sulphide-rich vein type of deposit with a total gold content of 99 metric tons. It is located in the San Juan de Camerones district of the Sierra Madre Occidental, Cordillera, Durango state, Mexico. Disseminated sulphides and sulphide-rich veins and stockwork carrying Au-Ag-Zn mineralization are hosted by an Early Cretaceous, porphyritic quartz latite (or monzonite) dome, by a heterolithic volcaniclastic breccia with a sedimentary-igneous matrix overlying the quartz latite, and by the enclosing sequence of submarine argillite, arkose and conglomerate. Pyrite is the dominant ore mineral, with subordinate sphalerite and galena, and accessory arsenopyrite, chalcopyrite, pyrargyrite and tetrahedrite. Mineralized veins are nearly free of silicate minerals, with some quartz and lesser siderite in places. Mineralization is localized in EW-trending, high-angle faults and the surrounding zones of fracturing. Sericitization (sericite-quartz-pyrite) of the host rocks and surrounding sediments is closely associated with the mineralization. Weak but pervasive silicification is also common. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Pb-Zn-Sb. Exact classification of this deposit is difficult due to the little geological knowledge available. The Metates deposit also shares similarities with deeper sections of low-sulphidation epithermal deposits, and with non-carbonate-hosted stockwork-disseminated deposits.

2207 Bermejal is a Tertiary intrusion-related Au-Ag skarn deposit with a total gold content of 25 metric tons in resources. It is located in the Mezcala district of the Morelos-Guerrero basin, Sierra Madre del Sur, Cordillera, state of Guerrero, Mexico. NS-trending faults and folds, and NW-trending deeply-seated faults along which intrusions are aligned are the dominant tectonic structures in the area. Massive to disseminated iron oxide orebodies and high-grade quartz veins are hosted by the Tertiary Bermejal granodiorite stock and by the adjoining contact-metamorphosed limestones and dolostones of the Early to Late Createceous Morelos Formation, whereas quartz stockworks and associated disseminated sulphides are hosted solely by the intrusion. Hematite and magnetite are the dominant ore minerals, with lesser amounts of pyrite, chalcopyrite, arsenopyrite, sphalerite, galena, pyrrhotite and marcasite. Secondary oxides are abundant, such as plumbojarosite, hematite, goethite, limonite, arsenolite, azurite, malachite, chalcocite and Cu arsenides, with minor amounts of minium, cerussite, and zincite. Gangue mineralogy consists of quartz and calcite, with minor siderite and phlogopite, with trace amounts of fluorite and orthoclase and anhydrite and gypsum filling vugs in the oxide ore. Mineralization is controlled and localized by the granodiorite intrusion contacts with the carbonate rocks. Structural control is exherted by NW-, NS- and EW-trending fault sets, and specifically by their intersections with a NE-trending fault set, which proved to be the most favorable traps. Reactive carbonate lithologies also played a key role in localizing mineralization. Concentric faults are centered on the Bermejal stock and result from cooling of the intrusion and gravity faulting. Skarn development occured in three stages: 1) an initial prograde endoskarn consisting of garnet (grossularite-andradite) and pyroxene (diopside-hedenbergite) with a lesser exoskarn forming an envelope around the stock, this stage is associated with minor amounts of gold; 2) an intense retrograde skarn assemblage with extensive chlorite-epidote, tremolite-actinolite, phlogopite-serpentine and lesser talc, muscovite and sericite, associated with the bulk of the gold mineralization; 3) a late skarn consisting of andradite or grossularite garnet in veins cutting the two previous stages. Silica flooding is related to late quartz-pyrite-opal veins along faults, and jasperoid alteration replaces skarns and forms a silica cap over the system. The Bermejal granodiorite stock has been affected by argillic alteration on its outermost edge, represented by a kaolinite-montmorillonite-kandites assemblage. Silicification (quartz-opal-chalcedony) and erratic potassic alteration (orthoclase-microcline-biotite) also occur throughout the granodiorite stock, the latter alteration also occurs in places along vein margins. The metallic signature of the bulk of the ore is Au-Ag-Fe-Cu-Pb-Zn-As-Mo.

3218 The Guanajuato district consists of Early to Late Oligocene, low-sulphidation epithermal Au-Ag deposits with a total gold content of 220 metric tons. It is located in the Mesa Central physiographic province of the Sierra Madre Oriental, Cordillera, Guanajuato state, central Mexico. The district is located on the NE flank of a NW-trending regional anticline, which forms the Sierra de Guanajuato and Sierra Gorda. Quartz veins and stockworks are mainly hosted by lithic lapilli tuffs and rhyolite tuffs (caldera deposits) of the Early Oligocene Bufa Formation, although all the rocks in the district, except the youngest formation (Chichindaro), are also mineralized. Quartz is the dominant gangue mineral, with lesser calcite and adularia, and minor sericite, dolomite, fluorite and zeolites. Ore mineralogy is dominated by pyrite, argentite and acanthite, with subordinate aguilarite, polybasite, electrum, galena, sphalerite, chalcopyrite, proustite, stephanite, pyrargyrite, guanajuatite and paraguanajuatite. Base metal sulphides are more common in the deeper parts of the deposits. The main silver-bearing veins are structurally controlled by SE- to SSW-trending, moderately-dipping, pre- to syn-mineral normal and sinistral or dextral oblique-slip faults of the La Sierra, Veta Madre and La Luz systems. NE-trending faults such as the San Nicolas, San Eusebio, El Panal and Marmaja faults are transverse to the first set and constitute the main gold-bearing structures. EW-trending, subvertical dextral strike-slip faults such as the Caballeros shear zone and Albertina fracture also carry mineralization. NS-trending faults with dips either to the E or W (such as the Cebolletas fault) cut the transverse series and localized high-grade ore shoots. The hydrothermal alteration assemblages vary with the host lithology, for example marbles and phyllitized sandstones, shales and volcanics are preferentially silicified and sericitized, whereas conglomerates are more affected by chlorite and adularia alteration. Potassic metasomatism and associated silicification (adularia-sericite-illite-quartz-calcite) occur in zones of intense fracturing within and near the ore. This alteration grades outwardly to argillic alteration (kaolinite-halloysite-montmorillonite), occuring very near or directly adjacent to the ore, and to an intense and pervasive phyllic alteration (sericite-illite-pyrite). The last two types of alteration are thought to be related to boiling and flashing of the hydrothermal fluid. Extensive propylitic alteration (chlorite-montmorillonite-calcite-epidote) is the distal alteration product. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Cu-Pb-Se-Li-Bi-Hg.

3219 The Pachuca-Real del Monte Ag-Au district consists of Early Miocene, low-sulphidation epithermal deposits with a total gold content of 231 metric tons. It is located in the Sierra de Pachuca of the Sierra Madre Oriental, Cordillera, Hidalgo state, east-central Mexico. A broad belt of regional SE-trending normal faulting is the dominant tectonic structure in the area. Mineralized quartz veins and veinlets are hosted by a volcanic sequence of Early Miocene basalts, andesites, dacites, rhyodacites and rhyolites, and interspersed volcanogenic sediments such as conglomerates and sandstones. Gangue mineralogy is dominated by quartz (crystalline, opal, and chalcedony), with lesser adularia, calcite, albite and rhodonite, and minor chlorite, prehnite, barite, kaolinite, sericite and epidote. Ore mineralogy is dominated by pyrite, together with important quantities of sphalerite, galena and chalcopyrite, argentite and acanthite, and minor polybasite, stephanite, miargyrite, pyrargyrite, proustite and sternbergite. Orebodies are structurally controlled by SE-trending, moderately-dipping normal faults and their subsidiaries.

Veins occur in dilatant zones at fault intersections or at fault strike and/or dip changes. NS-trending vertical faults with unknown movement direction are also mineralized. Hydrothermal alteration consists of proximal adularization (adularia-chlorite-pyrite) adjacent to the veins, which probably grades outward to sericitic alteration (illite-calcite-pyrite-chlorite-sericite) which is found above the orebodies. Distal expression of the hydrothermal alteration is represented by a propylitic alteration assemblage of epidote-adularia-albite-chlorite-calcite-pyrite. Silicic alteration with acid-leach of carbonate minerals occurs in some veins and is considered to be of hypogene origin. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Ag-Au-As-Sb-Pb-Zn-Cu-Hg.

3220 La Natividad is a Late Tertiary, low-sulphidation epithermal Au-Ag deposit with a total gold content of 157 metric tons. It is located in the Sierra de Juarez of the Sierra Madre del Sur, Cordillera, Sinaola state, Mexico. The regional structural grain is oriented N-S in the area. Banded and brecciated quartz veins are hosted by greenschist-grade, Jurassic to Cretaceous carbonaceous slates, conglomerate and graphitic schists, Late Tertiary porphyritic quartz monzonite, and by andesitic tuffs. Quartz is the dominant gangue mineral, with lesser calcite. Ore mineralogy is dominated by pyrite, with lesser galena, sphalerite and chalcopyrite, and minor tennantite and pyrargyrite. Veins are localized within NNE- to NE-trending and WNW-trending, moderately- to steeply-dipping normal faults, and within NS-trending, subvertical normal faults. Hydrothermal alteration around the veins affected mainly the quartz monzonite and volcanic rocks, consisting of proximal silicification, grading outward to sericitization, and outward to distal chloritization. Pyritization is ubiquitous in all these three zones. Sediments such as shales, arkoses and conglomerates, along with the graphitic schists, are mostly sericitized, and have lost their carbonaceous content. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Pb-Zn-Cu-As-Sb.

4125 The El Oro district is made up of Early Tertiary(?), low-sulphidation epithermal Au-Ag deposits with a total gold content of 202 metric tons. It is located in the Basin and Range physiographic province of the Sierra Madre Occidentale, Cordillera, Sonora state, Mexico. Regional, NW-trending high-angle normal faults are the dominant tectonic structures in the area. Banded quartz-carbonate veins and associated disseminated sulphides are hosted by Lower Cretaceous, calcareous to carbonaceous shales, and by Lower Cretaceous to Early Tertiary andesite flows and porphyritic diorite sills and dykes. The main gangue minerals are quartz and calcite. Ore mineralogy is dominated by pyrite, with subordinate argentite, galena and chalcopyrite, minor proustite and rare native silver. Iron oxide minerals such as limonite are sometimes abundant and carry ore-grade mineralization. Veins are structurally controlled by NW-trending, moderately- to steeply-dipping normal faults parallel to the regional trend (such as the San Rafael Fault, hosting the vein of the same name), and their subsidiary faults. EW- to SW-trending faults, such as the Esperanza Fault, offset the mineralized bodies. Andesite flows and diorite sills are sericitized and carbonatized near the veins. Sulphidation is also present in the shale and diorite, near the orebodies. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Pb-Cu.

4127 La Colorada is a syn- to post-Middle Tertiary, probable low-sulphidation epithermal Au-Ag deposit with a total gold content of 82 metric tons. It is located in the Sonora gold belt of the Sierra Madre Occidentale, Basin and Range physiographic province, Cordillera, Sonora state, Mexico. Regional shears controlled the emplacement of intrusive rocks and gold mineralization.

Quartz veins and stockworks are hosted by Laramide (Paleocene) diorite, granodiorite and quartz porphyry, and by intruded calcareous siltstones and limestones of the Lower Cretaceous Barranca Formation. Quartz is the dominant gangue mineral, with manganese oxides. Ore mineralogy consists of pyrite, galena, sphalerite and chalcopyrite. Mineralization is structurally controlled by the ENE-trending, steeply-dipping Colorada Sur fault zone, and by EW-trending faults (such as the South Vein structure) associated with the Colorado Sur fault. Intersections of the two sets are particularly favorable sites for gold mineralization. Intrusive contacts localized deformation and hence, gold mineralization. Hydrothermal alteration consists of argillic alteration in the hanging wall of the veins, and silicification of the sediments in the footwall. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Au-Pb-Zn-Cu.

4128 The Mulatos/Escondida deposit and district is a Late Oligocene to Early Miocene(?), high-sulphidation epithermal Au-Ag deposit with a total gold content of 10 metric tons, and resources of 80 metric tons. It is located in the Salamadra gold camp of the Sierra Madre, Cordillera, Sonora state, Mexico. The Mulatos caldera is a dominant structural feature in the area. Disseminated sulphides, with minor quartz veinlets, are hosted by Early Oligocene to Early Miocene altered volcaniclastic conglomerate, felsic ash flow tuff and dacite flow domes, and by porphyritic granodiorite. Gangue minerals are opal, quartz and barite. Ore mineralogy is dominated by pyrite and enargite, with lesser marcasite, tennantite and chalcopyrite, and minor molybdenite (at depth). Mineralization is structurally controlled by NE-trending, high-angle normal faults. The highest grades are found in the porous tuffaceous sediments near the unconformity at the base of the volcaniclastic conglomerate. Post-mineral normal faulting affected the area. Hydrothermal alteration consists of an intense central zone of silicic alteration with vuggy silica and advanced argillic alteration (alunite-pyrophyllite), grading outward to an inner argillic zone of kaolinite-dickite, to an outer argillic zone of illite-smectite argillic, and finally to a distal propylitic alteration (chlorite-epidote) zone. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-As-Ba-Mo.

4203 La Herradura is a Tertiary quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 64 metric tons. It is located in the La Herradura district of the Caborca area (Altar graben), Great Basin and Range, American Cordillera, northwestern Sonora state, Mexico. The NW-trending, sinistral strike-slip Sonora-Mojave Megashear is the dominant regional tectonic structure in the area. Quartz veins and stockworks are hosted by tectonized slices of Precambrian quartz-feldspar and biotite gneisses and chloritic schists, and by (weakly mineralized) quartz diorite. Quartz is the main gangue mineral, with minor feldspar. Ore mineralogy is dominated by pyrite (frequently altered to iron oxides), with minor galena. Mineralization is structurally controlled by NW-trending, steeply-dipping shear zones characterized by intense foliation, veining and fracturing. Minor, low-angle, W-dipping to sub-horizontal shear zones also control some of the ore. Post-ore normal and strike-slip faults displaced the lithological units and mineralized veins. Hydrothermal alteration consists of proximal silicification of the host gneisses and schists near the veins and stockworks, within a broader halo of sericite-iron carbonates (ankerite-siderite). The metallic signature of the bulk of the ore is unknown is unknown.

4221 Dolores is an Early to Late Oligocene(?), low-sulphidation epithermal Au-Ag deposit with a total gold content of 10 metric tons. It is located in the Madera district of the Sierra Madre

Occidental, Cordillera, Chihuahua state, northern Mexico. A NW-trending structural zone controlling intrusion emplacement is the dominant regional tectonic structure in the area. Stockworks and mineralized breccias are hosted by Early Oligocene(?) monzonite dykes and by intruded andesite flows and latite pyroclastic rocks. Quartz is the dominant gangue mineral. Ore mineralogy is dominated by pyrite, with lesser electrum, argentite, polybasite, acanthite, pyrargyrite, miargyrite and stromeyerite, and minor galena, sphalerite, marcasite, arsenopyrite and chalcopyrite. Oxidized ore is present, down to depths of 120 metres below surface, as hematite, goethite, manganite and limonite. Mineralization is structurally controlled by NNW-trending, high-angle normal(?) shear zones such as the West Fault Zone, and by the lithological contact between NS-trending, steeply-dipping monzonite dykes and interbedded andesites and agglomeratic tuffs. Hydrothermal alteration consists of intense and proximal zones of potassic alteration (quartz-adularia-sericite), weak argillic alteration in the tuffs overlying the mineralized andesites and distal propylitic alteration in the volcanic rocks. Supergene oxidation is responsible for surface leaching of Au-Ag and enrichment in deeper oxidized zones. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Sb-As-Cu.

MONGOLIA

4265 Boroo is an Early Mesozoic or younger intrusion-related gold deposit of possible batholith-associated quartz vein (Korean-type) affinity, with a total gold content of 36 metric tons. It is located in the Ulaanbaatar area of the Khentey zone, Mongolia-Okhotsk fold belt, Transbaikal-Mongolian orogenic collage, Mongolia. The NE- to E-trending Mongolia-Okhotsk suture is the main regional tectonic structure in the area. Quartz veins are hosted in a Late Permian to Early Triassic leucocratic and biotite granite massif, and the adjacent Early Paleozoic sandstones and siltstones of the Kharin Group. Gangue mineralogy is mainly quartz. Ore mineralogy is dominated by pyrite, with subordinate arsenopyrite and lesser chalcopyrite, sphalerite, galena and tetrahedrite. Mineralization is located in a huge, flat-lying zone of crushing (fault zone?) and is structurally controlled by the contacts of the granite massif. It also has a spatial and paragenetic relationship with Early Mesozoic gabbro and diorite dykes. Hydrothermal alteration consists of pre-ore propylitic alteration (represented by an epidote-chlorite and an albite-chlorite-sericite-quartz assemblages), which was followed by ore-related potassic alteration (sericite-K-feldpar-carbonate-quartz-pyrite-arsenopyrite), sericitic alteration (quartz-sericite-carbonate-pyrite), silicification and quartz-carbonate alteration. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Zn-Pb. The Boroo deposit fits well into the “low-sulphide intrusion-related” group of deposits of Zorin *et al.* (2001). These are associated with Early to Late Jurassic intrusions, and similar deposits in Russia along the Mongolia-Okhotsk suture, which have been dated between 146±8 and 157±9 Ma.

NAMIBIA

4269 Navachab is a Middle Cambrian to Early Ordovician, mixed gold skarn deposit and quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 47 metric tons. It is located in the Karibib area of the Southern Central Zone, Damara Orogenic Belt, Namibia. Regional structure is dominated by the NNE-trending Abbabis

Lineament Zone and the NE-trending Omaruru Lineament, the latter dividing the Central Zone in the Southern and Northern zones of distinct magnetic signature. Quartz veins and associated skarn lenses of disseminated to semi-massive sulphides are hosted by interlayered, lower amphibolite facies pelite with calcite and dolomite marbles of the Late Proterozoic Okawayo Formation (Swakop Group). The mineralogy of the veins consists of quartz, carbonate, pyroxene and K-feldspar, with pyrrhotite as the main ore mineral. Ore mineralogy of the skarn lenses is dominated by pyrrhotite, with lesser chalcopyrite, sphalerite and scheelite and Bi minerals such as native bismuth, bismuthinite and maldonite, and rare pyrite and arsenopyrite. Gold is closely associated with Bi and Bi minerals. Mineralization is structurally controlled by NW-trending strike-slip faults and related splays, and is stratabound to the banded marble/pelite unit. Skarn lenses plunge shallowly to the north, parallel to the intersection lineation of flat-dipping veins with the steep bedding of the pelitic layers. Hydrothermal alteration consists of calc-silicate alteration along vein contact zones and is represented by a garnet-clinopyroxene-amphibole assemblage in the pelitic layers, and by a garnet-clinopyroxene-biotite-tourmaline-tremolite-quartz-carbonate-pyrrhotite assemblage in the marble layers. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Bi-Cu-Zn-W. Genesis of the deposit is still uncertain. Moore *et al.* (1999) suggested that Navachab is a mesothermal gold deposit with no obvious, direct relationship to granitoid intrusion. It is thought to have formed under relatively high temperature and reducing conditions (as evidenced by the almandine-spessartine-grossularite garnet mixture) with the hydrothermal fluid strongly buffered by wallrock compositons, during dynamic, amphibolite-facies regional metamorphism. Sulphur isotopic values, as well as C and O isotopic values, typically give a magmatic signature (Moore *et al.*, 1999). Alternatively, Badenhorst (1995) suggested two models of formation, one of which includes granitoids as either the source of the fluids or the source of heat which drove the fluids, and the other one attributing fluid circulation to regional metamorphism only.

NEW ZEALAND

3196 Waihi is a Late Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 239 metric tons. It is located in the Hauraki Goldfield of the Waihi Basin, Coromandel Volcanic Zone, Coromandel Peninsula, New Zealand. The region shows extensive block faulting, with regional NW- and NE- to ENE-trending, steeply-dipping faults. Crustiform, banded and brecciated quartz veins and veinlets are hosted by andesite flows and by flow breccias and dacitic tuffs of the Late Miocene Coromandel Group. Gangue mineralogy is dominated by quartz and calcite, with lesser adularia and inesite. Pyrite is the dominant ore mineral, with sphalerite, galena and chalcopyrite, lesser acanthite and electrum, and minor pyrargyrite, molybdenite, pyrrhotite and tetrahedrite. The four main mineralized veins are structurally controlled by NE-SW trending, steeply-dipping normal faults, whereas a number of lesser veins are found in EW-, NNE-, and NS-trending lesser normal faults. Hydrothermal alteration consists of a proximal halo of intense and pervasive silicification/potassic alteration characterized by quartz-adularia-sericite-pyrite-sphene±chlorite±calcite, surrounded by an advanced propylitic alteration halo of chlorite-calcite-quartz-pyrite±illite±adularia±albite±epidote, which grades outward to weak propylitic alteration represented by chlorite-calcite-smectite-montmorillonite-pyrite. Argillic alteration (illite-smectite-kaolinite-quartz-chlorite-pyrite-sphene) occurs locally along permeable faults and as late overprint. The metallic signature of the bulk of the ore is Au-Ag-As-Cu-Pb-Zn-Mo.

3198 Thames is a Late Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 45 metric tons. It is located in the Hauraki Goldfield in the Waihi Basin, Coromandel Volcanic Zone, Coromandel Peninsula, New Zealand. The region shows extensive block faulting, with the regional NW-trending Hauraki graben and also NE- to ENE-trending, steeply-dipping faults. The deposit is located in a dilational jog formed by dextral movement as a result of oblique convergence on the Hauraki graben fault. Quartz veins and stockworks are hosted by Late Miocene calc-alkaline andesites and rhyolite tuffs of the Coromandel Group. Gangue mineralogy is dominated by chalcedony and quartz, with some barite and illite. Pyrite and pyrargyrite are the dominant ore minerals, with lesser electrum and stibnite, and minor sphalerite, galena, chalcopyrite, tetrahedrite, tellurides, enargite, bournonite, robinsonite, molybdenite, polybasite and cinnabar. Mineralization is vertically zoned, with shallow stibnite-barite, through gold-pyrargyrite-pyrite, to tetrahedrite-Sb-sulphosalts at depth. The distribution of the mineralized zones is structurally controlled by mainly NE-trending, steeply-dipping normal faults and by lesser NW-trending, steep normal faults. The intersections of the two trends are the location of bonanza high-grade ore shoots. Hydrothermal alteration (postulated to be vertically zoned by Merchant, 1986) consists of distal (and at depth?) propylitic alteration (chlorite-calcite-albite-epidote-pyrite), grading inward and upward to sericitic alteration (illite-quartz-pyrite). This in turn, grades into the proximal argillic alteration represented by illite-smectite-kaolinite-pyrite. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Co-Pb-Zn-Te-Mo-Hg. Corbett and Leach (1998) and Brathwaite *et al.* (2001) suggested that the Thames epithermal deposit represents a distal system derived from the nearby Ohio Creek Cu-Mo-Au porphyry deposit. The epithermal vein system developed by mixing of upwelling mineralized fluids along NE-trending structures, with cool ground waters flowing down the cross structures. Advanced argillic alteration characterized by alunite-kaolinite-dickite-diaspore-pyrophyllite-pyrite at nearby Lookout Rocks is not the surface expression of the Thames deposit, as suggested by Merchant (1986), but is rather thought to represent a hot fluid venting directly from the Ohio Creek porphyry (Corbett and Leach, 1998).

NICARAGUA

4045 La India is a Pliocene(?) low-sulphidation epithermal Au-Ag deposit with a total gold content of 8 metric tons. It is located in the El Limon area of the Nicaraguan graben, Chortis Block, Central American Cordillera, Nicaragua. NE-trending strike-slip faults of regional extent are the dominant tectonic structures in the area. The deposit is located on the western shoulder of a collapsed caldera. Quartz veins and mineralized hydrothermal breccias are hosted by Oligocene to Pliocene felsic (dacitic) ignimbrites, basalts, andesites, by andesitic and dacitic tuffs and basalts of the Matagalpa and Coyol Groups. Quartz is the dominant gangue mineral, with minor calcite. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, hematite, galena and sphalerite. Mineralization is structurally controlled by NW-striking, steeply-dipping normal faults, and also by a lesser NE-trending fault system. Hydrothermal alteration consists of concentric halos of proximal potassic alteration (quartz-adularia-illite), grading outward to a zone of argillic alteration represented by quartz-kaolinite-illite-pyrite, and to a distal propylitic alteration (quartz-chlorite-calcite). A regional, district-wide zeolite alteration is present. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-Co.

4046 Bonanza is a Pliocene-Pleistocene, low-sulphidation epithermal Au-Ag-(Pb-Zn-Cu) deposit with a total gold content of 81 metric tons. It is located in the Piz Piz district within the Chortis Block, Central Nicaragua Uplift, Cordillera, Nicaragua. EW-trending, dip-slip faults with three upthrown and two downthrown blocks are the regional dominant tectonic structures in the area. Banded, breccia and vuggy quartz veins are hosted by andesites of the Oligocene to Late Miocene Matagalpa and Coyol groups. Quartz is the dominant gangue mineral, with lesser chlorite, amethyst, calcite, rhodochrosite, rhodonite, epidote and late kaolinite. Ore mineralogy is dominated by pyrite, with lesser sphalerite, chalcopyrite, galena and hematite. Mineralization is structurally controlled by SW-trending, steeply-dipping strike-slip faults and by NW-trending, moderately- to steeply-dipping faults. Hydrothermal alteration (data from Darce (1990), from the La Libertad district) consists of proximal potassic alteration (quartz-adularia-illite), grading outward to a sericitic-argillic zone of quartz-kaolinite-illite-pyrite and to a distal propylitic (quartz-chlorite-calcite) alteration zone. The metallic signature of the bulk of the ore is unknown, but Burn (1969) reports the lack of Sb, Te, As and Bi usually associated with low-sulphidation deposits, and also a lack of Sn or W.

4048 La Luz is a Tertiary intrusion-related, gold skarn or manto deposit with a total gold content of 71 metric tons. It is located in the southern part of the Piz Piz district, Chortis Block, Central American Cordillera, north-central Nicaragua. A NNW-trending synclinal fold is the dominant structure in the area. Replacement and disseminated sulphide mineralization is hosted by Lower Cretaceous limestones and calcareous shales and by Oligocene to Miocene andesites. Gangue mineralogy is dominated by epidote and quartz. Pyrite, chalcopyrite and hematite are the dominant ore minerals. Mineralization is structurally controlled by NNW-trending, steeply-dipping shears parallel to the synclinal fold, which are offset by NE-trending, moderately- to steeply-dipping shears. The andesite body in the hanging-wall of the deposit, and the olivine gabbro dykes acted as buffers and concentrated fluid flow along the structures. Mineralization is found exclusively in zones of epidote alteration and silicification. The metallic signature of the bulk of the ore is unknown.

NIGER

4141 Samira is a recently-discovered (and thus poorly defined) gold deposit of probable non-carbonate, stockwork-disseminated type(?) with a total gold content of 24 metric tons. It is located in the Samira Hill area of the Sirba greenstone belt. West African craton, Niger. Regional NE-trending folds are the dominant tectonic structure in the area. Disseminated sulphide mineralization is hosted by Birimian graphitic argillite, siltstone, mudstone, wacke and greywacke of Early Proterozoic age. The ore consists of pyrite and arsenopyrite in a quartz gangue. Mineralization is confined to a sedimentary horizon and is controlled by the permeability and porosity of this horizon (called the Samira Horizon). NE-trending, dextral strike-slip faults are present, but their relationship to the mineralization is unclear, and their timing may be post-mineralization. The deposit could also be related to turbidite-hosted quartz-carbonate vein deposits, as are most other Proterozoic deposits in the area.

Appendix 2

PAPUA NEW GUINEA

2130 Porgera is a Late Miocene to Early Pliocene, alkalic type low-sulphidation epithermal/porphyry Au-Ag deposit with a total gold content of 608 metric tons. It is located in the Papuan Fold Belt at the border of the Australasian plate, Enga province, Papua New Guinea. The deposit is localized on the southern side of the Stolle-Lagaip fault, a major SE-trending regional structure that marks the boundary between the Australasian plate to the south and the accreted island arc terranes to the north. Two stages of mineralization are present. Both stages are hosted by the alkalic gabbros and diorites of the Late Miocene Porgera Intrusive Complex and by the intruded carbonaceous and calcareous shales, mudstones and siltstones of the Middle Jurassic to Late Cretaceous Chim and Om formations. Stage I mineralization is low-silica and high-sulphide, and consists of disseminated sulphides, sulphide-rich veins and veinlets and fault breccias. Gangue minerals in this stage are mostly calcite, dolomite, quartz and minor apatite and zeolites. Ore mineralogy is dominated by pyrite, sphalerite and galena, with accessory arsenopyrite, tetrahedrite, chalcopyrite, freibergite, electrum, pyrrhotite, proustite and pyrargyrite. Stage II mineralization is high-silica and low-sulphide, and consists of vuggy, drusy and breccia quartz veins and hydrothermal breccias. Gangue mineralogy is dominated by quartz and roscoelite, with lesser calcite, dolomite and adularia. Ore mineralogy is mainly pyrite, with lesser marcasite, Au-Ag tellurides and tetrahedrite, and minor chalcopyrite and Hg-Pb tellurides. Intrusive contacts and faults bounding the intrusions are the main structural controls for distribution and localization of stage I mineralization. The Romanae Fault Zone, a late, post-stage I but pre- to syn-stage II ENE-trending, steeply-dipping normal dip-slip fault which cuts the southern end of the intrusive complex, is the main structural control for stage II epithermal quartz veins and hydrothermal breccias emplacement. Hydrothermal alteration consists of early, intrusion-related propylitic alteration (chlorite-epidote-calcite-dolomite) in the intrusions and the adjoining sediments. Contemporary with stage I mineralization is the phyllic (sericite-dolomite-pyrite-anatase-quartz) alteration occurring along intrusive contacts, faults and vein walls. Anhydrite alteration (anhydrite-sericite-dolomite) occurs at depth as partial replacement and vein fill, and biotite-actinolite-anhydrite alteration occurs in the deepest part of the system. The metallic signature of the bulk of the ore is Au-Ag-Zn-Pb-Cu-As-Sb-Hg-Te. Stage I fluids are clearly of magmatic origin (Richards *et al.*, 1997). It is suggested that a dilute fluid of probable evolved meteoric groundwater combined with input from the Romanae Fault Zone, which tapped into the magmatic fluids, is responsible for stage II mineralization (Richards *et al.*, 1997).

2133 Misima is a Miocene-Pliocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 120 metric tons. It is located on Misima Island in the Louisiade Archipelago, Milne Bay province, Papua New Guinea. The dominant regional structure is an E-W oriented, E-plunging antiform forming elongate domal folding. Sugary, banded and vuggy quartz-carbonate veins, hydrothermal breccias and disseminated sulphides are hosted by upper greenschist to lower amphibolite grade greenschists and schists (of basaltic/volcaniclastic origin) of the Cretaceous to Paleogene Sisa Association, and by Neogene porphyritic microgranodiorite of the Boiou intrusive suite. Gangue mineralogy is dominated by quartz, calcite and adularia, with minor barite and rhodochrosite. Ore mineralogy is dominated by pyrite, sphalerite, galena and chalcopyrite, with minor magnetite, tetrahedrite, pyrrhotite, covellite, chalcocite and native Cu. Mineralized veins are structurally controlled and hosted by the Umuna Fault Zone, a 100 to 300-metre-wide, SE-trending, steeply-dipping zone of subparallel and anastomosing normal faults and shears. Intersections of fracture sets in the Umuna fault zone have produced intensively fractured wedges, which are the preferential loci of mineralization. Intrusive contacts of the microgranodiorite are also commonly brecciated and mineralized. A NW-trending, sinistral strike-slip pre- to syn-mineral fault offsets the Umuna fault and is also mineralized. Propylitic (chlorite-epidote) alteration is pervasive around veins, in breccias and at intrusive contacts. Sericitic alteration (sericite-chlorite±smectite) affected most of the schists and intrusive rocks within the Umuna fault zone, and is accompanied by silicification in the upper part of the deposit. Deep, probably supergene oxidation affected the deposit. Millfeed material is almost exclusively oxide ore. The metallic signature of the bulk of the ore is Au-Ag-Zn-As-Sb-Ba-Pb-Cu-Mn-Bi-Cd.

2135 Kerimenge is an Early Pliocene, low-sulphidation epithermal Au-Ag deposit with a total gold resource of 32 metric tons. It is located in the Wau district of the Morobe Goldfield, Owen Stanley Ranges, Fly-Highlands, Papuan Mobile Belt (or Central Orogenic Belt), Morobe Province, Papua New Guinea. The dominating regional tectonic structure in the area is the NW- to N-trending, normal and strike-slip Owen Stanley Fault system. Another regional structure (although on a reduced scale) is the Wau Corridor (graben), a NW-trending down faulted block bounded to the SW by the Upper Watut and to the NE by the Wandumi normal faults. Colloform, vuggy and banded quartz-carbonate veins, stockworks and hydrothermal breccias are hosted by the tonalitic to granodioritic Early Pliocene Kerimenge porphyry. Quartz and rhodochrosite are the dominant gangue minerals, with lesser calcite, adularia and minor barite. Ore mineralogy is dominated by pyrite, with accessory arsenopyrite, sphalerite, chalcopyrite, galena, marcasite and tetrahedrite. The Escarpment fault, a NW-trending, steeply-dipping, normal fault in the Wau graben, localized the Kerimenge deposit. The immediate structural control over the mineralization is the Kerimenge fault, a N-trending, steeply-dipping brittle fault probably splaying from the Escarpment fault. Most of the mineralization is found in the hangingwall of the fault. Early/distal hydrothermal alteration consists of a widespread propylitic alteration (chlorite-epidote-calcite-pyrite) of the Kerimenge porphyry and adjoining sediments. A proximal sericitic alteration (sericite-quartz-pyrite) surrounds the veins and overprints the propylitic assemblage. Potassic metasomatism and silicification were locally intense, with development of an adularia-quartz assemblage along the Kerimenge fault. Local argillic alteration in the breccia zones overprints the sericitic alteration. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Zn-Cu-Pb-Sb.

2136 Hidden Valley is an Early Pliocene, low-sulphidation epithermal Au-Ag deposit with a total gold resource of 64 metric tons. It is located in the Wau district of the Morobe Goldfield, Owen Stanley Ranges, Fly-Highlands, Papuan Mobile Belt (or Central Orogenic Belt), Morobe Province, Papua New Guinea. The dominating regional tectonic structure in the area is the NW- to N-trending, normal and strike-slip Owen Stanley Fault system. Another regional structure (although at a reduced scale) is the Wau Corridor, a NW-trending down-faulted block bounded by to the SW by the Upper Watut and to the NW by the Wandumi normal faults. Carbonate veins and hydrothermal fault breccias are hosted by the Middle Miocene Morobe granodiorite, a composite monzogranite-adamellite-tonalite intrusion. Calcite is the dominant gangue mineral, with subordinate adularia, quartz and kutnahorite. Pyrite, sphalerite, galena and chalcopyrite are the dominant ore minerals, with minor tetrahedrite. Mineralized veins and breccias are structurally controlled by the NW-trending, moderately-dipping, normal Hidden Valley fault zone, and by the sub-parallel Lots-No Save fault. The bulk of the mineralized granodiorite occurs between the two faults. Metasedimentary lithologies acted as a structural cap to the hydrothermal system. Hydrothermal alteration of the Morobe granodiorite consists of a chlorite-pyrite assemblage. Metasedimentary rocks show weak but pervasive propylitic (chlorite-epidote-pyrite) alteration. Carbonate veins and breccia zones have an inner argillic alteration zone of kaolinite-carbonate±smectite, grading outward to an outer phyllic alteration zone of illite-leucoxene-quartz. Supergene oxidation occurs in near-surface environment. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb-Cu-Sb.

2139 Ladolam (Lihir) is a Pleistocene, alkalic epithermal Au-Ag deposit with a total gold content of 752 metric tons. It is located on Lihir Island in the Tabar to Feni alkaline arc, New Ireland Basin, Finisterre, Papua New Guinea. The deposit is located near the SE-trending inactive Kilinailau Trench, and occurs along a NE-trending active ridge within the Luise volcano, an elliptical caldera breached by the sea. Mineralized quartz veins, vuggy hydrothermal breccias and stockworks are hosted by alkaline porphyritic latite and trachybasalt lavas and pyroclastics of Pleistocene age, and by an underlying monzonite intrusion. Quartz, adularia, anhydrite and calcite are the dominant gangue minerals. Ore mineralogy is dominated by pyrite, with subordinate marcasite, lesser chalcopyrite, pyrrhotite, galena, sphalerite, covellite arsenopyrite and minor molybdenite, tetrahedrite, tennantite, luzonite, enargite, sylvanite, stibnite and cinnabar. Distribution of the mineralization is structurally controlled by faults and fault zones such as the high-grade Minifie structure, the NS-trending Letomazien structure, the Lienetz-Coastal structure, and the ENE-trending bounding South Lienetz structure. A prominent ore control is a subhorizontal breccia body (termed the "boiling zone"), which is a vuggy breccia with leached matrix containing high-grade ore. Early potassic alteration (K-feldspar-biotite) and weak propylitic alteration (chlorite-amphibole-albite-epidote-calcite-magnetite) with uneconomic low-grade mineralization are related to the intrusive monzonite porphyry body. The highest gold grades occur where the potassic alteration zone is overprinted by later epithermal-related advanced argillic, argillic and phyllic alteration. Epithermal-related alteration is vertically zoned (probably reflecting a boiling water table), with an illite-Kspar-silica assemblage at depth forming a phyllic alteration zone, which grades upward to an extensive argillic alteration zone (kaolinite-smectite-illite) surrounding shallow advanced argillic and silicic alteration zones. The latter form a cap of alunite-opal-kaolinite-sulphur reminiscent of hot-spring type mineralization. The metallic signature of the bulk of the ore may be separated into an epithermal signature with Au-Ba-Cs-As-Ag-Rb and a porphyry signature with W-U-Mo-Cu-Pb-Cr. The Ladolam deposit is difficult to situate within the classification scheme. Porphyry-style mineralization is minor and of economic grade only where overprinted by epithermal-related alteration; however, it is clear that the porphyry body is genetically related to the epithermal mineralization. The distinction between epithermal low-sulphidation and high-sulphidation mineralization types is not evident, as the deposit shows characteristics common to both types. Moreover, shallow alunite-opaline silica argillic alteration developed in the shallow hot-spring environment and presence of solfatara and active hot-spring activity further adds to the complexity of the deposit Rytuba *et al.* (1993) concluded that the Ladolam deposit is a unique type of deposit. Moyle *et al.* (1990) proposed a 3-stage model for the formation of the Ladolam deposit, with initial monzonite intrusion and development of related potassic alteration, followed by a catastrophic event that formed the caldera-wide crackle breccias and anhydrite-calcite veining (from inrushing seawater), and finally sealing of the breccia isolating the system from the sea, allowing for heating of meteoric waters (now being the primary source of recharge) and alteration from interaction with increasingly hot rocks as the fluid moved downward in the open breccias.

Appendix 2

PERU

4136 Yanacocha (Carachugo, Maqui Maqui, San Jose and Yanacocha Norte mines) is a Middle Miocene, high-sulphidation epithermal Au-Ag deposit with a total gold content of 1392 metric tons, and is the largest gold producer in South America. It is located in the Yanacocha mining district, Andean Cordillera, northern Peru. The dominant regional tectonic structure is the Chicama-Yanacocha corridor, a NE-SW-oriented structural zone about 30-40 km wide and 200 km long, with sinistral(?) movement. Disseminated sulphides, quartz veins and mineralized breccias are hosted by intensely altered Middle Miocene crustal tuffs, andesite and dacite flows of the Yanacocha Volcanic Complex. Orebodies are also hosted on the margins and within feldspar porphyry dioritic intrusive rocks. Glaciation of the deposits produced fluvio-glacial sediments, and three deposits occur in unconsolidated and poorly sorted Quaternay gravel and boulders. Gangue mineralogy of the veins is mainly quartz and alunite. Gold in the oxide zone (down to 300m depth) is associated with iron oxides, jarosite, scorodite and beudantite. Sulphide ore mineralogy consists of enargite, pyrite, covellite and digenite, with minor sphalerite and galena. Mineralization is structurally controlled by NE- and NW-trending conjugate faults with strike-slip movement, such as the El Tapado and Carbon faults. A lithological control is also present at the San Jose mine, where pyroclastic units host stratabound high-grade orebodies due to their more permeable nature. Hydrothermal alteration is intense and pervasive, with wide halos broadly centered on volcanic domes. Silicification and silicic alteration are found in the core of the deposit, represented by a quartz-pyrite and vuggy to granular silica assemblages. This is surrounded by an advanced argillic alteration assemblage of silica-alunite-pyrophyllite-kaolinite which is zoned and grade outward from silica-alunite-pyrophyllite to silica-kaolinite±alunite and to kaolinite-montmorillonite-pyrite. The advanced argillic zone in turns grade outward into a weak, distal “propylitic” alteration (quartz-sericite-illite-albite±chlorite-magnetite). The metallic signature of the bulk of the ore is Au-Ag-Cu-As-Pb-Hg.

4201 Pierina is a Middle Miocene, high-sulphidation epithermal Au-Ag deposit with a total gold content of 224 metric tons. It is located in the Pierina Belt of the Cordillera Negra, Andean Cordillera, Peru. Disseminated sulphides and quartz veins are hosted by rhyodacite pumice tuff and lithic tuff and underlying andesite flows of the Early Tertiary Calipuy Group. Most of the ore is oxidized, with a mineralogy of pyrite, enargite, covellite and chalcocite. There is a strong lithological control over the orebodies. The pumice tuff hosts most of the disseminated ore and is also the most altered unit, owing to its porous and permeable nature. The lithic tuff hosts mainly fracture-controlled ore, whereas the andesite contains only veinlet gold. Hydrothermal alteration is pervasive, with a core of silicic alteration (vuggy silica-alunite±pyrophyllite), surrounded by an advanced argillic halo of alunite-pyrophyllite-dickite which grades outward to an argillic alteration halo of kaolinite-illite. Propylitic alteration is negligible. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu.

4213 Tambo Grande is an Early to Middle Cretaceous, Au-Ag-Cu-Zn gold-rich VMS (Volcanogenic Massive Sulphide) deposit with a total gold content of 58 metric tons. It is located in the Tambogrande district, within the Lancones Basin, Andean Cordillera, northwestern Peru. Regional structure is dominated by NS-trending normal faults which forms the graben-host structure of the Lancones Basin, and by a broad, NE-trending anticline. Disseminated to massive sulphide lenses and stockworks are hosted by Early to Mid-Cretaceous, unmetamorphosed dacites, andesites and amygdaloidal pillow basalts of the Ereo Formation (San Lorenzo Group).

Gangue minerals are mainly quartz, calcite and barite, with minor ankerite and siderite. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, sphalerite, digenite, chalcocite and covellite, and minor tetrahedrite-tennantite, enargite, galena, bornite, arsenopyrite and pyrrhotite, cubanite, hematite, hessite, tellurobismuthinite, magnetite, ilmenite, argentite and native silver. Mineralization is related to NW-trending, oblique-normal synvolcanic graben faults associated with the tertiary (3rd order) grabens, located inside the NS-trending 2nd order grabens. Hydrothermal alteration consists of quartz-epidote alteration of the intermediate and mafic volcanics in the hangingwall and lateral footwall of the deposit. The immediate footwall of the dacites and basalts, and the hydrothermal conduits, are pervasively altered with quartz-sericite-chlorite and sericite-quartz-chlorite assemblages (hard quartz-dominated silicification and soft sericite-dominated sericitization). Lateral fragmental rocks and hyaloclastites present Mg-chlorite alteration. Intense Fe-chlorite alteration is restricted to narrow selvages in the sulphide stringer zone. Silicic alteration with vuggy silica is found in the felsic rock units internal to the deposit. The metallic signature of the bulk of the ore is Au-Ag-Zn-Pb-Cu-As-Sb-Bi-Ba-Hg.

PHILIPPINES

4139 Lepanto, with a total gold content of 188 metric tons, consists of three genetically linked Au-Cu-Ag orebodies of different types: 1) the Enargite high-sulphidation epithermal deposit (also known as the Lepanto sensu-stricto deposit, 123 t Au), 2) the Far South East porphyry gold deposit (resource of 885 t Au) and 3) the Victoria low-sulphidation epithermal deposit (51 t Au, plus a resource of 85 t Au). The Lepanto deposit is located within the Mankayan district, Luzon Central Cordillera, northern Luzon Island, Philippines. The dominant regional tectonic structure is the Philippine Fault system, a N- to NW-trending strike-slip fault parallel to the Philippine and Manila trenches. The Abra River fault is a NW-trending, steeply-dipping sinistral strike-slip fault splaying from the Philippine Fault and another important regional structure in the Lepanto area. Mineralization at Enargite consists of sulphide-rich veins, disseminated sulphides and hydrothermal breccias mainly hosted by dacites, dacite tuffs and breccias and andesites of the Pliocene Imbanguila dacite unit. Quartz, with minor anhydrite, barite and alunite are the gangue minerals. Ore mineralogy is dominated by pyrite and enargite, with subordinate luzonite, tennantite-tetrahedrite, chalcopyrite, sphalerite, galena, electrum, tellurides (calaverite, petzite, hessite, krennerite), selenides and minor supergene covellite, guanajuatite and colusite. Mineralization is structurally controlled by the Lepanto Fault, an EW- to ENE-trending subvertical normal fault splay of the Abra River fault, and by its intersection with the unconformity at the base of the Imbanguila dacite unit, along which ore can be found laterally over 2.5 km. Silicic alteration with vuggy silica occurs at the core of the deposit, with a halo of advanced argillic (quartz-alunite-anhydrite-diaspore-dickite-pyrophyllite) alteration. Beneath the unconformity in the metavolcanic basement, the advanced argillic alteration grades into a pervasive chloritized zone. In the dacitic rocks above the unconformity, it grades into an argillic alteration halo of kaolinite-illite-smectite, which in turns grades outward into the distal, district-wide propylitic alteration halo. The metallic signature of the ore (inferred from its mineralogy) is Au-Ag-Cu–Zn-Pb-Te-Se. Mineralization at Far South East consists of disseminated sulphides, quartz veinlets, and a late intramineral hydrothermal breccia hosted by Late Pliocene-Pleistocene quartz diorite porphyritic dykes and irregular stocks intruding the Cretaceous to Late Miocene metavolcanic basement. Grades are higher in the melanocratic phase of the intrusion. Quartz, anhydrite, sericite and hematite are the main gangue minerals. Ore mineralogy is dominated by chalcopyrite, bornite and pyrite, with lesser molybdenite and Bi-Te-bearing tennantite. Early potassic alteration (biotite-magnetite-K feldspar) centered on the core of the intrusion is overprinted by, and grades outward to, a sericite-illite-chlorite-hematite alteration zone (equivalent to intermediate argillic alteration). Surrounding and associated to the quartz-anhydrite-copper sulphide veinlets is a halo of intense sericite-illite alteration. These quartz-anhydrite-copper sulphides veins yiel 3 times the grade of the sericite-chlorite altered rocks. Upward and outward from the core of the porphyry ore the sericitic alteration grades to an advanced argillic (pyrophyllite-quartz-anhydrite-dickite-nacrite-kaolinite) alteration. Higher still (at shallower levels) are the quartz-alunite zone and high-sulphidation ore of the Enargite deposit. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Mo-Bi-Te. Mineralization at Victoria consists of vuggy, banded and crustiform quartz-carbonate veins mainly hosted by the Imbanguila dacite unit. Metavolcanic basement rocks host lesser and lower ore-grade veins. Quartz and rhodochrosite are the dominant gangue minerals, with lesser rhodonite and gypsum. Ore mineralogy is dominated by sphalerite, galena and chalcopyrite, whereas some veins are copper-rich with chalcopyrite, tetrahedrite, bornite and chalcocite. Veins are structurally controlled by the EW- to ENE-trending, steeply-dipping Lepanto normal fault. Hydrothermal alteration consists of proximal silicification, grading outward to sericitic-argillic alteration and to distal propylitic alteration. The metallic signature of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb-Cu-Sb.

4139 The Baguio Au-Ag district consists of numerous Pleistocene, low-sulphidation epithermal deposits with a total gold content of 811 metric tons. In addition, porphyry copper mineralization and a gold-bearing zinc skarn (Thanksgiving mine) are situated on the margins of the epithermal district. The Baguio district is located in the Itogon area of the Benguet Province, northern Luzon Island, Luzon Central Cordillera, Philippines. The dominant tectonic structure in the area is the Philippine fault, a N- to NW-trending fault parallel to the Philippine and Manila trenches. N-trending folds associated with a second deformational event are also an important regional feature which controlled diatreme emplacement. Quartz vein and stockwork mineralization is hosted by Upper Cretaceous gabbro of the Itogon ophiolite, Early Miocene Itogon quartz diorite, andesites, andesitic tuffs and graywackes of the Late Miocene Klondyke Formation, and by Late Miocene to Early Pliocene quartz tonalite of the Bataloc diatreme and granodiorite of the Virac granodiorite. Gangue mineralogy of the veins is dominated by quartz and chalcedony, with subordinate calcite, rhodonite, rhodochrosite and anhydrite, and minor sericite and adularia. Pyrite is the dominant ore mineral, with lesser sphalerite, galena, chalcopyrite and tellurides (petzite, hessite, altaite, calaverite, sylvanite, coloradoite), and minor marcasite, molybdenite, arsenopyrite, tetrahedrite, famatinite, pyrargyrite, proustite, native Ag, bornite, cinnabar and stibnite. Quartz veins and stockworks are structurally controlled. At Acupan, veins occur within E-trending, steeply-dipping, normal dip-slip faults and at intersections of younger NE-trending, subvertical normal-dextral dip-slip faults with an E-trending fault set. At Antamok, orebodies occur within NW-trending, steeply-dipping sinistral strike-slip faults which are conjugated to the NE-trending dextral set. Hydrothermal alteration is concentrically zoned around the veins. The proximal zone of alteration in the volcanics and granodiorite consists of narrow zones (2 cm or less) of intense potassic alteration (adularia-quartz-calcite-pyrite-chlorite), whereas chlorite alteration is dominant in the gabbros and diorites. Locally, narrow zones of proximal silicification (quartz-sericite-pyrite-chlorite-calcite) are also present. The proximal alteration grades outward to an inner zone of sericitic alteration characterized by a sericite-illite-muscovite-quartz-calcite-pyrite assemblage, to an outer sericitic alteration zone represented by sericite-chlorite-quartz-pyrite-calcite-rutile. This in turn grades outward to the distal, weak and diffuse propylitic (chlorite-epidote-quartz-sericite-calcite-rutile) alteration. Steam-heated advanced argillic alteration (quartz-alunite-diaspore-pyrophyllite-pyrite) occurs in the NW part of the district and is related to the waning stages of the hydrothermal system. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb-Cu-Te-As-Sb-Mo-Hg.

ROMANIA

2140 Rosia Montana (Verespatak) is a Miocene, intrusion-related breccia pipe Au-Ag deposit with a total gold content of 349 metric tons. It is located in the Golden Quadrilateral district of the South Apuseni Mountains, Banat Belt, Carpatho-Balkan Province (Tethyan-Eurasian metallogenic belt), Transylvania, Alba province, Romania. Back-arc-related spreading and rifting produced regional NW-striking sinistral strike-slip faults and NE-striking faults, and their intersection controlled the emplacement of intrusive rocks. Disseminated sulphides in hydrothermal breccias and zones of fracturing, high-grade quartz-carbonate veins and minor sulphide-rich stockworks are hosted by a Miocene subvolcanic porphyritic tonalite stock and related maar vent breccias and felsic pyroclastics, intruding Cretaceous shales and slates (the latter are also minor ore hosts). Gangue mineralogy is dominated by quartz and carbonates (calcite and rhodochrosite), with lesser adularia. Ore mineralogy is dominated by pyrite and arsenopyrite, and other base-metal sulphides such as sphalerite, galena and chalcopyrite, with lesser electrum, alabandite, tetrahedrite, proustite, pearceite, polybasite, argentite and marcasite. The deposit is structurally controlled by a restraining bend in the NW-trending regional strike-slip fault, and related dilational structures associated with the bend, such as NNW-SSE and NNE-SSW subvertical and E-W planar fractures. Hydrothermal alteration consists of intense and pervasive silicification, potassic alteration (with adularia) and pyritization in the central core of the ore zones. This is surrounded by a halo of argillic alteration (kaolinite-sericite-pyrite) which grades outward into distal chlorite alteration. The metallic signature of the bulk of the ore is Au-Ag-Zn-Pb-Cu.

2141 Baia Sprie is a Late Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 113 metric tons. It is located in the Baia Mare district of the Gutîi Mountains, East Carpathians, northwestern Romania. EW-trending sinistral strike-slip crustal faults of the Bogdan Voda fault system form a graben in the Baia Sprie area, and their intersections with another NW-SE crustal fault localized the emplacement of intrusive and extrusive rocks. Banded, drusy and brecciated quartz-carbonate veins, disseminated sulphides and hydrothermal fault breccias are hosted by a Late Miocene subvolcanic pyroxene andesite dyke and andesite to basaltic andesite flows. Gangue mineralogy is dominated by quartz (and chalcedony) and carbonates (calcite, siderite, ankerite, rhodochrosite), with lesser adularia, barite and clay minerals. Pyrite is the dominant ore mineral, together with important sphalerite and galena, lesser marcasite, chalcopyrite and pyrrhotite, and a wide variety of minor and/or exotic minerals, including bournonite, tetrahedrite, wolframite, scheelite, hematite, stibnite, melnikovite, realgar, magnetite and orpiment. Ore is vertically zoned, with Cu-rich mineralization occurring at depth, Pb-Zn at intermediate levels and Au-Ag ore at shallow levels. Mineralization is structurally controlled by the EW-trending, steep to subvertical sinistral strike-slip Dragos Voda fault and splays. A NE-SW-trending fault system also localized mineralization. Hydrothermal alteration is also vertically zoned; early propylitic alteration (mainly chloritic) is mainly present at depth and forms a wide outer halo around the more shallow ore zones. Proximal alteration consisting of potassic alteration (adularia and biotite), sericitization and argillic alteration (alunite and kaolinite) occur mainly at median and shallow levels. The metallic signature of the bulk of the ore is Au-Ag-Pb-Zn-Cu-Sb-As-Cd-Bi-W-Co-Ni-V-Mn-Tl.

RUSSIA

1777 **Mutnovsky** is a Pleistocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 29 metric tons. It is located in the Mutnovsky area of the East Kamchatka belt, Kurile-Kamchatka Magmatic Arc, Kamchatka peninsula, Far East Russia. A NE-oriented horseshoe-shaped caldera of the Zhirov volcanic system is the dominant regional structure in the area. Massive to banded and brecciated quartz and quartz-carbonate veins are hosted by Oligocene to Neogene calc-alkaline intermediate volcanic rocks, and by a gabbro-diorite intrusion. Gangue mineralogy is dominated by quartz, chalcedony and carbonate (calcite and/or rhodochrosite), with minor sericite, adularia and albite. Pyrite and sphalerite are the dominant ore minerals, with subordinate galena, marcasite and tetrahedrite, and minor tennantite, argentite, chalcopyrite, arsenopyrite, calaverite, petzite, proustite-pyrargyrite, stephanite, hessite and stutzite. Subvertical ore-bearing veins follow a dominant N-S trend, with a subordinate NNW-SSE orientation. Mineralization is best developed in the gabbro-diorite intrusion, and dies away in the lava-pyroclastic series. Hydrothermal alteration consists of a proximal bleaching zone of potassic/sericitic alteration with sericite-K-feldspar-quartz-albite-chlorite-pyrite. This grades outward to an almost regional propylitic alteration zone (chlorite-epidote-pyrite-sericite-clay minerals-calcite-quartz). Hypogene advanced argillic alteration represented by a pyrite-quartz-kaolinite-alunite assemblage apparently postdates the main ore stage. Supergene advanced argillic alteration is locally developed in association with mineralized veins in surface outcrops. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb-Mn-Cu-As-Sb-Te.

1778 **Asacha** is a Neogene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 30 metric tons. It is located in the Mutnovsky area of the East Kamchatka belt, Kurile-Kamchatka Magmatic Arc, Kamchatka peninsula, Far East Russia. An EW-oriented, horseshoe-shaped caldera that is part of the Zhirov volcanic system is the dominant regional structure in the area. Banded and colloform quartz-feldspar veins are hosted by Neogene calc-alkaline andesitic lavas and tuffs. Gangue mineralogy is dominated by quartz and adularia, with lesser sericite. Pyrite is the dominant ore mineral, with minor polybasite and naumannite. Mineralization is structurally controlled by NS-oriented, subvertical strike-slip faults. Hydrothermal alteration consists of proximal zones of potassic alteration with adularia, and sericitic alteration characterized by an assemblage of chlorite-sericite-quartz. These grade outward to a more regional propylitic alteration zone, characterized by chlorite-epidote-pyrite-sericite-clay minerals-calcite-quartz. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Se-Cu-Sb-Hg.

1779 **Dukat** is an Early to Late Cretaceous low-sulphidation epithermal Au-Ag deposit with a total gold content of 24 metric tons. It is located in the Omsukchan mining district of the Balychano-Sugoi trough (or Baligichan graben), outer marginal zone of the Okhotsk-Chukotka volcanic belt, Kolyma-Omolon Superterrane, Magadan Oblast, Far Eastern Russia. The deposit is localized in a volcanic dome, at the intersection of the NE-trending Yudoma-Aluchin zone of imbricate-overthrust structures (regional thrust fault) with a NNW-trending, steeply-dipping, sinistral strike-slip fault. Banded, brecciated, colloform and cockade-textured quartz veins and disseminated to semi-massive sulphides (the latter at depth) are mainly hosted by Early Cretaceous ultra-potassic ignimbritic rhyolite. Quartz is the dominant gangue mineral, with lesser adularia, rhodonite and rhodocrosite, and minor chlorite, sericite, epidote, tourmaline and helvite. Argentite, native Ag, electrum, acanthite, kustelite, freibergite, silver sulphosalts, pyrite, galena, sphalerite, chalcopyrite, arsenopyrite, pyrrhotite and magnetite are all important ore constituents, with minor naumannite, stromeyerite, jalpaite, sternbergite, mackinstryite, polybasite, pyrargyrite and stephanite. Mineralization is a two-stage process separated in time, with 1) Early Cretaceous gold-silver stage adularia-chlorite-quartz veins related to subvolcanic granitic emplacement and volcanic activity, and 2) Late Cretaceous silver-rich stage quartz-rhodonite-rhodocrosite veins with regeneration of hydrothermal activity associated with granodiorite emplacement at 80 Ma (Sakharova *et al.*, 1998). Mineralization is structurally controlled by NW-trending, graben-parallel faults, and by NE- and NW-trending faults cutting across the volcanic dome. High-grade ore shoots (typically fluorite-rich) are located at fault intersections, in bends within the fault planes and under screens of silty layers. Hydrothermal alteration consists of propylitic alteration (epidote-chlorite-albite) at depth and in the lower ore levels, grading upward to a potassic alteration (adularia-chlorite-sericite-quartz) at mid-levels to argillic alteration (sericite-quartz-kaolinite) in the upper ore levels and above the ore zones. Skarn formation occurs at depth along the margins of the granodiorite pluton, and is represented by feldspar-biotite and chlorite-garnet-tourmaline assemblages. The metallic signature of the ore is also characteristically zoned according to depth. An Ag-Au-Co-Ni-Mo-W signature is prevalent below the ore level, Ag-Au-Sn-Mn-Pb-Zn at the bottom ore level, Ag-Au-Sb-Cu at middle ore level, and Ag-Au-As-Sb-Hg at the top and above ore levels.

1781 Natalka is an Early Cretaceous, turbidite-hosted quartz-carbonate vein Au-Ag-PGE deposit with a total gold content of 100 metric tons. It is located in the Omchak mining district of the Yana-Kolyma metallogenic belt, Kular-Nera Terrane, Kolyma-Omolon Superterrane, Magadan, northeast Russia. The dominant regional tectonic structures in the area are the NW-trending, oblique-reverse Tenka fault zone, and the NW-trending Ayan-Yuryakh anticlinorium. Massive to brecciated and banded quartz veins, veinlets and disseminated sulphides are hosted by greenschist grade, silty argillites, sandstones, siltstones, tuffaceous shales and conglomerates of the Late Permian Verkhoyansk Complex. Quartz is the dominant gangue mineral, with lesser carbonates, albite, K-feldspar, chlorite, sericite, kaolinite, montmorillonite, barite and apatite. Ore mineralogy is dominated (95%) by arsenopyrite and pyrite, with minor pyrrhotite, Co-Ni sulpharsenides (skutterudite), sphalerite, chalcopyrite, galena, ilmenite and rutile, and local millerite, tetrahedrite, bournonite, boulangerite, stibnite and cobaltite. Mineralization is structurally controlled by a NW- to NNW-trending, steeply- to vertically-dipping, Z-shaped, reverse-sinistral transpressive fault system (including the Natalka, Omchak, Main and Northeast faults). Ore zones occur within tension fractures related to transpressive deformation. N-to NNE-trending faults offset the orebodies, but are locally mineralized. Hydrothermal alteration consists of proximal and intense silicification and carbonatization of the host sandstones, siltstones and conglomerates, also affecting the nearby intrusions. Sulphidation also occurs, and is most intense in the shale unit. Mafic dykes are affected by albitization. Felsic dykes are affected by sericitic alteration, characterized by quartz-albite-sericite. Minor garnet-pyroxene skarns are developed at contacts of fault-intruded granitoids. The metallic signature of the bulk of the ore is Au-Ag-As-PGE-W-Bi-Sb-Pb-Zn-Sn.

1782 Karamken is a Late Cretaceous, low-sulphidation epithermal Au-Ag deposit with a total gold content of 40 metric tons. It is located in the Okhotsk sector of the Okhotsk-Chukotka volcanic belt, Kolyma-Omolon Superterrane, Magadan, northeast Russia. The deposit is localized on the western margin of the Verkhne-Armansk volcano-tectonic depression, a Late Cretaceous caldera located at the intersection between the regional EW-oriented Karamken-Utesnensk fault zone and an older NW-trending set of regional faults of the Yana-Kolyma fold belt. Banded and colloform quartz-feldspar veins and associated disseminated sulphides are hosted by Late Cretaceous subvolcanic dacite, andesite, rhyodacite and rhyolite, and auto-breccias of the Kol'chanskaya suite (Ol'chan Group). Quartz and adularia are the dominant gangue minerals, with lesser sericite, calcite and kaolinite. Ore mineralogy is dominated by pyrite with lesser sphalerite, hessite, cassiterite, stannite, chalcopyrite, marcasite, freibergite, naumannite, polybasite, galena, canfieldite, pyrargyrite, electrum, native Ag and selenides. Mineralization is structurally controlled by the intersection of NE-trending, steeply-dipping linear faults with low-angle half-ring faults. Intermediate to felsic volcanics acted as permeable bodies focusing the ore fluids, whereas the overlying basalt acted as a impermeable barrier and is much less altered. Hydrothermal alteration consists of proximal silicification and quartz-adularia potassic alteration, grading to an outer proximal zone of quartz-sericite. This grades outward into a distal propylitic quartz-chlorite alteration (also occuring regionally along faults). Proximal alteration at depth is more commonly represented by carbonatization. At shallow levels, quartz-sericite alteration grades to argillic alteration (quartz-kaolinite), to near-surface advanced argillic (gypsum-kaolinite-alunite). The two latter types of alteration could be of supergene origin (Smirnov, 1977). The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Se-Te-Sn-Pb-Cu.

2097 Taseevo is a Late Cretaceous to Early Paleocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 557 metric tons. It is located in the Balei district of the Transbaikal region, Transbaikal-Mongolian orogenic collage, northeastern Siberia, Russia. The deposit is localized in the Balei graben, a structure located at the intersection of NE- and NW-trending regional faults. Banded and colloform quartz veins, stockworks, and disseminated sulphides are hosted by sandstones and conglomerates of the Jurassic to Cretaceous Novotroyitsk Formation, by intermediate tuffs of the Middle Jurassic Kiprin Formation, and (to a lesser degree) by Late Archean to Early Proterozoic basement gneisses and schists. Quartz and chalcedony are the dominant gangue minerals, with lesser adularia and minor kaolinite and carbonates. Ore minerals are pyrite, arsenopyrite, chalcopyrite, tetrahedrite, silver sulphosalts, pyrargyrite, electrum and tellurides. Stockworks and disseminated sulphides at Balei are structurally controlled by EW-oriented, steeply-dipping normal faults, and their intersections with NNW-trending faults. Quartz veins and associated disseminated sulphides at Taseevo are controlled by NE-striking, steeply-dipping normal faults and extension joints. Hydrothermal alteration consists of proximal silicification, adularization and sulphidation, with late overprinting kaolinitization and carbonatization. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Se-Te.

3210 Ametistovoye is an Oligocene(?) low-sulphidation epithermal Au-Ag deposit with a total gold resource of 46 metric tons. It is located in the Koryak district of the Central-Koryak metallogenic province, Kamchatka fold belt, Kurile-Kamchatka magmatic arc, Kamchatka peninsula, Far Eastern Russia. The deposit is associated with a caldera which represents the dominant structure in the area. Quartz veins and quartz stockworks are hosted by Oligocene porphyritic altered diorite. Mineralization is distributed along a series of concentric, steeply-dipping ring faults associated with the caldera structure. Hydrothermal alteration consists of feldspar-clay alteration in the veins selvages. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-Hg.

4027 Zun-Holba is a Middle Devonian(?) quartz-carbonate shear-zone-related Au-Ag-PGE deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 33 metric tons. It is located in the Kitoi-Urik ore field of Eastern Sayan, northeast margin of the Gargan Block, Buryat Republic, Eastern Siberia, Russia. The Samarta-Kholbinsk Syncline is the dominant regional tectonic structure in the area. Quartz veins and veinlets and associated disseminated sulphides are hosted by greenschist to amphibolite grade Archean granitic gneiss, Upper Proterozoic limestones, sandstones, carbonaceous shales and schists, Paleozoic granitoids, and at the contact of pyroxenite rocks. Gangue minerals are dominated by quartz, with lesser calcite and tourmaline. Pyrite is the dominant ore mineral, with lesser galena, sphalerite, chalcopyrite, arsenopyrite, pyrrhotite, scheelite, tetrahedrite and cubanite. Orebodies are structurally controlled by the NW-trending, steeply-dipping Kholbinsk fracture zone, which is related to the central part of the Samarta-Kholbinsk Syncline. Early, pre-ore serpentinization occured within the ultrabasic rocks. Carbonatization (listwaenites, characterized by an assemblage of quartz-carbonate) and sericitization (beresites) affected the rocks around the ore zones. The metallic signature of the bulk of the ore is Au-Ag-Pt-Pd-Se-Bi-Te-Cu-Zn-Pb.

4028 Kubaka is an Early Cretaceous, low-sulphidation epithermal Au-Ag deposit with a total gold content of 97 metric tons. It is located in the Kedon metallogenic belt, in the Omolon massif of the Kolyma Mountains, Omolon terrane, Kolyma-Omolon superterrane, Magadan Oblast, Far East Russia. The deposit is located in a zone of conjugated regional deep faults, in a block defined by NE-trending linear faults, and within a volcanic structure, possibly a caldera. Banded, colloform and brecciated quartz-feldspar veins, hydrothermal breccias and associated disseminated sulphides are hosted mainly by Middle Jurassic rhyodacites and rhyodacite ignimbrites of the Kubaka Series. Gangue mineralogy is dominated by quartz and adularia, with lesser calcite and minor barite and fluorite. The principal ore minerals are pyrite, arsenopyrite, galena, acanthite, naumannite, freibergite, pyrargyrite, aguilarite, electrum, custelite, native silver, hessite, pearceite and stephanite. Mineralization is structurally controlled by NW-trending, steeply-dipping, en echelon normal faults, and by EW-oriented faults. Hydrothermal alteration consists of pre-ore sericitic alteration (“beresite”) represented by a quartz-sericite-pyrite assemblage, followed by a syn-ore potassic alteration around the veins, characterized by an assemblage of quartz-adularia-sericite. This is in turn overprinted by post-ore argillic alteration (quartz-kaolinite). The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Cu-Pb-Se-Hg-Mn.

4029 Rodnikovoe is a Quaternary, low-sulphidation epithermal Au-Ag deposit with a total gold resource of 6 metric tons. It is located in the Mutnovsky area of the Eastern Kamchatka volcanic belt, Kurile-Kamchatka Magmatic Arc, Kamchatka peninsula, Eastern Russia. Regional faults controlled the distribution of the volcanic centers and intrusions. Quartz-carbonate vein mineralization is hosted by Pleistocene subvolcanic diorite and gabbro-diorite. Quartz is the dominant gangue mineral, with lesser chalcedony, calcite, rhodocrosite and adularia, and minor chlorite and sericite. Ore mineralogy is dominated by pyrite, chalcopyrite, galena, marcasite, hessite, sphalerite, sulfosalts, arsenopyrite, stibnite, pearceite, argentite and native Ag. Mineralization is structurally controlled by NNW- and NS-trending, steeply-dipping normal faults. Hydrothermal alteration consists of regional, pre-mineral propylitic alteration, characterized by the assemblage chlorite-epidote-pyrite-sericite-clay minerals-calcite-quartz. An envelope of proximal potassic alteration/ silicification, characterized by a quartz-sericite-adularia assemblage extends a few metres away from the veins. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Te-Hg-Cu-Pb-Zn.

4030 Pokrovskoye is a Late Cretaceous, low-sulphidation epithermal deposit with a total gold content of 10 metric tons, and resources of 294 metric tons. It is located in the North Bureya district of the Bureya terrane, Southern Urals, Transbaikal-Mongolian orogenic collage, Amur Oblast, Far East Russia. A NNE-trending shear zone (suture zone?), filled by a tectonic melange, is the dominant regional tectonic structure in the area. Quartz veins and associated disseminated sulphides are hosted by a Late Cretaceous sequence of andesite, dacite and tuff. Quartz is the dominant gangue mineral, with lesser adularia, kaolinite and carbonates. Ore mineralogy is dominated by pyrite, with lesser tellurides. The gently-dipping contact between the lower andesite sequence and a granodiorite porphyry sill is the main structural control on mineralization. Hydrothermal alteration consists of potassic (adularia-chlorite-sericite-quartz), propylitic (albite-sericite-calcite-chlorite-pyrite), sericitic (quartz-sericite-hydromica) and argillic (kaolinite-montmorillonite-hydromica-carbonates-quartz-pyrite) assemblages. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Te.

4031 Berezovskoe is an Early Silurian(?) quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 466 metric tons. It is located in the Berezovo ore field, East Tagil' area of the Tagil'-Magnitogorsk basin, Central Urals, Russia. The dominant regional tectonic structures of the area are the Eastern Urals Anticlinorium and the N- to NNW-trending Murzinskiy fault. The latter separates the older gneiss-schist complex from the younger volcanic domain, and controlled intrusion emplacement. Banded and drusy quartz veins and associated disseminated sulphides are hosted by porphyritic granite, feldspar porphyry and feldspar syenite dykes related to the Early Silurian Shartash pluton (of similar composition). Quartz veins are mostly confined to the dykes, but some veins (named “krassyk veins”) occur in the surrounding gabbros, serpentinites, diabases, shales and tuffs. Quartz is the dominant gangue mineral, with lesser tourmaline and ankerite. Ore mineralogy is dominated by pyrite, with lesser chalcopyrite, sphalerite and galena, and minor tennantite, tetrahedrite and scheelite. Ore-hosting dykes are NS-oriented and probably intruded high-angle faults of the same orientation, related to the regional structure. Veins are controlled by EW-oriented, steeply-dipping tension fractures perpendicular to the orientation of the dykes, and by SE-trending, high-angle shear fractures linking with the EW-oriented set in a distinctive “ladder” pattern. Krassyk veins are the extension (with the same orientation) of the tension veins hosted by the granitoid dykes. Dykes that are hosted by sedimentary or effusive rocks are favored host due to their competency contrast with the surrounding rocks. Dykes within the pluton are not fractured, and dykes within serpentinite or schistose rocks are deformed and boudinaged and too dispersed to be economic. Hydrothermal alteration of the granite dykes consists of “beresite alteration” (quartz-sericite-pyrite). Gabbros and serpentinite are affected by “listwaenite alteration” (carbonate-quartz-talc-micas). Supergene oxidation along fractures in dykes is characterized by development of crocoite-wulfenite-malachite-iron hydroxides. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-Sb-W.

4032 Vorontsovskoe is a Late Devonian to Late Carboniferous sediment-hosted micron gold deposit (Carlin-type) with a total gold content of 68 metric tons. It is located in the Turinsk-Auerbakhovsk ore district of the Tagil magmatic arc, Urals fold system, northern Urals, Russia. Regional NS-oriented faults are the dominant tectonic structure in the area. Quartz veins and veinlets and associated disseminated sulphides are hosted by brecciated to massive Devonian limestones. Quartz is the dominant gangue mineral, with lesser sericite and carbonate. Ore mineralogy is dominated by arsenopyrite and pyrite, with subordinate pyrrhotite, realgar, orpiment, chalcopyrite, sphalerite, stibnite, cinnabar, alabandite, routhierite, pierrotite, zinkenite, tennantite, tetrahedrite, chalcostibite, boulangerite, jamesonite, galena and bournonite. Mineralization is structurally controlled by the intersection of the Vorontsovsk overthrust fault with NS-oriented high-angle faults splaying from the regional trend. The main ore-bearing zones follow the limestone-tuffite lithological contact. Hydrothermal alteration patterns are complex and vary in time. Pre-ore wollastonite skarns and pyroxene-garnet iron-copper skarns occur along faults and fractures adjacent to granodioriote intrusions,;the latter commonly host gold-bearing quartz veins. Potassic alteration (K-feldspar with intergrowths of oligoclase-albite) is distributed over the same area as the skarns along fractures, and also affects the diorite and granodiorite intrusions. This alteration grades outward to an ore-bearing propylitic alteration of actinolite-epidote-albite-calcite-chlorite±adularia. Low-grade to uneconomic carbonate alteration (represented by quartz-dolomite-ankerite-sericite-chlorite-albite) is superposed on skarns and replaces intermediate-basic volcanic rocks and intrusions along faults. Sericitic alteration (characterized by quartz-sericite±adularia±chlorite±albite) is the main gold-bearing alteration type and affects mainly the intermediate-basic volcanics and pyroclasics. It occurs primarily along faults and fractures and the Vorontsovsk overthrust, and overprints the carbonate alteration. Jasperoid alteration occurs within the limestone and along its contacts, and overprints the sericitic alteration, in which case ankerite is also associated with the jasperoid. Low-termperature argillic alteration (montmorillonite-kaolinite-quartz) also occurs in the deposit. The metallic signature of the bulk of the ore is Au-Ag-As-Hg-Tl-Sb-Pb-Zn-Cu-Pt-Pd.

4033 Kochkar is an Early Permian, quartz-carbonate shear-zone-related gold district-deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 380 metric tons. It is located in the Plast Massif of the East Uralian Zone, Southern Urals, Russia. The dominant regional tectonic structure in the area is the Main Uralian Fault, a N- to NNE-trending, steeply-dipping sinistral strike-slip transpressive shear zone. Massive, laminated and ribboned quartz-carbonate veins and disseminated sulphides are hosted by Late Carboniferous to Early Permian, fine-grained to porphyritic gabbro and diorite (mafic to intermediate) dykes intruding Early to Middle Carboniferous granodiorite-trondjhemite-tonalite granitoids which also host ore. Quartz is the dominant gangue mineral, with lesser carbonate and minor sericite, scheelite, biotite and chlorite. Ore mineralogy is dominated by pyrite and arsenopyrite, with subordinate chalcopyrite, sphalerite, pyrrhotite, marcasite, tetrahedrite, galena, bismuthinite, tetradymite, boulangerite and bournonite. Mineralization is structurally controlled by the ENE-, NE- and E-trending (and rarer SE-trending), steeply-dipping mafic dykes. Mineralized veins are localized mostly within the gabbro and diorite dykes and at their margins. Due to competency contrasts with the enclosing granitoids, the dykes were the loci of syn-mineralization, ductile dextral strike-slip shearing (with some dip-slip component) and mylonitization deformation. SE-trending dykes were activated as sinistral strike-slip shears, also with a dip-slip component. Late, NE-trending, brittle-ductile faults overprint the dykes and commonly contain chloritic gouge. Hydrothermal alteration consists of proximal sericitic alteration around the veins (sericite/muscovite-albite-carbonate-chlorite), with local development of tourmaline and scheelite. This grades outward to distal albitization, characterized by an assemblage of albite-muscovite-quartz. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Zn-Pb-Bi-B-W.

4034 The Darasun ore field is a Middle Jurassic to Early Cretaceous quartz-carbonate shear-zone-related gold field (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 115 metric tons. It is located in the Transbaikal gold-molybdenum belt (Eastern Zabaikal belt), Severo-Darasun Arch, Chita Oblast, Siberia, Russia. The deposit occurs at the intersection of two regional tectonic zones, the Klichinsko-Darasun and Zharcha-Voskhodovo tectonic zones. Brecciated, banded and cockade quartz veins and small amounts of disseminated sulphides are hosted by granite, granodiorite, syenite, quartz diorite and plagiogranite intrusions of the Middle Jurassic Amudzhikan-Sretenskii complex. Quartz is the dominant gangue mineral, with subordinate carbonate, tourmaline and sericite, minor apatite and rutile and rare amounts of gypsum, anhydrite, barite, fluorite and zeolite. Ore mineralogy is dominated by pyrite, arsenopyrite, chalcopyrite and pyrrhotite, with lesser sphalerite, galena, tetrahedrite, bournonite, marcasite, stibnite, zinkenite, boulangerite, jamesonite, tellurides, native Bi and bismuthinite, and rare Ag-Pb-Bi sulfosalts, molybdenite, iron oxides and Hg minerals. Mineralization is structurally controlled by NW-trending, steeply-dipping, reverse shear zones, by NE- to E-trending, steeply-dipping, strike-slip-reverse faults, and their intersections. Hydrothermal alteration consists of chloritization, carbonatization, sericitization (beresite alteration or quartz-sericite-pyrite) and pyritization of acid rocks along faults and around veins. Basic rocks are affected by carbonate alteration (listwaenite alteration or quartz-carbonate-talc) and local tourmalinization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Bi-Zn-Pb-Cu-Te-Mo-Hg.

4206 Julietta an Early Cretaceous, low-sulphidation epithermal Au-Ag deposit with a total gold content of 20 metric tons. It is located in the Julietta district of the Okhotsk sector, Okhotsk-Chukotka volcanic belt, Kolyma-Omolon Superterrane, Magadan Oblast, Far Eastern Russia. The deposit is localized in a large resurgent caldera, at the center of a volcano-tectonic depression located at the intersection of the NS-oriented Tan'ya-Nursk deep fault zone and the NE-striking Engterinsk fault. Colloform, crustiform and banded quartz veins and minor associated disseminated sulphides are hosted by andesites, basaltic andesites and andesitic tuffs of the Early Cretaceous Ivanyinskaya Formation. Quartz is the dominant gangue mineral, with lesser ankerite, dolomite, calcite, sericite and adularia, minor rhodocrosite, rhodonite and anatase, and rare apatite. Ore mineralogy is dominated by pyrite, with minor sphalerite, chalcopyrite, galena, tetrahedrite, kustelite, polybasite, acanthite, stephanite and mackinstryite and rare freibergite, native Ag, pyrargyrite, naumannite, hessite, canfieldite, sternbergite, tennantite, arsenopyrite and marcasite. Mineralization is structurally controlled by W-trending, steeply-dipping and sinuous tension fractures, and by NW-trending, steeply-dipping, dextral strike-slip faults. Fault and fracture intersections and flexures localized high-grade, bonanza ore zones. Hydrothermal alteration is zoned, and consists of a proximal potassic alteration (represented by an assemblage of quartz-adularia), grading progressively outward to an inner sericitic alteration zone (sericite-quartz-carbonate-pyrite) forming mostly linear zones along structures, and an outer sericitic zone (quartz-carbonate-sericite-pyrite). Distal alteration consists of a widespread, low-temperature propylitic assemblage of pyrite-calcite-quartz-chlorite-sericite, which grades at depth to a medium temperature propylitic assemblage of epidote-chlorite-albite-calcite. Garnet-vesuvianite-calcite-diopside skarn and a thick pyritization aureole formed around and near the borders of post-ore diorite/granodiorite plutons of the Okhotsk Complex (which intruded the volcanic rocks), they caused recrystallization and dilution of the ore near their contacts. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-As-Sb-Zn-Cu-Pb-Hg-Se-Te.

4207 Nezhdaninskoye is an Early to Late Cretaceous, intrusion-related non-carbonate-hosted stockwork-disseminated Au-Pt deposit with a total gold content of 114 metric tons. It is located in the South Verkhoyansk Synclinorium area of the northern portion of the Allakh-Yun belt, Verkhoyansk-Kolyma orogenic Belt, Sakha-Yakutia, Russia. The deposit is localized at the intersection of the NS-oriented Kiderikinsk deep fault and the NE-trending Suntarsk deep fault. Quartz veins, stockworks and disseminated sulphides are hosted by greenschist grade, tectonized (sometimes mylonitized) siltstones and sandstones of the Early Permian Djuptagamsk and Dybinsk suites, and by fault-intruded, Late Cretaceous lamprophyre dykes. Quartz is the main gangue mineral, with minor scheelite, sericite, muscovite, calcite, ankerite, K-feldspar and albite, and rare chlorite, apatite and zircon. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser chalcopyrite, sphalerite, tetrahedrite and galena, and minor bournonite, geocronite, boulangerite, zinkenite, meneghinite, famatinite, chalcostibite, berthierite, stibnite, diaphorite, andorite, owyeeite, pyrargyrite, miargyrite, stephanite, polybasite and billingsleite. Mineralization occurs in the NS-oriented Dybinsk anticline, and is structurally controlled by two fault systems and their intersections: 1) the S-trending, steeply-dipping Nezhdaninsk fracture system, and 2) ENE- to E-trending subvertical faults such as the Kurumsk fault. Late, NW-trending subvertical shears healed by barren quartz veins cut across the orebodies. Hydrothermal alteration consists of pre-ore regional propylitic and sericite-carbonate alteration, overprinted by ore-related, fault-controlled beresite (or sericitic) alteration and arsenopyrite-pyrite-pyrrhotite sulphidation. Beresite alteration facies are vertically zoned in the rock sequence. In siltstones, a quartz-carbonate-sericite assemblage occurs at high level, and quartz-carbonate-albite-sericite at depth. In sandstones, quartz-albite-sericite facies occurs in the upper levels, whereas quartz-carbonate-albite occurs at depth. Lateral zonations are also present in both beresite and sulphidic alteration, characterized by sericite and pyrite in the outer parts, and by albite and arsenopyrite in the inner parts. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Pb-Cu-Zn-Ba-W. According to Bortnikov *et al.* (1998), mineralization is two-stage: 1) an Early Cretaceous 115-124 Ma arsenopyrite-pyrite-rich stage associated with active magmatism and regional metamorphism, and 2) a Late Cretaceous silver-lead-rich stage associated with emplacement of the Geldinsk stocks and remobilization of previous sulphides. Isotopic and fluid inclusion data support a model of mixing of magmatic, metamorphic and meteoric fluids, where the magmatic contribution is predominant. Bortnikov *et al.* (1998) further suggested that hydrothermal alteration zonation is the product of an evolution of the hydrothermal fluid, and not replacement.

4208 Aginskoe is a Pliocene or later low-sulphidation epithermal Au-Ag deposit with a total gold content of 33 metric tons. It is located in the Central Kamchatka gold field of the Central Kamchatka volcanic belt, Kamchatka-Kuril volcanic arc, Kamchatka Oblast, Far Eastern Russia. Regional faults controlled the distribution of the volcanic centers and intrusions, and the deposit is located in a well-preserved paleovolcanic center. Colloform quartz-feldspar veins are hosted by Miocene to Pliocene andesites and andesitic tuffs. Quartz is the dominant gangue minerals, with lesser adularia and sericite, and minor corrensite, zeolite and calcite. Pyrite and tellurides (hessite, altaite, calaverite, sylvanite and petzite) are the dominant ore minerals. Mineralization is structurally controlled by oblique and radial faults within the paleocaldera. Hydrothermal alteration consists of remnants of silicic sinters and widespread, low-temperature, propylitic alteration. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Te.

4224 Olimpiada is a Late Proterozoic (?) turbidite-hosted quartz-carbonate vein gold deposit with a total gold content of 197 metric tons. It is located in the Central (Tseyko-Tatar) zone of the Yenisey fold belt (or range/ridge), western edge of the Siberian Craton, Krasnoyarsk, Russia. The deposit is localized in a fault-bounded block at a bend of the NNW-oriented Tatar deep fault, the dominant regional tectonic structure in the area. Stratiform disseminated sulphide mineralization (and very rare sulphide stringers) is hosted by Late Proterozoic greenschist grade quartz-mica, quartz-carbonate-mica, and carbonaceous quartz-muscovite metasedimentary schists of the Korda Formation, Sukhoy Pit Group. Quartz and carbonates are the dominant gangue minerals. Ore mineralogy is dominated by arsenopyrite and pyrrhotite, with subordinate pyrite, stibnite and scheelite, minor berthierite, gudmundite, aurostibite, jamesonite, tetrahedrite, galena, sphalerite, chalcopyrite, bismuthinite, marcasite, magnetite and ilmenite. Interlaminar shear zones or strike-slip faults, and NE-trending, steeply-dipping transverse faults are important controlling structures. The contact zone between quartz-carbonate and carbonaceous quartz-muscovite(-graphite) schists localized most of the mineralization; the carbonaceous schist is thought to have acted as an impermeable barrier to ore-bearing fluids (Khiltova and Pleskach, 1997). The orebodies are sheet-like and follow the gently E- to NE-dipping, compressed, subisoclinal, recumbent Medvezhinskaya anticline. The largest orebody of the deposit is located in the immediate hinge zone of the anticline. Hydrothermal alteration of the schists consists of propylitic (quartz-albite-mica-clinozoisite) alteration, sericitic (quartz-muscovite-carbonate) alteration and argillic (quartz-kaolinite) alteration. An important part of the deposit consits of a supergene ore-bearing weathering crust of quartz-kaolinite-muscovite and Fe-Mn-Sb-oxides and hydroxides, with free gold or disseminated gold in limonite aggregates. The metallic signature of the bulk of the ore is Au-Ag-W-As-Sb. According to Goryainov (1994), the granites of the Tatarsk-Ayakhta complex are older than the mineralization, whereas Khiltova and Pleskach (1997), citing Lu and Grinenko, sugggested that the Olimpiada deposit owes its origin to the hydrothermal-metasomatic processes developed during their intrusion.

4225 Sukhoi Log is a Late Proterozoic to Early Permian turbidite-hosted quartz-carbonate vein Au-Ag-Pt-Pd deposit with a total gold resource of 1048 metric tons. It is located in the Lena goldfields of the Bodaibo intracratonic basin, Baikal-Patom fold belt, Siberian Craton, Eastern Siberia, Irkutsk, Russia. EW-oriented, syn-metamorphic first-order folds of the Bodaibo Synclinorium are the dominant regional tectonic structures in the area. Disseminated sulphides, quartz and quartz-carbonate veins are hosted by Early to Late Proterozoic greenschist grade carbonaceous black shales of the Khomolkho Formation. Quartz and carbonate are the main gangue minerals. Ore mineralogy is dominated by pyrite, with subordinate pyrrhotite and arsenopyrite, and minor to rare sphalerite, chalcopyrite, tetrahedrite, galena and sulphosalts. Mineralization is structurally located in the hinge zone of the first order folds, and is controlled by SE-trending dextral strike-slip faults (2^{nd} generation) that affect the hinge zone, and by lithological contacts. Orebodies are tabular in shape, and associated with graphite-rich (organic matter-rich) silty pelite units. Hydrothermal alteration consists of proximal sericitic alteration (or beresite/listwaenite alteration) represented by an assemblage of quartz-sericite-carbonate-pyrite, which grades outward to distal quartz-chlorite-sericite-carbonate propylitic alteration. The metallic signature of the bulk of the ore is Au-Ag-Pt-Pd-Cu-Sb-Se-Hg-U. Larin *et al.* (1997) proposed a two-stage model for the genesis of the Sukhoi Log deposit, apart from the early (pre-ore) barren syn-diagenetic massive pyrite. The first stage consisted of early local concentration of gold in favorable lithology and structures and corresponds to Late Proterozoic syn-metamorphic veins with pyrite-pyrrhotite and disseminated sulphides, which are parallel to the schistosity. This was followed by the main gold-bearing event of pyrite-arsenopyrite in quartz veinlets, coeval to dyke emplacement (Early Carboniferous to Early Permian), and associated with low-temperature, mineralized sericitic alteration zones.

4226 Verninskoe is a turbidite-hosted, quartz-carbonate vein Au-Ag deposit with a total gold content of 34 metric tons. It is located in the Lena goldfields of the Bodaibo intracratonic basin, Baikal-Patom fold belt, Siberian Craton, Eastern Siberia, Irkutsk, Russia. EW-oriented, syn-metamorphic first-order folds of the Bodaibo Synclinorium are the dominant regional tectonic structures in the area. Disseminated sulphides and quartz veins are hosted by Middle to Late Proterozoic shallow marine sandstone and siltstone of the Khomolkho Formation. Quartz is the dominant gangue mineral. Ore mineralogy consists of pyrite and arsenopyrite. Mineralization is structurally controled by folds. The metallic signature of the bulk of the ore (partially inferred from its mineralogy) is Au-Ag-As.

4227 Golets Vysochaishiy is a turbidite-hosted, quartz-carbonate vein gold deposit with a total gold content of 44 metric tons. It is located in the Lena goldfields of the Bodaibo intracratonic basin, Baikal-Patom fold belt, Siberian Craton, Eastern Siberia, Irkutsk, Russia. EW-oriented, syn-metamorphic first-order folds of the Bodaibo Synclinorium are the dominant regional tectonic structures in the area. Disseminated sulphides and quartz veins are hosted by Middle to Late Proterozoic greenschist grade metasedimentary schists of the Khomolkho Formation. Quartz is the dominant gangue mineral. Ore mineralogy consists of pyrite and arsenopyrite. Mineralization is structurally located in the hinge zone of the first order folds, and is controlled by SE-trending dextral strike-slip faults (2^{nd} generation) which affects the hinge zone. The metallic signature of the bulk of the ore (partially inferred from its mineralogy) is Au-Ag-As-Pt-Pd.

4228 Chertovo Koryto is a turbidite-hosted, quartz-carbonate vein Au-Pt deposit with a total gold resource of 200 metric tons. It is located in the Lena goldfields of the Bodaibo intracratonic basin, Baikal-Patom fold belt, Siberian Craton, Eastern Siberia, Irkutsk, Russia. EW-oriented, syn-metamorphic first-order folds of the Bodaibo Synclinorium are the dominant regional tectonic structures in the area. Quartz veins and associated disseminated sulphides are hosted by greenschist grade Middle to Late Proterozoic metasedimentary schists. Quartz is the dominant gangue mineral. Ore mineralogy consists of pyrite and arsenopyrite. The metallic signature of the bulk of the ore is Au-Ag-Pt-Pd.

4229 Maiskoe is an Early to Middle Creteceous(?) turbidite-hosted quartz-carbonate vein Au-Ag-Pt-Pd-Sb-W deposit with a total gold content of 114 metric tons. It is located in the Maiskaya metallogenic zone of the Anyui-Chukotka metallogenic province, Novosibirsk-Chukotka fold system (Okhotsk-Chukutka volcanic belt), Chukotka, Russia. The deposit occurs in a horst block in a dome-shaped uplift, at the junction of major regional faults. Disseminated sulphides and quartz stockworks are hosted by greenschist grade, shallow marine mudstone, shale and siltstone of Middle Triassic age. Ore mineralogy is dominated by pyrite, arsenopyrite and stibnite, with lesser marcasite, molybdenite, galena, sphalerite, cassiterite, Bi sulphosalts, chalcopyrite, native Ag, and cinnabar. Mineralization is structurally controlled by the NS-oriented, high-angle Etchikun-Rymyrkan fault and splays. Orebodies form elongated en echelon zones within the fault, with gently-dipping lenses and pods linking them. Orebodies are also localized in or at the contact with granite-rhyolite dykes. Hydrothermal alteration consists of silicification and sulphidation of crushed shale and siltstone of the orebodies, with minor proximal sericitic alteration of the sediments (characterized by quartz-sericite-kaolinite) and argillic alteration of the magmatic rocks (quartz-kaolinite). Weak carbonate and graphitic alterations also occur. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Pb-Zn-W.

4230 Karalveem is an Early to Middle Cretaceous quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 41 metric tons. It is located in the Malyi Anyui metallogenic zone of the Anyui-Chukotka metallogenic province, Novosibirsk-Chukotka fold system (Okhotsk-Chukotka volcanic belt), Chukotka, Russia. NW-oriented regional faults are the dominant tectonic structures in the area. Quartz vein mineralization is hosted by greenschist grade, Midde Triassic gabbro-diabase dykes and intruded shales and sandstones. Gange mineralogy is dominantly quartz, with lesser muscovite and minor calcite, albite, ankerite and topaz. Ore mineralogy is dominated by arsenopyrite, with subordinate galena, scheelite, sphalerite, pyrite and pyrrhotite. Orebodies are mostly confined to the gabbro-diabase dykes and their contacts with the shale-sandstone sequence, and die out rapidly outside of the dykes. Narrow and steep NW-trending folds affect the whole area, and orebodes are controlled by strike-slip faults associated with this folding. Hydrothermal alteration consists of proximal carbonatization (quartz-carbonate) and sulphidation. Sericitic (sericite-chlorite) alteration also occurs. The metallic signature of the bulk of the ore is Au-Ag-As-Pb-Bi-W±Hg.

4231 Kyuchus is a Late Cretaceous to younger(?) turbidite-hosted quartz-carbonate vein Au-Hg-Sb deposit with a total gold content of 157 metric tons. It is located in the Kular metallogenic district of the Moma rift, Verkhoyansk-Kolyma fold system, Sakha-Yakutia, Russia. The NE-trending Kular anticlinorium and the NE-trending Yana crustal fault are the dominant regional tectonic structures in the area. Quartz stockworks, stringers, and disseminated sulphides are hosted by Middle Triassic siltstones and mudstones of the Verkhoyansk Complex. Quartz is the main gangue mineral. Ore mineralogy is dominated by arsenopyrite, pyrite, stibnite and cinnabar, with lesser realgar, marcasite, chalcopyrite, orpiment, berthierite, sphalerite, galena, bournonite, pyrrhotite and tetrahedrite. The Kyuchus Syncline is a NE-trending fold affecting the southeastern flank of the Kular Anticlinorium. The deposit is located in a NE-trending sinistral strike-slip branch of the regional Yana fault. Quartz veins and disseminated sulphides occupy EW- and NS-oriented, steeply-dipping faults and shear zones. Hydrothermal alteration of the sediments near the orebodies and shear zones consists of silicification, argillic alteration (kaolinite-dickite), carbonatization (ankerite-calcite) and graphitic alteration. The metallic signature of the bulk of the ore (partially inferred from its mineralogy) is Au-Ag-As-Sb-Hg-Cu-Pb-Zn. Volkova and Volkov (1999) suggested that the cinnabar-stibnite ore association is superposed on the older pyrite-arsenopyrite ore association, the latter possibly associated with Late Cretaceous granitic magmatism.

4232 Shkolnoe is an Early Cretaceous quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 2 metric tons. It is located in the Verkhyaya Kolyma metallogenic district of the Indirgirka-Kolyma metallogenic zone, Verkhoyansk-Kolyma fold system, Magadan, Russia. The Ayan-Yuryakhsky anticlinorium and deep NE- and NW-trending faults controlling intrusion emplacement are the dominant regional tectonic structures in the area. Gold-bearing quartz and quartz-carbonate veins are hosted by diorite, granodiorite and adamellite of the Late Jurassic to Early Cretaceous Brugalinsky stock. Some mineralization is also hosted by the Late Permian to Late Jurassic hornfelsed mudstones and siltstones near the pluton. There are two stages of gold mineralization, an early quartz-molybdenite-arsenopyrite-löellingite-pyrite-sphalerite-chalcopyrite-native bismuth-Bi tellurides-gold, stage, followed by the main-stage assemblage of arsenopyrite-pyrite-sphalerite-chalcopyrite-gold-electrum-freibergite-tetrahedrite-Pb-Sb-Ag-sulphosalts-argentite-stibnite. The bulk of the gold is associated with tetrahedrite (Eremin, 1995). Mineralization is structurally controlled by en echelon, E- to NE-trending faults and shears. Hydrothermal alteration consists of sericitic ("beresite") and argillic alteration around the veins. The metallic signature of the bulk of the ore (partially inferred from its mineralogy) is Au-Ag-As-Sb-Cu-Zn-Pb-Bi-Te. Initially interpreted as an intrusion (granite)-related deposit formed over an extensive period by collisional processes, Newberry and Layer (1997) concluded that Shkolnoe is a post-collisional, metamorphic-related deposit.

4233 Khakandzha is a Late Cretaceous to Early Eocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 60 metric tons. It is located in the Dzhugdzhur zone of the Okhotsk-Chukotka magmatic arc, Kolyma-Omolon Superterrane, Khabarovsk, Russia. NS-oriented deep faults are the dominant tectonic structures in the area. Quartz veins and stockworks are hosted by Early to Late Cretaceous high alkaline spherulitic, aphyric, pillowed and brecciated rhyolite, and by calc-alkaline andesite and rhyodacite. Gangue mineralogy is dominated by quartz, with subordinate adularia, rhodochrosite, sericite, calcite and rhodonite, and minor kaolinite, barite, epidote, chalcedony, apatite and zicon. Pyrite, argentite and galena are the dominant ore minerals, with lesser chalcopyrite, sphalerite, polybasite, kustelite, pyrargyrite, pearceite, tetrahedrite, sternbergite and cinnabar. Mineralization is structurally controlled by the NNW-trending, gently- to moderately-dipping lithologic contact between the rhyolite and andesite-rhyodacite units, and by NE-striking faults. Hydrothermal alteration consists of proximal silicification/potassic alteration (characterized by quartz-adularia-kaolinite) in the rhyolites, grading outward to distal sericitic alteration (quartz-sericite). The andesites and rhyodacites are affected by propylitic (chlorite-carbonate) alteration, which is intense along the NE-trending fault zone. Post-ore argillic alteration also occurs along faults. The metallic signature of the bulk of the ore (partially inferred from its mineralogy) is Au-Ag-Pb-Cu-As-Sb-Mo-Mn-Zn.

4234 Tas-Yuryakh is a sediment-hosted micron gold disseminated Au-Ag deposit with a total gold content of 40 metric tons. It is located in the Tas-Yuryakh district of the Allakh-Yun metallogenic province, Verkhoyansk-Kolyma fold system, Khabarovsk, Russia. Stockwork mineralization is hosted by shallow marine Cambrian carbonate and siltstone. Gangue mineralogy consists of quartz, sericite and carbonate. Ore mineralogy consists of hematite, scorodite and jarosite for the oxide ore, and of pyrite, arsenopyrite, chalcopyrite, galena, tetrahedrite, sphalerite and polybasite for the sulphide ore. Mineralization is structurally controlled by lithological contacts. Hydrothermal alteration consists of silicification, represented by an assemblage of quartz-sericite-chlorite-carbonate. Dykes of the carbonatite-lamprophyre association are related to the mineralization. The metallic signature of the bulk of the ore is Au-Ag-As±Hg.

4235 Tokur is a Late Jurassic to Early Cretaceous intrusion-related, non-carbonate-hosted stockwork-disseminated gold deposit with a total gold content of 29 metric tons. It is located in the Selemdzha-Kerbi district of the Mongol-Okhotsk suture zone, Transbaikal-Mongolian orogenic collage, Amur Oblast, Russia. Quartz veins and associated disseminated sulphides are hosted by Carboniferous sandstone, quartz sandstone, siltstone and shale. Quartz is the dominant gangue mineral, with subordinate adularia, sericite, calcite and chlorite. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser sphalerite, galena, chalcopyrite, scheelite, pyrrhotite, native Au, tetrahedrite, tennantite, marcasite and stibnite. Mineralization is structurally controlled by folds and lithological contacts. Orebodies are gently- to moderately-dipping, comformable to the stratigraphy and occur inside or at bed contacts. Steeply-dipping, diorite-diabase dyke-intruded faults intersect the orebody at high angle. Hydrothermal alteration consists of of silicification and sericitization along the quartz veins, of hornblende alteration, and of supergene oxidation that has resulted in gold enrichment in the first 200 metres of the deposit below surface. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Zn-Pb-W-Sb. According to Yugay (1971), mineralization is paragenetically related to the dykes of porphyritic diorite and diabase, and classified as an intermediate deposit type between plutonic- and volcanic-associated deposits.

4236 Mnogovershinnoe is an Early Paleocene to Early Eocene low sulphidation epithermal Au-Ag deposit with a total gold content of 82 metric tons and resources of 127 metric tons. It is located in the Lower Amur district of the East Sikhote-Alin magmatic arc, Sikhote-Alin fold system, Khabarovsk, Russia. The N- to NNE-trending Central Sikhote-Alin fault is the dominant regional tectonic structure in the area. The deposit is confined to a NS-oriented graben in the western part of the Bkchi-Ul tectono-magmatic uplift. Banded and breccia quartz veins and stockworks are hosted by Paleocene calc-alkaline andesite and dacite of the Ul volcanic structure. The volcanic rocks are comagmatic with the granitic intrusions of the Ukchi-Belskiy massif. Quartz is the main gangue mineral, with subordinate adularia, sericite rhodonite and carbonate. Ore mineralogy consists of pyrite, and lesser (in no particular order) marcasite, argentite, Au and Ag tellurides, galena, sphalerite, chalcopyrite, freibergite, cinnabar, tetrahedrite-tennantite, pyrrhotite, arsenopyrite, bismuthinite, wolframite, cassiterite, and molybdenite. Mineralization is structurally controlled by NE-trending, steeply-dipping fault splays of the Central Sikhote-Alin fault. These faults also parallel the folds which affect the Mesozoic basement beneath the volcanic belt. NW-trending, steeply-dipping faults related to a Late Paleozoic structural event and NS-oriented “joint zones”, combined to the NE trend, provided the complex block structure of the ore field. Hydrothermal alteration consists of weak proximal potassic alteration and silicification (characterized by a quartz-adularia-sericite assemblage) which grades outward to a distal (low-temperature) propylitic alteration (chlorite-carbonate-sericite). Skarnification and high-temperature propylitic alteration (represented by epidote-chlorite-hornblende-biotite) are associated with contact metamorphism near the granitic intrusions. The metallic signature of the bulk of the ore (partially inferred from its mineralogy) is Au-Ag-Cu-Zn-Pb-Te-As-Mo-Sn-Mn-W.

4237 Ozernovskoe is a Neogene low-sulphidation, epithermal Au-Ag-Te deposit with a total gold content of 45 metric tons. It is located in the Palana-Komandor fault zone area of the

Central Kamchatka volcanic belt, Kurile-Kamchatka magmatic arc, Koryak Okrug, Russia. Quartz-feldspar veins and stockworks, and associated disseminated sulphides are hosted by Neogene basaltic andesite, andesite, dacite and dacitic pyroclastics. Quand and adularia are the dominant gangue minerals, with lesser kaolinite and sericite. Ore mineralogy is dominated by pyrite, with lesser goldfieldite, tellurides, sylvanite and selenides, and minor (local) Cu-Mo sulphides, realgar and orpiment. Mineralization forms tabular, linear orebodies along a NW-trending fault zone. Hydrothermal alteration consists of silicification and potassic alteration (represented by a quartz-adularia-sericite assemblage), with argillic (quartz-kaolinite-montmorillonite-sericite) alteration in the central part of the orefield, near the main volcanic vent. Proximal advanced argillic alteration, represented by a pyrite-alunite-kaolinite-quartz assemblage, surrounds the orebodies. This grades to a distal propylitic (sericite-chlorite) alteration. The metallic signature of the bulk of the ore is Au-Ag-As-Pb-Zn-Te.

4238 Klyuchi is a Mesozoic or younger (?) gold deposit of probable intrusion-related batholith-associated quartz vein affinity, with a total gold content of 90 metric tons. It is located in the Klyuchi orefield of the Eastern Transbaikalian Au-Mo belt, Transbaikal-Mongolian orogenic collage, Chita Russia. Breccia and cockscomb-textured quartz veins and stockworks are hosted by Early Mesozoic porphyritic granite, granodiorite and quartz diorite of the Amudzhikan-Sreten complex, characterized by explosion breccias and hybridism. Quartz and tourmaline are the dominant gange minerals, with minor rutile and sphene. Ore mineralogy consists mainly of pyrite, chalcopyrite and arsenopyrite, with rare freibergite, hematite, enargite, tennantite, molybdenite, galena, sphalerite, benjaminite, famatinite, tetrahedrite, bismuthinite, native Bi, tetradymite, bornite, valleriite and aldagonite. Mineralization is structurally controlled by an E-trending, steeply-dipping fault bringing into contact Paleozoic and Mesozoic granitoids. Intersection of this fault with a NW-trending, steeply-dipping fault localized the main orebody. Hydrothermal alteration consists of pre-ore silicification, sericitization and chloritization related to the Mesozoic intrusive emplacement, syn-ore tourmalinization, and post-ore carbonatization in joints and groundmass. The metallic signature of the bulk of the ore (partially inferred from its mineralogy) is Au-Ag-As-Cu-Bi-Mo-Zn.

4239 Ukoninskoe is an Early Mesozoic or younger (?) low-sulphidation epithermal Au-Ag-Pb deposit with a total gold content of 30 metric tons. It is located in the Yablonevyi ridge area of the Stavonoy block, Transbaikal-Mongolian orogenic collage, Chita oblast, Russia. Disseminated sulphides and quartz-carbonate veins and veinlets are hosted by Late Paleozoic to Early Mesozoic volcanic rocks. The metallic signature of the bulk of the ore is Au-Ag±Cu±Pb±Zn.

4240 Sovetskoe is a Late Proterozoic, turbidite-hosted quartz-carbonate vein Au-Ag deposit with a total gold content of 49 metric tons. It is located in the Central zone of the Yenisey Range, Siberian Craton, Krasnoyarsk, Russia. The NW-trending Yenisey ridge anticlinorium is the dominant regional tectonic structure in the area. Quartz veins and associated disseminated sulphides are hosted by metasedimentary quartz-chlorite-sericite and quartz-muscovite-biotite argillaceous schists and phyllites of the Early to Late Proterozoic Uderei Group. Quartz is the dominant gangue mineral, with lesser calcite, albite, sericite and chlorite. Ore mineralogy is dominated by pyrite and arsenopyrite, with minor stibnite, pyrrhotite, chalcopyrite, galena, sphalerite and marcasite, and rare bismuthinite, native silver, freibergite, maucherite, violarite and calaverite. The deposit is situated on the complexely-deformed northeastern limb of the

Yenisey ridge anticlinorium. Mineralization is structurally controlled by N-trending, steeply-dipping thick shear zones that are related to the folding. Gold-bearing quartz veins occur in the hinge zones of NW-trending folds, and are injected into the axial cleavage. The Main fault (and its subsidiaries the First and Second faults) is a N-trending, steeply-dipping oblique thrust and strike-slip fault which controlled granite intrusion emplacement and served as conduit for hydrothermal fluid. Hydrothermal alteration consists of silicification, sericitization, chloritization and sulphidation adjoining the orebodies. The metallic signature of the bulk of the ore is Au-Ag-As-Pb-Zn-Cu-Mn. Tomilenko and Gibsher (2001) suggested, on the basis of fluid inclusion data, that early synmetamorphic quartz veins are relatively barren of gold. The main gold-bearing stage is superposed on earlier veins and is associated with granitic intrusions, which provided the thermal energy necessary for the driving of hdyrothermal fluids through faults and shear zones. Sulfur was mobilized largely from the host rocks (Tomilenko and Gibsher, 2001).

4241 Arylakh (Lunny) are two Late Cretaceous low-sulphidation epithermal Au-Ag deposits with a total gold content of 1 metric tons. It is located in the Omsukchan district of the Okhotsk-Chukotka magmatic arc, Kolyma-Omolon Superterrane, Magadan oblast, Russia. A caldera overlying an intrusive dome structure is the main tectonic structure in the area. Banded, cockade, massive and colloform-textured quartz veins and hydrothermal breccias are hosted by Late Cretaceous rhyolite and ignimbrite (Arylakh), andesites and tuff (Lunny), granodiorite (Lunny), and minor sandstones, siltstones and argillites. Quartz and adularia are the main gangue minerals, with subordinate rhodonite, rhodochrosite and pyrolusite. Ore mineralogy is dominated by pyrite, arsenopyrite, galena, sphalerite and chalcopyrite, with minor acanthite, sulphosalts, selenides, polybasite, proustite, argentite, pyrargyrite, freibergite and native Ag. Mineralization at Arylakh is structurally controlled by ENE-trending, high-angle oblique faults. Orebodies are localized in axes of small anticlines, and along the lithological contact between arenaceous rocks with subvolcanic diabase and tonalite dykes and sills. Mineralization at Lunny is controlled by NE-trending, high-angle faults. Hydrothermal alteration at Arylakh consists of proximal silicification and potassic alteration (quartz-adularia),with sericitic (quartz-sericite-chlorite) alteration, grading to distal propylitic alteration. A deeply penetrative zone of supergene oxidation characterized by jarosite, argentojarosite and iron hydroxides also occurs. Hydrothermal alteration at Lunny consists of proximal sericitic alteration (beresite) represented by an assemblage of pyrite-carbonate-sericite-quartz, which grades to propylitic alteration consisting of a pyrite-carbonate-chlorite-sericite-epidote-albite assemblage. Unmineralized skarns developed locally at Lunny along intrusion contacts. The metallic signature of the bulk of the ore is Ag-Au-As-Sb-Se-Co-Ni.

4242 Kommunarovskoe is an Early to Late Silurian quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 49 metric tons. It is located in the Berikul district of the Kuznetsk Alatau, Altai-Sayan fold system, Kemerovo, Russia. The orefield is localized on the eastern limb of the S-striking Kommunar anticline (near its axis), the dominant regional tectonic structure in the area. Quartz veins and stockworks and quartz-carbonate veins are hosted by basalts and comagmatic gabbro-diabase, as well as diorite intrusions. Quartz is the dominant gangue mineral, with lesser calcite and chlorite. Ore mineralogy is dominated by pyrite and pyrrhotite, with lesser chalcopyrite, tetrahedrite, tellurobismuthinite, scheelite, sphalerite and galena. Mineralization is structurally controlled by a NW-trending fault zone delimiting a 3-km-long zone of weakness. Most of the mineralization is associated with conjugated NE-trending faults within this weakness zone. Hydrothermal alteration consists of actinolite alteration and albitization (represented by an assemblage of actinolite-quartz-albite-sphene-apatite-magnetite) associated mainly with the stockwork zones in mafic volcanics and intrusions. Sericitic alteration zones are associated with quartz veins hosted by diorite intrusions. A later stage of fluid circulation accounts for carbonate alteration associated with quartz-carbonate veins. Calc-silicate alteration is associated locally with skarn mineralization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Zn-Pb-As-Bi-W-Te. Grebenshchikova *et al.* (1996) suggested that gold mineralization was the result of Silurian granitic magmatism (Solgonskiy batholith).

4243 Saralinskoe is a probable Early to Late Silurian (?) quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 22 metric tons. It is located in the Berikul district of the Kuznetsk Alatau, Altai-Sayan fold system, Kemerovo, Russia. Banded, layered and colloform-textured quartz veins are hosted by schistose (mylonitized) andesite and rhyolite and tuffaceous rocks, and to a lesser degree by dolerite-gabbro dykes. Quartz is the main gangue mineral. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser pyrrhotite, chalcopyrite, sphalerite and galena, and minor sternbergite, acanthite, native silver, gold, alabandite, safflorite and aikinite. Mineralization is structurally controlled by N-trending, moderately- to steeply-dipping shear zones. Pre- to post-ore NNW-trending dolerite-gabbro dykes and their contact with the volcanic rocks form an important ore control. Sulfur recrystallization (pyrite to pyrrhotite) also occurs near the borders of the dykes. Hydrothermal alteration consists of sericitic alteration and carbonation (addition of organic matter) of the volcanics enclosing the veins in the shear zones. The metallic signature of the bulk of the ore (partially inferred from its mineralogy) is Au-Ag-As-Cu-Pb-Zn-Bi-Co-Mn.

4246 Svetlinskoe is a Late Carboniferous to Early Permian quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 116 metric tons. It is located in the East Urals zone of the Urals fold system, Chelyabinsk area, Russia. The deposit is confined to the intersection zone of NS-oriented and NW-trending faults. Disseminated sulphides and quartz veins are hosted by ultramafic intrusions (harzburgite, serpentinite and pyroxenite), and by gabbro and diorite dykes that have intruded an Early Paleozoic volcano-sedimentary package. Quartz is the main gangue mineral. Ore mineralogy consists of dominant pyrite, pyrrhotite and chalcopyrite, with lesser galena, sphalerite and tetrahedrite, and minor scheelite, pentlandite, melonite, altaite, frobergite, hessite, sylvanite, calaverite, petzite and bornite. Mineralization is structurally controlled by NS-oriented and NW-trending faults. Hydrothermal alteration consists of early (330 Ma) quartz-sericite alteration associated with disseminated sulphides beresite-listwaenite alteration (quartz-sericite-carbonate) associated with gold-bearing quartz veins has been dated at 310 Ma. Main-stage disseminated sulphide mineralization is associated with quartz-biotite and quartz-sericite alteration, and dated at 292 Ma. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-Te. Most of the above data is derived from a paper by Bortnikov *et al.* (1999), who suggested that the generation of ore-forming fluids resulted from direct magmatic (granitic) input and metamorphic devolatilization reactions in rocks adjacent to plutons (“mesothermal” classification). Zlotnik-Khotkevich and Var’yash (1982) and other authors referred to Svetlinskoe as a low-sulphidation epithermal deposit confined in a collapse caldera.

4247 Evenskoe is a Late Cretaceous low-sulphidation epithermal Au-Ag deposit with a total gold content of 25 metric tons. It is located in the Omolon-Anadyr metallogenic zone of the Okhotsk-Chukotka magmatic arc, Kolyma-Omolon Superterrane, Magadan oblast, Russia. The 50 km-long and 7 km-wide NW-trending Turomcha volcanic structure is the dominant regional structure in the area. Quartz veins and stockworks, and hydrothermal breccias are hosted by Late Cretaceous ignimbrite, andesite flows, rhyolite, trachyrhyolite, rhyodacite and dacite. Quartz is the dominant gangue mineral, with lesser carbonate, adularia, epidote and barite. Ore mineralogy is dominated by pyrite, with subordinate argentite, electrum, tetrahedrite, tellurides, selenides, kustelite, native Ag, polybasite-pearceite, proustite, pyrargyrite, stromeyerite, tennantite, naumannite, aguilarite, hessite and native Bi. Mineralization is structurally controlled by a NW-trending fault bounding the Turomcha volcanic structure. Hydrothermal alteration consists of proximal silicification and potassic alteration, represented by an assemblage of quartz-adularia-illite, and grades away to a high- and low-temperature propylitic alteration. The metallic signature of the bulk of the ore is Ag-Au-As-Sb-Pb-Cu-Zn-Te-Bi. According to Moiseenko and Eyrish (1996), mineralization could be of Paleocene age, although Nokleberg *et al.* (1996) report an Ar-Ar age on vein adularia of 78 Ma.

4248 Konstantinovskoe is a Cambrian, possible batholith-associated quartz vein gold deposit with a total gold content of 34 metric tons. It is located in the Artemovskiy district of the Derba block, Altai-Sayan fold system, Krasnoyarsk, Russia. Mineralization consists of quartz veins with pyrite and gold associated with a Cambrian granite suite.

4257 Kuranakh is a Late Jurassic to Early Cretaceous sediment-hosted disseminated micron gold (Carlin type) deposit with a total gold content of 374 metric tons. It is located in the Central Aldan district of the Aldan Shield, Siberian Craton, Sakha-Yakutiya, Russia. A NW-trending deep fault zone and the Kuranakh syncline are the dominant regional tectonic structures. Disseminated to (locally) semi-massive sulphide mineralization is hosted by Early Cambrian shallow marine limestone of the Ungelinskaya and Kutorginovaya formations, and by Early Jurassic subaerial arkosic sandstone and siltstone of the Yukhtinskaya Formation. Quartz is the main gangue mineral, with lesser adularia and minor barite. Ore mineralogy is dominated by pyrite, with minor marcasite and rarer pyrrhotite, chalcopyrite, arsenopyrite, galena, sphalerite, native Au, Ag and Bi, coloradoite, sylvanite, altaite, naumannite, clausthalite, tiemannite, cinnabar and orpiment. Mineralization is structurally controlled by the unconformity at the contact zone between the limestones and the clastic sediments, which is the site of solution-collapse breccias and karstification. NNW- to N-trending, steeply-dipping syn-sedimentary normal faults that are intruded by syenite (kersantite) dykes are also an important ore control, with orebodies located along the dyke contacts. Hydrothermal alteration consists of jasperoid alteration (granular quartz replacing chalcedonic quartz in breccia matrix) and potassic alteration, represented by a quartz-adularia-pyrite assemblage. The latter is closely related to mineralization and occurs both as breccia cement and as breccia fragments. Supergene oxidation is especially pervasive in the breccia zones, where the rocks and ore are altered to a mix of iron hydroxides and clay material. This supergene oxidation is associated with remobilisation and redeposition in oxidized ore. The metallic signature of the bulk of the ore (partially inferred from its mineralogy) is Au-Ag-Cu-As-Zn-Pb-Bi-Te-Hg.

Appendix 2

SAUDI ARABIA

2179 Mahd Adh Dhahab is a Late Proterozoic, low-sulphidation epithermal Au-Ag deposit with a total gold content of 165 metric tons. It is located in the Mahd Adh Dhahab district within the Jidah Terrane of the Arabian Shield, Saudi Arabia. The dominant structures in the area are the NE-trending, subvertical Sayilah and Ghadayrah faults with vertical movement. Quartz veins and stockworks are hosted by intermediate and felsic lapilli tuffs and tuff breccias of the Late Proterozoic Tuwal Formation (Mahd Group), which have been intruded by a subvolcanic rhyolite dome. Quartz is the dominant gangue mineral, with lesser K-feldspar and carbonates. Ore mineralogy is dominated by chalcopyrite, sphalerite and pyrite, with lesser tellurides such as petzite, hessite and sylvanite. Mineralization is structurally controlled by N-trending, subvertical faults resulting from extensional tectonics. Quartz veins also occur astride the uncomformity at the Lahuf-Tuwal formations contact. A strong lithological control is provided by the permeable ore-hosting tuff horizons, and the finer-grained, less permeable tuffs which constrained fluid flow. Hydrothermal alteration consists of proximal potassic alteration (with adularia), sericitization, and silicification, with a (late) distal propylitic alteration. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-Te.

SLOVAKIA

4130 Kremnica is a low-sulphidation epithermal Au-Ag-Sb deposit of probable Miocene age with a total gold content of 47 metric tons. It is located in the Kremnica-Sturek area of the Kremnicé hory Mountains, Central Slovakia Neovolcanic area, Carpathians, Slovakia. NNE- to NE-trending regional faults belonging to the Carpathian structure are the dominant tectonic feature of the area. Banded, colloform, crustiform and vuggy quartz-carbonate veins and stockworks are hosted by Miocene rhyolites and pyroxene andesite flows and by intrusive rhyolite dykes. Gangue mineralogy is dominated by quartz, with lesser chalcedony, dolomite and adularia, and minor clay minerals, sericite, chlorite, celestite and apatite. Pyrite is the dominant ore mineral, with lesser arsenopyrite, galena, sphalerite, chalcopyrite and stibnite, and minor to trace amounts of goethite, proustite, pyrargyrite, electrum, hessite, marcasite, melnikovite, polybasite, bournonite, tetrahedrite and cinnabar. Two vein systems are structurally controlled by ENE-trending, strike-slip faults parallel to regional structures and by N-striking, moderately- to steeply-dipping faults, both of which could be linked with radial and concentric faults of a collapsed caldera. A shale and claystone formation forming the basement of the deposit are thought to have formed an impermeable barrier and played a role in ponding of the ore fluid (Mato *et al.*, 1999). Hydrothermal alteration around the veins consists of proximal (adjacent to the veins) silicification, grading outward to an inner intermediate zone of potassic alteration (with adularia), to an outer zone of argillic alteration (kaolinite-illite-montmorillonite), and lastly to a distal propylitic alteration zone of chlorite-epidote-calcite. The metallic signature of the bulk of the ore is Au-Ag-Sb-As-Hg-Te.

SOUTH AFRICA

2186 Sheba is a Middle Archean, quartz-carbonate shear-zone-related Au-Ag-As deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 93 metric tons. It is located in the Barberton Mountain Land area of the Barberton greenstone belt, Kaapvaal craton, South Africa. The major regional tectonic structures in the area are the tight, WSW-striking Ulundi Synclinorium and Eureka Syncline. The deposit occurs on the Sheba Fault, an E-trending regional fault at the contact between rocks of the Moodies and Fig Tree groups. Quartz-carbonate veins and asociated disseminated sulphides are hosted by greenschist grade, Archean talc schists, quartz-muscovite fuchsitic schists (from ultramafic volcanics) and cherts of the Zwartkoppie Formation, by quartzites of the Moodies Group, and by greywackes and shales of the Fig Tree Group. Quartz, calcite, dolomite and ankerite are the dominant gangue minerals, with lesser tourmaline and fluorite. Ore mineralogy is dominated by pyrite (all rocks), gersdorffite (schist-chert) and arsenopyrite (greywacke-shale), with lesser chalcopyrite, sphalerite, stibnite, pyrrhotite, tetrahedrite, millerite and pentlandite, and minor amounts of galena, molybdenite, jamesonite, marcasite and covellite. The Sheba Fault is crosscut by NE- and SE-trending, moderately- to steeply-dipping shear zones. The intersections of the shears with the Sheba Fault and areas between the NE and SE trends controlled fluid flow and mineralization distribution. Zones of bending within the shears are also favorable sites for ore deposition. Hydrothermal alteration consists mainly of muscovite alteration, carbonatization and sulphidation. The schists (ultramafic rocks of probable komatiitic origin) and sedimentary rocks along the various structures were altered to form an assemblage of ankerite(dolomite)-muscovite-quartz. Sulphidation produced pyrite and arsenopyrite. Silicification is noted along the Sheba Fault. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Cu-Ni-Rb.

2187 Fairview is a Middle Archean quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 68 metric tons. It is located in the Barberton Mountain Land area of the Barberton greenstone belt, Kaapval craton, South Africa. The major regional tectonic structures in the area are the tight, WSW-striking Ulundi Synclinorium and Eureka Syncline. The deposit occurs on an arcuate, NNE-trending segment of the Sheba Fault, a steeply-dipping regional fault at the contact between rocks of the Moodies and Fig Tree Groups. Disseminated sulphide mineralization is hosted by greenschist grade, turbiditic greywackes and shales of the Archean Fig Tree Group and quartzites of the Moodies Group, whereas quartz veins and stockworks are hosted by the Zwartkoppie Bar, a prominent chert unit within talc and quartz-muscovite fuchsitic schists in the Zwartkoppie Formation, at the contact of the Fig tree turbidites. The reefs mined at the Fairview mine are the extension of those mined at the nearby Sheba mine. Ore mineralogy is dominated by pyrite and arsenopyrite, with minor chalcopyrite, sphalerite, galena and stibnite. The mineralization is structurally controlled by NE- and SE-trending, moderately- to steeply-dipping shear zones, splays of the Sheba fault. Another structural control is provided by competent coarse clastic units, which fractured and concentrated fluid migration during deformation. Hydrothermal alteration consists of pervasive carbonatization that occurred during the early stages of the hydrothermal system. Sericitization is less common but is found near the disseminated sulphide bodies within the sedimentary rocks, represented by a sericite-quartz-albite assemblage, and is also associated with late, low-grade blue-black quartz veins. Some minor chloritization is also noted. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Cu-Zn-Pb.

2188 New Consort is an Archean(?), quartz-carbonate shear-zone-related Au-Ag-As deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 94 metric tons. It is located in the Barberton Mountain Land of the Barberton greenstone belt, within the Kaapvaal craton, South Africa. The Lily Fault, an E-trending fault at the contact between the Fig Tree and Onverwacht Groups, and the Eureka and Lily synclines are the major regional tectonic structures in the area. Disseminated to semi-massive sulphides (up to 20% sulphides) and quartz veins are hosted by mylonitic rocks of the “Consort Bar”, a strongly laminated and siliceous cherty rock, and by the underlying amphibolitized komatiites of the Archean Onverwacht Group. The main gangue minerals within the veins are quartz, with lesser calcite, tourmaline and topaz. Ore mineralogy is dominated by arsenopyrite, with lesser pyrite, pyrrhotite, chalcopyrite, loellingite and pentlandite. The “Consort Bar” is found within the Noordkaap Fault, at the contact between talc-biotite-amphibolite schists and granulites of the Onverwacht Group and metapelites of the Fig Tree Group. The Shires Shear Zone is a N-striking, vertically-dipping shear splay of the Noordkaap fault, and constitutes another important ore controlling structure. A series of N-striking, vertically-dipping shears, including the Ivaura and MMR faults, parallel the Shires Shear Zone. Hydrothermal alteration consists of silicification along the faults and shears, specifically within the Consort Bar, and sulphidation of the surrounding sedimentary and volcanic rocks. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Cu-Ni. Viljoen (1982) considered the deposit to be a syngenetic komatiite-related emplacement, and though the deposit shares similarities with iron-formation hosted (Homestake type) deposits, evidence of shearing and faulting, and related hydrothermal alteration, coupled with the “sporadic” nature of the mineralization, point toward a more epigenetic hydrothermal-deformation related deposit of the quartz-carbonate shear-zone-related type.

2195 Welkom (also named Orange Free State Goldfield) is a group of Precambrian Au-U paleoplacer deposits with a total gold content of 11,491 metric tons. It is located in the Witwatersrand basin, Kaapvaal craton, Orange Free State, South Africa. A major thrust fault (the Border fault) controlled late Witwatersrand basin sedimentation and was later reactivated as an extensional structure. The whole basin is folded along a NW-trending, asymetrical anticlinal axis called the Koppies arch. Disseminated gold and sulphides are hosted by greenschist grade sedimentary rocks consisting of fluvial fans and braided fluvial channels of conglomerate, quartz arenite, quartz wacke and quartzite of the Middle Archean Central Rand Group. Production at Welkom is mostly from the Basal/Steyn Reef, and minor production has been extracted from the Leader Reef, the Beatrix, A and B reefs, and the EA Reefs. Gangue mineralogy is dominated by quartz, with lesser zircon, chromite, muscovite, chlorite, chloritoid, pyrophyllite, rutile and leucoxene. Pyrite is the dominant ore minerals, with subordinate pyrrhotite and arsenopyrite, and minor to trace amounts of cobaltite, gersdorffite, galena, carbon, uraninite, branerite and gold. Mineralization is primarily lithologically controlled by the conglomerate reefs; classic quartz pebble banket ore supplied 40% of all Witwatersrand gold. The mineralized reefs, however, coincide with unconformity surfaces, and carbon seams near the unconformities are extremely high grade. Bedding-parallel, brittle-ductile reverse shear zones are also important in localizing mineralization. NE-trending extension faults (termed Platberg faults) displaced orebodies with throws of up to thousand of metres, some of them also have an important dextral strike-slip component. Basin-wide hydrothermal alteration centered on the gold fields has been recognized by Phillips and Law (2000). It consists of: 1) a pyrophyllite-chloritoid-muscovite-chlorite-pyrite assemblage centered on the mineralized reefs and conglomerate horizons, 2) a muscovite-chlorite-pyrite assemblage in the quartzite and arenitic horizons, and 3) an albite-epidote-calcite-muscovite-paragonite-pyrite assemblage that has affected the shale horizons. Abundant pyrite in the alteration zones and widespread quartz veins (in places gold-bearing) adjacent to or within mineralized areas and unconformities, indicate substantial fluid flow and elevated levels of sulfur in solution (Phillips and Law, 2000). The (partially metallic) signature of the bulk of the ore is Fe-C-S-Ti-Au-U-Zr-Cr. There are three main theories for the genesis of the extremely-gold-rich Witwatersrand deposits: 1) purely detrital origin, 2) purely hydrothermal (epigenetic) origin, and 3) modified placer model, whereby gold is detrital but affected by in situ remobilization and redeposition. For a more complete review of the Witwatersrand gold fields, the reader is referred to Phillips and Law (2000) paper.

2196 The Klerksdorp goldfield is a group of Precambrian Au-U paleoplacer deposits with a total gold content of 7332 metric tons. It is located in the Witwatersrand basin, Kaapvaal craton, Transvaal, South Africa. Major thrust faults (the Buffelsdoorn and Kroomdrai faults) controlled late Witwatersrand basin sedimentation and were later reactivated as extensional structures. The whole basin is folded along a NW-trending, asymetrical anticlinal axis called the Koppies arch. Disseminated gold and sulphides are hosted by greenschist grade sedimentary rocks consisting of fluvial fans and braided fluvial channels of conglomerate, quartz arenite, quartz wacke and quartzite of the Middle Archean Central Rand Group. Production at Klerksdorp is mostly from the Vaal Reef and the Ventersdorp Contact Reef. Gangue mineralogy is dominated by quartz, with lesser zircon, chromite, muscovite, chlorite, chloritoid, pyrophyllite, rutile and leucoxene. Pyrite is the dominant ore minerals, with subordinate pyrrhotite and arsenopyrite, and minor to trace amounts of cobaltite, gersdorffite, galena, carbon, uraninite, branerite and gold. Mineralization is primarily lithologically controlled by the conglomerate reefs; classic quartz pebble banket ore supplied 40% of all Witwatersrand gold. The mineralized reefs, however, coincide with unconformity surfaces, and carbon seams near the unconformities are extremely high grade. Bedding-parallel, brittle-ductile reverse shear zones are also important in localizing mineralization. NE-trending extension faults (termed Platberg faults) displaced orebodies with throws of up to thousand of metres. Synclinal/anticlinal folds parallel the faults. Basin-wide hydrothermal alteration centered on the gold fields has been recognized by Phillips and Law (2000). It consists of: 1) a pyrophyllite-chloritoid-muscovite-chlorite-pyrite assemblage centered on the mineralized reefs and conglomerate horizons, 2) a muscovite-chlorite-pyrite assemblage in the quartzite and arenitic horizons, and 3) an albite-epidote-calcite-muscovite-paragonite-pyrite assemblage that has affected the shale horizons. Abundant pyrite in the alteration zones and widespread quartz veins (in places gold-bearing) adjacent to or within mineralized areas and unconformities, indicate substantial fluid flow and elevated levels of sulfur in solution (Phillips and Law, 2000). The (partially metallic) signature of the bulk of the ore is Fe-C-S-Ti-Au-U-Zr-Cr. There are three main theories for the genesis of the extremely-gold-rich Witwatersrand deposits: 1) purely detrital origin, 2) purely hydrothermal (epigenetic) origin, and 3) modified placer model, whereby gold is detrital but affected by in situ remobilization and redeposition. For a more complete review of the Witwatersrand gold fields, the reader is referred to Phillips and Law (2000) paper.

2197 Carletonville (also named West Wits Line) is a group of Precambrian Au-U paleoplacer deposits with a total gold content of 11,467 metric tons. It is located in the Witwatersrand basin, Kaapvaal craton, Transvaal, South Africa. Major thrust faults, the Rietfontein and Bank faults, controlled late Witwatersrand basin sedimentation and were later reactivated as extensional structures. The whole basin is folded along a NW-trending, asymmetrical anticlinal axis called the Koppies arch. Disseminated gold and sulphides are hosted by greenschist grade sedimentary rocks consisting of fluvial fans and braided fluvial channels of conglomerate, quartz arenite, quartz wacke and quartzite of the Middle Archean Central Rand Group. Production at Carletonville is mostly from the Carbon Leader/North Leader reefs, the Middelvlei Reef, and the Ventersdorp Contact Reef. Gangue mineralogy is dominated by quartz, with lesser zircon, chromite, muscovite, chlorite, chloritoid, pyrophyllite, rutile and leucoxene. Pyrite is the dominant ore minerals, with subordinate pyrrhotite and arsenopyrite, and minor to trace amounts of cobaltite, gersdorffite, galena, carbon, uraninite, branerite and gold. Mineralization is primarily lithologically controlled by the conglomerate reefs; classic quartz pebble banket ore supplied 40% of all Witwatersrand gold. The mineralized reefs, however, coincide with unconformity surfaces, and carbon seams near the unconformities are extremely high grade. Bedding-subparallel thrust faults form duplexes through the ore field and produce high-grade zones where they intersect the reefs. Extension faults (termed Platberg faults) displaced orebodies with throws of up to thousand of metres. Basin-wide hydrothermal alteration centered on the gold fields has been recognized by Phillips and Law (2000). It consists of: 1) a pyrophyllite-chloritoid-muscovite-chlorite-pyrite assemblage centered on the mineralized reefs and conglomerate horizons, 2) a muscovite-chlorite-pyrite assemblage in the quartzite and arenitic horizons, and 3) an albite-epidote-calcite-muscovite-paragonite-pyrite assemblage that has affected the shale horizons. Abundant pyrite in the alteration zones and widespread quartz veins (in places gold-bearing) adjacent to or within mineralized areas and unconformities, indicate substantial fluid flow and elevated levels of sulfur in solution (Phillips and Law, 2000). The (partially metallic) signature of the bulk of the ore is Fe-C-S-Ti-Au-U-Zr-Cr. There are three main theories for the genesis of the extremely-gold-rich Witwatersrand deposits: 1) purely detrital origin, 2) purely hydrothermal (epigenetic) origin, and 3) modified placer model, whereby gold is detrital but affected by in situ remobilization and redeposition. For a more complete review of the Witwatersrand gold fields, the reader is referred to Phillips and Law (2000) paper.

2198 The West Rand is a group of Precambrian Au-U paleoplacer deposits with a total gold content of 5432 metric tons. It is located in the Witwatersrand basin, Kaapvaal craton, Transvaal, South Africa. A major thrust fault, the Rietfontein fault, controlled late Witwatersrand basin sedimentation and was later reactivated as an extensional structure. The whole basin is folded along a NW-trending, asymetrical anticlinal axis called the Koppies arch. Disseminated gold and sulphides are hosted by greenschist grade sedimentary rocks consisting of fluvial fans and braided fluvial channels of conglomerate, quartz arenite, quartz wacke and quartzite of the Middle Archean Central Rand Group. Production at the West Rand is mostly from the Main Reef, the South Reef, the Kimberley Reef, the Monarch Reef, and the Ventersdrop Contact Reef. Gangue mineralogy is dominated by quartz, with lesser zircon, chromite, muscovite, chlorite, chloritoid, pyrophyllite, rutile and leucoxene. Pyrite is the dominant ore minerals, with subordinate arsenopyrite and pyrrhotite, and minor to trace amounts of cobaltite, gersdorffite, galena, carbon, uraninite, branerite and gold. Mineralization is primarily lithologically controlled by the conglomerate reefs; classic quartz pebble banket ore supplied 40% of all Witwatersrand gold. The mineralized reefs, however, coincide with unconformity surfaces, and carbon seams near the unconformities are extremely high grade. Bedding-parallel, brittle-ductile reverse shear zones are also important in localizing mineralization. NE-trending extension faults (termed Platsberg faults) displaced orebodies with throws of up to thousand of metres. Basin-wide hydrothermal alteration centered on the gold fields has been recognized by Phillips and Law (2000). It consists of: 1) a pyrophyllite-chloritoid-muscovite-chlorite-pyrite assemblage centered on the mineralized reefs and conglomerate horizons, 2) a muscovite-chlorite-pyrite assemblage in the quartzite and arenitic horizons, and 3) an albite-epidote-calcite-muscovite-paragonite-pyrite assemblage that has affected the shale horizons. Abundant pyrite in the alteration zones and widespread quartz veins (in places gold-bearing) adjacent to or within mineralized areas and unconformities, indicate substantial fluid flow and elevated levels of sulfur in solution (Phillips and Law, 2000). The (partially metallic) signature of the bulk of the ore is Fe-C-S-Ti-Au-U-Zr-Cr. There are three main theories for the genesis of the extremely-gold-rich Witwatersrand deposits: 1) purely detrital origin, 2) purely hydrothermal (epigenetic) origin, and 3) modified placer model, whereby gold is detrital but affected by in situ remobilization and redeposition. For a more complete review of the Witwatersrand gold fields, the reader is referred to Phillips and Law (2000) paper.

2199 The Central Rand is a group of Precambrian Au-U paleoplacer deposits with a total gold content of 9122 metric tons. It is located in the Witwatersrand basin, Kaapvaal craton, Transvaal, South Africa. A major thrust fault, the Rietfontein fault, controlled late Witwatersrand basin sedimentation and was later reactivated as an extensional structure. The whole basin is folded along a NW-trending, asymmetrical anticlinal axis called the Koppies arch. Disseminated gold and sulphides are hosted by greenschist grade sedimentary rocks consisting of fluvial fans and braided fluvial channels of conglomerate, quartz arenite, quartz wacke and quartzite of the Middle Archean Central Rand Group. Production at the Central Rand is mostly from the Main/South/Main Reef Leader complex. Gangue mineralogy is dominated by quartz, with lesser zircon, chromite, muscovite, chlorite, chloritoid, pyrophyllite, rutile and leucoxene. Pyrite is the dominant ore minerals, with subordinate arsenopyrite and pyrrhotite, and minor to trace amounts of cobaltite, gersdorffite, galena, carbon, uraninite, branerite and gold. Mineralization is primarily lithologically controlled by the conglomerate reefs; classic quartz pebble banket ore supplied 40% of all Witwatersrand gold. The mineralized reefs, however, coincide with unconformity surfaces, and carbon seams near the unconformities are extremely high grade. Bedding-parallel, brittle-ductile reverse shear zones are also important in localizing mineralization. NE-trending extension faults (termed Platsberg faults) displaced orebodies with throws of up to thousand of metres. Basin-wide hydrothermal alteration centered on the gold fields has been recognized by Phillips and Law (2000). It consists of: 1) a pyrophyllite-chloritoid-muscovite-chlorite-pyrite assemblage centered on the mineralized reefs and conglomerate horizons, 2) a muscovite-chlorite-pyrite assemblage in the quartzite and arenitic horizons, and 3) an albite-epidote-calcite-muscovite-paragonite-pyrite assemblage that has affected the shale horizons. Abundant pyrite in the alteration zones and widespread quartz veins (in places gold-bearing) adjacent to or within mineralized areas and unconformities, indicate substantial fluid flow and elevated levels of sulfur in solution (Phillips and Law, 2000). The (partially metallic) signature of the bulk of the ore is Fe-C-S-Ti-Au-U-Zr-Cr. There are three main theories for the genesis of the extremely-gold-rich Witwatersrand deposits: 1) purely detrital origin, 2) purely hydrothermal (epigenetic) origin, and 3) modified placer model, whereby gold is detrital but affected by in situ remobilization and redeposition. For a more complete review of the Witwatersrand gold fields, the reader is referred to Phillips and Law (2000) paper.

2200 The East Rand is a group of Precambrian Au-U paleoplacer deposits with a total gold content of 8546 metric tons. It is located in the Witwatersrand basin, Kaapvaal craton, Transvaal, South Africa. A major thrust fault, the Rietfontein fault, controlled late Witwatersrand basin sedimentation and was later reactivated as an extensional structure. The whole basin is folded along a NW-trending, asymetrical anticlinal axis called the Koppies arch. Disseminated gold and sulphides are hosted by greenschist grade sedimentary rocks consisting of fluvial fans and braided fluvial channels of conglomerate, quartz arenite, quartz wacke and quartzite of the greenschist grade metamorphosed Middle Archean Central Rand Group. Production at the East Rand is mostly from the Nigel Reef and the Kimberley Reef. Gangue mineralogy is dominated by quartz, with lesser zircon, chromite, muscovite, chlorite, chloritoid, pyrophyllite, rutile and leucoxene. Pyrite is the dominant ore minerals, with subordinated arsenopyrite and pyrrhotite, and minor to trace amounts of cobaltite, gersdorffite, galena, carbon, uraninite, branerite and gold. Mineralization is primarily lithologically controlled by the conglomerate reefs; classic quartz pebble banket ore supplied 40% of all Witwatersrand gold. The mineralized reefs, however, coincide with unconformity surfaces, and carbon seams near the unconformities are extremely high grade. Bedding-parallel, brittle-ductile reverse shear zones are also important in localizing mineralization, as well as hinge zones of anticlinal folds. NE-trending extension faults (termed Platsberg faults) displaced orebodies with throws of up to thousand of metres. Basin-wide hydrothermal alteration centered on the gold fields has been recognized by Phillips and Law (2000). It consists of: 1) a pyrophyllite-chloritoid-muscovite-chlorite-pyrite assemblage centered on the mineralized reefs and conglomerate horizons, 2) a muscovite-chlorite-pyrite assemblage in the quartzite and arenitic horizons, and 3) an albite-epidote-calcite-muscovite-paragonite-pyrite assemblage that has affected the shale horizons. Abundant pyrite in the alteration zones and widespread quartz veins (in places gold-bearing) adjacent to or within mineralized areas and unconformities, indicate substantial fluid flow and elevated levels of sulfur in solution (Phillips and Law, 2000). The (partially metallic) signature of the bulk of the ore is Fe-C-S-Ti-Au-U-Zr-Cr. There are three main theories for the genesis of the extremely-gold-rich Witwatersrand deposits: 1) purely detrital origin, 2) purely hydrothermal (epigenetic) origin, and 3) modified placer model, whereby gold is detrital but affected by in situ remobilization and redeposition. For a more complete review of the Witwatersrand gold fields, the reader is referred to Phillips and Law (2000) paper.

2201 Evander (also named Far East Rand) is a group of Precambrian Au-U paleoplacer deposits with a total gold content of 1932 metric tons. It is located in the Witwatersrand basin, Kaapvaal craton, Transvaal, South Africa. Major thrust faults controlled late Witwatersrand basin sedimentation and were later reactivated as extensional structures. The whole basin is folded along a NW-trending, asymetrical anticlinal axis called the Koppies arch. Disseminated gold and sulphides are hosted by greenschist grade sedimentary rocks consisting of fluvial fans and braided fluvial channels of conglomerate, quartz arenite, quartz wacke and quartzite of the Middle Archean Central Rand Group. Production at Evander is mostly from the Kimberley Reef. Gangue mineralogy is dominated by quartz, with lesser zircon, chromite, muscovite, chlorite, chloritoid, pyrophyllite, rutile and leucoxene. Pyrite is the dominant ore minerals, with subordinate pyrrhotite and arsenopyrite, and minor to trace amounts of cobaltite, gersdorffite, galena, carbon, uraninite, branerite and gold. Mineralization is primarily lithologically controlled by the conglomerate reefs; classic quartz pebble banket ore supplied 40% of all Witwatersrand gold. The mineralized reefs, however, coincide with unconformity surfaces, and carbon seams near the unconformities are extremely high grade. Bedding-parallel, brittle-ductile reverse shear zones are also important in localizing mineralization. NE-trending, low- and high angle extension faults (termed Platberg faults) displaced orebodies with throws of up to thousand of metres. Basin-wide hydrothermal alteration centered on the gold fields has been recognized by Phillips and Law (2000). It consists of: 1) a pyrophyllite-chloritoid-muscovite-chlorite-pyrite assemblage centered on the mineralized reefs and conglomerate horizons, 2) a muscovite-chlorite-pyrite assemblage in the quartzite and arenitic horizons, and 3) an albite-epidote-calcite-muscovite-paragonite-pyrite assemblage that has affected the shale horizons. Abundant pyrite in the alteration zones and widespread quartz veins (in places gold-bearing) adjacent to or within mineralized areas and unconformities, indicate substantial fluid flow and elevated levels of sulfur in solution (Phillips and Law, 2000). The (partially metallic) signature of the bulk of the ore is Fe-C-S-Ti-Au-U-Zr-Cr. There are three main theories for the genesis of the extremely-gold-rich Witwatersrand deposits: 1) purely detrital origin, 2) purely hydrothermal (epigenetic) origin, and 3) modified placer model, whereby gold is detrital but affected by in situ remobilization and redeposition. For a more complete review of the Witwatersrand gold fields, the reader is referred to Phillips and Law (2000) paper.

SPAIN

1797 El Valle-Boinas consists of an Early Cambrian to Late Permian, intrusion-related Au-Cu skarn deposit and a superimposed low-sulphidation Au-Ag epithermal deposit, with a total gold content of 30 metric tons. It is located in the Rio Narcea gold belt, in the Cantabrian zone of the Iberian Hercynian Massif, Alpine orogeny, western Asturias, Spain. The dominant regional structures are the Courio anticline, a NNE-trending, Paleozoic anticline overturned to the NW, with axial plane dipping 45-70^o to the SE, and a NE-oriented regional fault system with an extended reactivation history. Skarn mineralization consists of semi-massive to massive sulphide lenses and sulphide veinlets hosted by Early-Middle Cambrian limestone and dolomite beds of the Lancara Formation (exoskarn), and by Late Carboniferous monzogranite of the Boinas laccolith (endoskarn). Gangue mineralogy of the sulphide-rich veins is dominated by quartz, with amphibole and calcite. Ore mineralogy is dominated by arsenopyrite, pyrrhotite, pyrite, chalcopyrite and bornite, with lesser magnetite, sphalerite, wittichenite, chalcocite, digenite, electrum and minor to trace amounts of native Bi, bismuthinite, petzite, safflorite, cobaltite, gersdorffite, nickeline and cubanite. Epithermal mineralization, consisting of quartz veins and hydrothermal breccias, is associated with Early to Late Permian, fault-intruded diorite and granodiorite dykes, and crosscuts the previously mineralized rocks, inducing retrograde skarn alteration. Epithermal veins are dominated by quartz and carbonates, with minor adularia, chlorite and sericite. Pyrite is the dominant ore mineral, with arsenopyrite, sphalerite, chalcopyrite, stannite, tetrahedrite, bournonite, galena, boulangerite, stibnite and jamesonite. The mineralization and intrusions are structurally controlled by three fault systems; a NW-SE Hercynian dextral and sinistral strike-slip fault system with Early Permian normal dip-slip reactivation, a NE-SW fault system (conjugate to the first system) reactivated as reverse faults during the Alpine orogeny, and again as a strike-slip structure during the Tertiary, and an EW-trending fault system. Bedding planes and favorable reactive lithologies of the Lancara Formation controlled the distribution of the skarn mineralization. Intrusion of monzogranite and quartz monzonite produced early potassic alteration (K-feldspar-muscovite-rutile). Prograde endoskarn in the intrusive rocks is composed of pyroxene-garnet-titanite-rutile. Retrograde alteration caused by cooling of the fluids and also by fluids associated with the epithermal mineralization produced a ferrohornblende-quartz-calcite-K-feldspar-sericite-sulphide assemblage. A calcic prograde exoskarn developed within limestone, represented by an inner (near intrusive) garnet-pyroxene assemblage and an outer wollastonite-pyroxene-vesuvianite calcic skarn. Retrograde alteration of the calcic skarn consists of epidote-amphibole-chlorite-K-feldspar-apatite-titanite. A prograde magnesian prograde exoskarn developed within dolomite is represented by a pyroxene-olivine assemblage, which has undergone retrograde alteration to tremolite-serpentinite-phlogopite-quartz-calcite-magnetite. The late acid dykes and associated epithermal mineralization related to the NE-SW faults re-activation are responsible for potassic alteration, sericitization, serpentinization, chloritization and carbonatization of the skarns. Intense silicification and jasperoid breccias with hematite are broadly developed closer to the surface. The metallic signature of the bulk of the ore is Au-Ag-Cu-Bi-Te-As.

SUDAN

3202 Hassai is a Middle to Late Proterozoic gold-rich VMS deposit with a total content of 62 metric tons. It is located in the Ariab district of the Ariab-Arbaat belt, Red Sea Hills area, Arabian-Nubian Shield, northeastern Sudan. Regional structure is dominated by a NE-trending, transpressive thrust shear zone, by SE-trending transcurrent sinistral strike-slip shears parallel to the regional Oko Shear Zone (which acted as hydrothermal conduits) and by an ENE-oriented anticlinorium. Massive to disseminated sulphide lenses and subjacent stockwork zones are hosted by Middle to Late Proterozoic, greenschist grade rhyolite and rhydoacite flows, and by the associated felsic tuff (lappilli tuff, ash-flow tuff, crystal tuff and tuff breccia) of the Nafirdeib Group. Basalts and andesites with associated chert form the hangingwall of the lenses. Gangue mineralogy of the sulphide lenses consists of quartz, calcite and barite, with lesser chlorite, muscovite and albite. Ore mineralogy is dominated by pyrite, chalcopyrite and sphalerite, with lesser galena, arsenopyrite and tennantite, and minor stibnite, native Ag, hessite, petzite, calaverite, tellurobismuthite, tetradymite, aleksite, and rare molybdenite, magnetite, hematite, pyrrhotite, enargite, cubanite and mackinawite. The deposit is located on the flanks of an EW-oriented, slightly overturned to the north, isoclinal F_2 fold. High-grade zones plunging similarly to P_2 fold axes may indicate some structural control by the folds (Récoché, 1993). These are affected by NE-trending, steeply-dipping reverse (and normal?) faults. Sulphide lenses are located along the lithological contact between felsic and intermediate to mafic volcanic rocks. Hydrothermal alteration has affected mainly the felsic volcanic rocks below the ore lenses, and consists of chloritization and/or sericitiziation, along with carbonatization and silicification. Extensive and pervasive supergene oxidation has led to the formation of gold-enriched jarosite-goethite-hematite-limonite ores with, gypsum and alunite. The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-Ba-As-Sb-Bi-Sn-Te.

SURINAME

4222 Gross Rosebel is an Early Proterozoic(?), quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 76 metric tons. It is located in the Rosebel region of the Guiana Shield, Amazonian craton, north-central Suriname. The dominant regional tectonic structures in the area are an EW-striking, W-plunging synclinorium, and a NW-trending, low-angle thrust fault. Quartz-carbonate veins and disseminated sulphides are hosted by greenschist to lower amphibolite grade siltstones, sandstones, graywackes, conglomerates, andesites and intermediate volcaniclastic rocks of the Early Proterozoic Marowijne Supergroup. Quartz is the dominant gangue mineral, with important carbonates, feldspar (volcanic-hosted) and tourmaline (near granite). Ore mineralogy is dominated by pyrite, with minor pyrrhotite and chalcopyrite. Mineralization is structurally controlled by ESE- to SE-trending, subvertical to steeply-dipping fractures related to an extension regime created in the nose of parasitic isoclinal folds. Lithological control on orebodies is exerted by lithological contacts, such as between volcanic and sedimentary rocks and between sandstone and siltstone, which localized deformation and shear strain due to competency contrast. Orebodies also occur in subvertical, axial planar parallel shears and associated Riedel fractures. Hydrothermal alteration consists of propylitic alteration, with potassic alteration (with K-feldspar) near quartz-carbonate-felspar veins, and weak carbonate alteration surrounding the quartz-carbonate veins. There is also pyrite-pyrrhotite sulphidation of the veins selvages. Supergene weathering created auriferous lateritic soil and saprolitic rock down to a maximum depth of 100 metres below surface, where groundwater fluctuations have remobilized gold. The metallic signature of the bulk of the ore is unknown.

SWEDEN

3197 Boliden is an Early Proterozoic, Au-Ag-Cu-Pb-Zn-As gold-rich volcanogenic massive sulphide deposit with a total gold content of 125 metric tons. It is located in the Skellefte district of the North Svecofennian, Baltic Shield, northern Sweden. N- to NNE-striking, gentle to open D_2 folds with a local axial planar crenulation cleavage are the dominant regional tectonic structures in the area. Massive to disseminated sulphide zones and sulphide-rich veins are hosted by Early Proterozoic, porphyritic dacite and rhyolite flows and basaltic andesites of the Skellefte Group, and by quartz porphyritic intrusions. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser pyrrhotite, chalcopyrite, sphalerite, galena, boulangerite, jamesonite, tetrahedrite, bournonite, gudmundite and minor aurostibite, stannite, native Ag and Bi and other sulphosalts. Quartz and tourmaline are the dominant gangue minerals. An E-striking, subvertical oblique-sinistral shear zone (along the Boliden ore zone), with cleavage developed conformable to orebodies, affected the mineralization and alteration systems, remobilizing some of the ore in brittle structures. Late NNE- and NW-trending sinistral and dextral faults offset the orebodies. Proximal and pervasive aluminous alteration (andalusite-sericite-quartz±corundum±rutile±apatite) occurs below the massive ore in the center of the orebody. This aluminous alteration grades outward to an inner sericitic alteration zone (sericite-quartz±andalusite-arsenopyrite-chalcopyrite), and an outer chloritic alteration zone (quartz-sericite-chlorite-pyrite). The metallic signature of the bulk of the ore is Au-Ag-Cu-Zn-Pb-As-Sb-Co-Se-Te-W-Mo-Bi. Bergman Weihed *et al.* (1996) proposed an alternate high-sulphidation epithermal model for the genesis of the Boliden deposit, related to fluids focused along a fault and discordant precipitation of sulphide lenses, with later deformation and stretching during regional folding and shearing, and recrystallization during peak metamorphism.

TAIWAN

3222 Chinkuashih is a Pleistocene, high-sulphidation epithermal Au-Cu-Ag deposit with a total gold content of 92 metric tons. It is located in the Central Range of the Ryukyu volcanic arc, northern Taiwan. The dominant tectonic structures in the area are NE-trending and NS-trending faults related to Pleistocene tectonic movement, and NE-trending folds. Quartz veins, stockworks and mineralized hydrothermal breccias are hosted by Pleistocene calc-alkaline tonalite and intruded Miocene calcareous sandstones. Gangue mineralogy is dominated by quartz, with subordinate barite and minor kaolinite and alunite. Enargite, luzonite and pyrite are the dominant ore minerals, with lesser galena, sphalerite and electrum, and minor stibnite. Mineralization is structurally controlled by NS-trending, subvertical normal faults. Hydrothermal alteration consists of an inner central zone of silicic alteration with massive to vuggy silica, surrounded by a proximal halo of advanced argillic alteration (quartz-alunite), which grades outward to an argillic alteration zone (quartz-illite-chlorite), and to a distal propylitic alteration zone. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Cu-Ag-As-Sb-Pb-Zn.

TAJIKISTAN

4019 Jilau is a Late Carboniferous to Permian Au-Ag deposit with a total gold content of 16 metric tons. The deposit is of controversial origin but shares affinities with intrusion-related non-carbonate-hosted, stockwork-disseminated deposits, and with porphyry gold deposits. It is located in the Penjikent district of the Zeravshan Range, Southern Tien Shan, western Tajikistan. The dominant regional tectonic structures in the area are the Zeravshan anticlinorium and the Zeravshan fault, an ESE-trending, steeply-dipping, deep-seated shear zone, which is a splay of the regional Nikoleav lineament suture zone. Banded and laminated quartz veins, stockworks and disseminated sulphides are hosted by the Early Carboniferous Chinorsai granodiorite. Quartz is the dominant gangue mineral, with minor carbonate. Ore mineralogy is dominated by scheelite, with lesser arsenopyrite, pyrite and minor chalcopyrite. The deposit is located near the axial zone of the Chinorsai anticline, a third order WNW-trending fold. Mineralization is structurally controlled by three sets of faults and shears; i) SE-trending, steeply-dipping, oblique reverse-dextral faults (such as the Jilau-Andezak shear zone) that form important dilational jogs, ii) a SW-trending conjugate reverse-sinistral fault set (Southern fault), and iii) the Dykovy, Central and Northern faults, which are E-trending, high-angle reverse faults. The host granodiorite behaved as a competent, isotropic and brittle body, localizing deformation and fluid-flow. Hydrothermal alteration consists of silicification and sulphidation of the host granodiorite around the mineralized veins and stockworks. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-W-S-Cu. Cole *et al.* (2000) suggested that the ore fluid was derived partly from magmatic (the Chinorsai intrusives) and metamorphic sources. Presence of CH_4 would attest of the fluid origin or passage through reducing carbonaceous rocks (impure dolomite or skarn). Deposit classification is uncertain; however, Cole *et al.* (2000) suggested that Jilau could be similar to an intrusion-related deposit in tungsten-tin provinces (according to Thompson *et al.*, 1999), such as Mokrsko (Czech Republic) and Fort Knox (Alaska).

4020 Taror is a Late Carboniferous to Permian, Au-Cu-Ag skarn deposit with a total gold content of 33 metric tons. It is located in the Zeravshan Range of the Southern Tien Shan, western Tajikistan. The dominant regional tectonic structures in the area are the Zeravshan anticlinorium and the Zeravshan fault, an ESE-trending, steeply-dipping, deep-seated shear zone, which is a splay of the regional Nikoleav lineament suture zone. Disseminated sulphides and quartz veins are hosted by the Early Carboniferous Chinorsai granodiorite and the intruded Devonian carbonate rocks (limestone and dolomite). Ore mineralogy is reportedly complex, and an oxide zone is present at shallow levels. Mineralization is structurally controlled by the contact between the granodiorite and carbonate host, which corresponds with a SE-trending, shallowly-to moderately-dipping fault that controlled fluid flow. The presence of reactive carbonate lithologies is also an important ore-controlling feature. Hydrothermal alteration consists of skarn alteration within the granodiorite and the limestones, and of quartz-carbonate alteration in the granodiorite. Part of the metallic signature of the bulk of the ore is Au-Cu-Ag-As.

TANZANIA

4132 Bulyanhulu is an Archean, quartz-carbonate shear-zone-related Au-Ag-Cu deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 412 metric tons. It is located in the Bulyanhulu district of the Lake Victoria greenstone belt, Dodoma craton, central Tanzania. Quartz vein mineralization is hosted by Archean, greenschist grade, tectonized argillite layers with a basalt-andesite footwall and felsic pyroclastic ash tuff in the hanging-wall. Quartz is the dominant gangue mineral. Ore mineralogy consists of pyrite, chalcopyrite and pyrrhotite. The vein reefs are structurally controlled by several parallel, NW-striking, steeply-dipping shears occurring mainly in argillite horizons. Hydrothermal alteration consists of narrow zones of sericite-carbonate alteration that has affected metavolcanic and pyroclastic rocks around veins and shears.

4133 Geita is a Late Archean, iron-formation-hosted vein and disseminated Au-Ag deposit (Homestake type) with a total gold content of 355 metric tons. It is located in the Geita greenstone belt, which is part of the larger Sukumaland greenstone belt (also known as the Lake Victoria greenstone belt), Dodoma craton, northwestern Tanzania. A W-plunging regional D_1 anticline is the main tectonic structure in the area. Semi-massive to disseminated sulphides and later quartz veins are mainly hosted by Late Archean, lower greenschist grade, oxide facies banded iron-formation. Diorite intrusions host stockwork ore. Trachyandesite lavas, lamprophyre dykes and felsic to intermediate tuffs also host some ore. The main ore minerals are pyrite, sphalerite, galena and chalcopyrite. Gangue mineralogy of the mineralized BIF is restricted to chert and magnetite. The veins are composed of quartz and carbonates, with additional biotite in the diorite-hosted stockwork ore. The major structure within the mine is the Main Geta fold, a NE-striking, moderately NNW-plunging, isoclinal, reclined F_2 anticline. Orebodies crosscut the fold closure, limb and axial plane of this structure. NNE-striking ductile to brittle-ductile shearing and zones of mylonitic breccias found on the limb of the Main Geta fold are probably genetically related to the fold. The shears occur in the BIF and at their contact with the trachyandesites or lamprophyre dykes and are the main control on hydrothermal fluid flow and mineralization. NW-trending shears and their intersections with NE-trending shears are also important controls on ore distribution at Kukuluma, Matandani, Area 3 and Ridge 8 deposits. A SW-trending, moderately-dipping basal thrust at the Geita Hill orebody controls the mineralization distribution. Late, SE-trending faults offset the orebodies. The first mineralization stage of semi-massive to disseminated sulphides occurred concomitantly with actinolite alteration (actinolite-tremolite-biotite-carbonate) and sulphidation, which affected selected layers of the BIF and which occur adjacent to shears, fractures and breccia zones. Sulphidation of the oxide layers of the BIF is significant. Silicification is also closely associated with pyritized, high-grade zones. Carbonatization is extensive throughout the trachyandesite hosts, around the mineralized bodies and along shears and fractures, though it appears to predate the gold mineralization event (Borg, 1994). The metallic signature of the bulk of the ore is Au-Ag-Rb-Sr-Ba-Pb-U.

TURKEY

4220 Kisladag is an Early Miocene or younger intrusion-related porphyry gold deposit with a total gold content of 157 metric tons. It is located in the Izmir-Ankara zone of the Isparta Angle, Anatolian Plate, western Turkey. The dominant regional tectonic structures in the area are the Aksehir-Simav Fault, a NW- to WNW-trending, normal-dextral strike-slip fault, and the N-trending, normal-dextral strike-slip Antalya Fault, along which a number of alkaline volcanic centers are aligned. Quartz stockworks and hydrothermal breccias are hosted by Early Miocene andesitic crystal tuff and intruding microdiorite. Quartz is the dominant gangue mineral, with lesser tourmaline. Ore mineralogy is dominated by pyrite, with minor molybdenite, sphalerite, galena and chalcopyrite. Mineralization is structurally controlled by EW-trending and NW-trending zones of deformation around the margin of the intrusive diorite body. NE-trending post-mineral normal faults on the eastern side of the deposit offset the orebodies. Hydrothermal alteration consists of an inner, early potassic alteration zone (with K-feldspar), grading outward to and overprinted by silicification (quartz-tourmaline, especially in the breccia zones) and advanced argillic alteration (alunite-clay-sericite), to a distal chloritic alteration zone. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Mo-Zn-B-Ag-Pb-Cu.

UKRAINE

4022 May (Mayskoye, Savran) is an Early Proterozoic quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold resource of 41 metric tons. It is located in the Savran district of the Beloserkov zone, Belozersk greenstone belt, Ukrainian Shield, Ukraine. Quartz veins and hydrothermal breccias are hosted by Archean to Early Proterozoic biotite gneiss, granulite and granite. Quartz is the dominant gangue mineral. Ore mineralogy consists mainly of pyrite and marcasite, with some molybdenite. Mineralization occurs within, and is structurally controlled by, steeply-dipping shear zones. Hydrothermal alteration consists of widespread and intense silicification and sericite-chlorite alteration in the shears and around orebodies. The metallic signature of the bulk of the ore is unknown.

UNITED STATES

2202 Alaska-Juneau is an Early Eocene quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 232 metric tons. It is located in the Juneau district of the Taku Terrane, North American Cordillera, Alaska, United States. The important tectonic structures in the area are the Coast Range MegaLineament and the EW-trending, steeply-dipping, oblique normal SilverBow Fault. Quartz-carbonate veins and associated disseminated sulphides are hosted mainly by metamorphosed rocks of the

Perseverance Slate, a Late Jurassic to Early Cretaceous belt of slate, schist and amphibolite lenses exposed in the core of a NE-plunging antiform. Districution of mineralized veins follows contacts between amphibolite lenses and slate and is also controlled by steeply-dipping, dextral reverse and left-lateral shear zones parallel to the regional trend. Ore minerals (in order of abundance) are pyrrhotite, pyrite, arsenopyrite, galena, sphalerite and chalcopyrite. Carbonate alteration is zoned, grading away from an ankerite zone near the orebodies, to a calcite zone. Biotite-chlorite alteration occurs in the ankerite zone surrounding the ore. Sulphidation of Fe-Ti oxides occurs in the wallrocks immediately adjacent to the orebodies; weak tourmalinization extends as much as 100 metres away. The metallic signature of the bulk of the ore is Au-Ag-As-Pb-Zn. Newberry and Brew (1988) proposed a model of formation where dewatering of low-grade metamorphic rocks produced CO_2-rich waters. Boiling induced through drop of confining pressure during ascent of the mineralizing fluids via tectonic channelways induced gold deposition.

2203 Treadwell is an Early Eocene, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 98 metric tons. It is located in the Juneau mining district within the Alexander Terrane, North American Cordillera, Alaska, United States. The Sundum and Fanshaw thrust faults are the two major regional tectonic structures in the area. Disseminated sulphides and reticulate veins and stringers are hosted almost entirely by altered and highly fractured diorite sills. The sills are localized at the contact between upper amphibolite grade, schistose hornblendites (or greenstones) and the upper greenschist grade black slates of the Late Jurassic to Early Cretaceous Seymour Canal Formation. The slates are in places also mineralized. Gangue mineralogy consists of calcite, quartz, albite and biotite. Ore minerals are pyrite, chalcopyrite, galena, sphalerite, molybdenite, native arsenic, realgar and orpiment. The diorite sills, due to their competency contrast with the enclosing slates, behaved as competent rock bodies during deformation and localized most of the fracturing. Steeply-dipping dextral-reverse and left-lateral shear zones (parallel to the regional trend) control the distribution of the ore zones. The sills are strongly and pervasively albitized, and have been termed albite diorite. The metallic signature of the bulk of the ore is Au-Ag-As-Cu-Pb-Zn-Hg-Mo-W. The Treadwell system is thought to have formed at the same time as the nearby Alaska-Juneau system and in the same way based on their similarities. Light *et al.* (1990) suggested that the environment of formation is similar to that of the Mother Lode deposits. Fluid inclusions and isotopic compositions suggest that the ore-forming fluids were derived from the metamorphism of deeper rocks (Light *et al.*, 1990).

3011 Bald Mountain is a Late Jurassic, composite intrusion-related sediment-hosted, micron gold (Carlin type) and porphyry-related Au-Ag deposit made up of the RBM, Rat, Top, LJ Ridge and number 1 to 5 deposits, with a total gold content of 70 metric tons. It is located around the Bald Mountain quartz monzonite stock in the Bald Mountain mining district, on the southern extension of the Carlin Trend, Great Basin and Range, North American Cordillera, Nevada, United States. The broad, N-trending Bald Mountain anticline is the main regional structure in the district area. Most of the mineralization at Bald Mountain is hosted by Late Jurassic quartz monzonite of the Bald Mountain Stock, brecciated and altered quartz-feldspar porphyry dykes and by dolomite of the Ordovician Antelope Valley Formation and calcareous shales of the Dundenberg Shale. Mineralization consists of disseminated sulphides at the Rat (Carlin-type style) and Top deposits, of quartz veins at the Top, RBM and Rat deposits, of high-grade sulphide-rich veins and semi-massive sulphide lenses of skarn affinity at the Top deposit, and of hydrothermal breccia bodies at the RBM deposit. Sulphide mineralogy is complex and varies with the type of mineralization encountered. Pyrite and sphalerite are the two most abundant sulphides; arsenopyrite, pyrrhotite, marcasite, chalcopyrite and galena are common, whereas stannite, bornite, tetrahedrite, stibnite and tellurides are lesser species. Structural and lithological controls played a key role in the formation and localization of the mineralization. NW-trending, steeply-dipping QFP dykes, and NW-trending, high-angle normal faults and structural zones intruded by QFP dykes, were important fluid pathways at the RBM and Rat deposits. Intersections of the NW-striking faults with N-striking faults localized ore shoots, and favorable lithologies of sandy siltstones and limestones of the Dundenberg Shale were preferentially mineralized at the Rat deposit. The contact of a shallowly-dipping QFP dyke and the carbonated rocks of the Antelope Valley Formation, and NE-striking breccia bodies and shear zones were the main controlling structures at the Top deposit. Copper veins at the Top deposits are related to a N-oriented, steeply-dipping trend. Hydrothermal alteration is widespread. Hornfels and marbles are typically developed along the borders of the intrusions. Argillic alteration of the QFP dykes and along faults is pervasive and laterally decreases in intensity, whereas adjacent sedimentary rocks show various degrees of intensity of argillic alteration. Pre-mineralization sericitic alteration also occurs in the dykes. Ore-hosting faults and their wallrocks, as well as the hydrothermal breccias, are typically silicified. Zonation of phyllic alteration to argillic alteration in the intrusive Bald Mountain stock, to jasperoid breccias and decarbonatization in the sediments is visible at the Top deposit. Carbon-rich zones at the Rat and Top deposits are similar to the early hydrocarbon stage in the Carlin deposits. Potassic alteration was recognized at depth. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Cu-Mo-Sn-Bi-Pb-Zn-Hg-Tl-Te.

3016 Fortitude-Surprise (Battle Mountain Complex) is an Eocene, intrusion-related Au-Ag-Cu skarn deposit with a total gold content of 257 metric tons. It is located on the Battle Mountain-Eureka Trend, Copper Canyon mining area, within the Great Basin and Range, North American Cordillera, Nevada, United States. The deposit is related to an Eocene granodiorite porphyry, the Copper Canyon Pluton. The Plumas Fault, a NS-trending, W-dipping normal fault and the Golconda Thrust Fault are the major regional tectonic structure in the area. Though skarns occur in most of the Pennsylvanian to Permian Antler Sequence sedimentary rocks, semi-massive sulphides, sulphide-rich veins and veinlets and disseminated sulphides are mainly hosted by the Antler Peak Limestone Formation composed of silty and carbonaceous limestones, with lenses of chert pebble conglomerate. Thinly bedded calcareous siltstones and sandstones, and conglomerates of the Battle Formation are other important hosts (notably at the Greater Midas pit of the Phoenix project). Pyrrhotite is the most abundant ore mineral, with goethite, pyrite, chrysocolla, chalcopyrite, malachite, marcasite, arsenopyrite, sphalerite, galena, tellurides and native bismuth. The Virgin Fault, a S-striking, steeply-dipping normal fault, is an important ore control at the Fortitude deposit. A granodiorite dyke extends from the main pluton, following the Virgin Fault, and appears to have been a major locus of hydrothermal fluid circulation. NE- to NNE-striking (and to a lesser scale, WNW-striking), high-angle normal faults tangent to the Virgin Fault also localized some of the mineralization. Potassic alteration (orthoclase-biotite) affected the granodiorite porphyry pluton and dykes and the early hornfels within the sedimentary package. There is also minor sericitic, chloritic and weak argillic alteration of the groundmass porphyry. Skarn alteration is zoned from a proximal, garnet-chalcopyrite dominant andradite-diopside-epidote near the intrusion, to a distal, Au-rich pyroxene-pyrrhotite dominant hedenbergite-garnet. A retrograde, actinolite-dominated prehnite-chlorite-quartz-calcite-sulphides skarn is the result of fluid cooling. Silicification within fault zones and adjacent skarns is also noted. The metallic signature of the bulk of the ore is Au-Cu-Ag-As-Bi-Te-Sb-Co-Ni-Cr.

3018 Beartrack is a Late Cretaceous gold deposit of probable porphyry-type affinity with a total gold content of 19 metric tons. It is located in the Mackinaw district of the Leesburg Basin, North American Cordillera, Idaho, United states. The Panther Creek fault zone, which is part of the Trans-Challis trend, is a major fault in the area. Mineralization at Beartrack consists of quartz stockworks and sheeted quartz veins hosted by Cretaceous quartz monzonite of the Idaho Batholith, and by clastic sedimentary rocks. The gangue mineralogy of the quartz veins and stockworks is dominated by quartz and orthoclase. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser galena, molybdenite, cinnabar, stibnite and wolframite. Alteration and mineralization are structurally controlled and restricted to three sets of thrust faults. Ore is associated mainly with NE-trending thrust faults. Hydrothermal alteration consists of proximal potassic (K-feldspar) and phyllic (quartz-sericite-pyrite) alteration of the intrusive host rocks and also occurs along the fault systems. Phyllic alteration grades outward to a distal propylitic assemblage. Silicification of hydrothermal breccias and within ore zones is also present. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Mo-Pb-Cu. Dating of the alteration at 68 Ma suggests a genetic relationship to the Idaho Batholith intrusion (Bartels *et al.*, 1990). An intrusion at depth, suggested by a regional geophysical high, may be a potential source of fluid or heat (Bartels *et al.*, 1990).

3030 Bullfrog is a Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 72 metric tons. It is located in the Bullfrog mining district of the Great Basin and Range province, North American Cordillera, Nevada, United States. The major regional structure in the area is the low-angle, normal Bullfrog Hills fault. The Contact fault is a normal listric faut that parallels the Bullfrog Hills fault and appears to merge into it. Quartz stockworks and banded or crustiform quartz-carbonate veins are hosted by Miocene felsic tuffs and breccias, welded rhyolite ash flows, and latite and basalt flows. Gangue mineralogy is mainly quartz, calcite and pyrolusite with trace amounts of adularia and sericite. Ore minerals are pyrite, limonite, malachite, chrysocolla and minor acanthite, tetrahedrite, chalcopyrite, galena, chalcocite, molybdenite, hessite and altaite. The MP and UP faults are NS- striking, moderately-dipping normal faults that host and control virtually all the orebodies. NE-striking faults are locally important but are generally less mineralized. The veins and faults wallrocks are pervasively silicified and contain adularia. Argillic alteration extends away from the ore-bearing structures, although it is relatively weak. The outer zone of alteration is formed by propyliticaly altered latites and basalts, represented by a chlorite-calcite-quartz-pyrite assemblage. Some silicic alteration is locally noted in the mineralized veins. The metallic signature of the bulk of the ore is Au-Ag-As-Mo-Sb.

3033 Cannon Mine is an Eocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 39 metric tons. It is located in the Wenatchee Gold Belt of the Columbia Plateau, North American Cordillera, Washington, United States. The Wenatchee area lies within the Chiwakum Graben, a NNW-trending, dextral, strike-slip basin. The main regional tectonic structures in the area are the Eagle Creek anticline and the high-angle, dextral strike-slip and oblique-slip Eagle Creek fault. Mineralization at the Cannon Mine consists of disseminated sulphides and quartz veins and veinlets hosted by coarse- to fine-grained arkose beds of the Eocene Chumstick Formation. Disseminated sulphides are pyrite, marcasite and arsenopyrite.

Veins are banded and sometimes brecciated, and carried spectacular gold grades They consist of quartz, chalcedony, adularia and calcite with sulphides and sulphosalts such as pyrite, pyrargyrite, tetrahedrite and minor acanthite, chalcopyrite, miargyrite and trace amounts of famatinite, native As and boulangerite. Orebodies are lithologically and structurally controlled. The area is complexly deformed, with two phases of flexural-slip folding represented by open to isoclinal folds, and synchronous dextral strike-slip faulting. The Wedge fault and the western strand of the Eagle Creek fault, with its related splay shears, are two important faults which served as fluid conduits. Numerous bedding-parallel shears are related to the flexural-slip folds and affected the mudstone interbeds. These sheared mudstones at the margins of the host arkose beds confined the hydrothermal fluids to the arkosic host, which were more permeable. The arkose beds also acted as competent layers during deformation, developing numerous joints and secondary permeability. Ore is primarily associated with tabular zones of silicification of the arkose beds. Argillic alteration forms a pervasive halo above and lateral to the orebodies and grades outward to a weak regional propylitic alteration. The metallic signature of the bulk of the ore is Au-Ag-Cu-Hg-As-Sb-Ba-V-Mn-Zr.

3039 Castle Mountain is a Mid-Miocene, low-sulphidation epithermal gold deposit with a total gold content of 38 metric tons. It is located in the Hart mining district within the Mohave Desert, North American Cordillera, California, United States. Structural geology in the Castle Mountains is dominated by the Castle Mountain Anticline. The deposit and areas of most intense alteration lie within or along the edges of a sag-caldera (synvolcanic depression). Banded quartz veins and stockworks are hosted mainly by altered and brecciated rhyolite flows and tuffs of the Miocene Linder Peak member, and by granite intrusions. Gold mineralization also occurs as disseminated suphides in the silicified matrix of hydrothermal breccias and in vugs. Gangue minerals are quartz, adularia, calcite, chlorite and illite, with minor leucoxene and rutile and late alunite. The orebody is almost exclusively hosted in the oxide zone, hence ore minerals are mainly hematite and goethite, with some partially oxidized (rarely fresh) pyrite. Trace amounts of chlorargyrite are also present. The intersections of NNE-trending, steeply-dipping to vertical, normal faults and fracture zones with subordinate NW-trending faults, served as conduits for ore-forming fluids and controlled the distribution of the mineralization. Lithologic control is dependant on rock texture; tuffs and breccias re more permeable, whereas rhyolitic and granitic rocks are more brittle and consequently more fractured. Silicification is intense near and within the orebodies, particularly in the breccias and loosely-welded tuff beds. Local silicic alteration is centered on the ore, and resulted in drusy quartz and vug formation. Sulphidation is closely associated with silicification and, to a lesser degree, silicic alteration. Associated with silicification zones are potassic alteration zones represented by assemblages of adularia-sericite-illite. Argillic alteration forms peripheral zones around the silicified areas and is consists of a kaolinite-montmorillonite-smectite-cristobalite assemblage. Propylitic alteration (chlorite-epidote-apatite-calcite-kaolinite-montmorillonite-pyrite-iron oxides) of varying intensity affects the latites and basalts underlying the ore deposits and forms the outer alteration halo. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Mo.

3048 The Cripple Creek Au-Ag district consists of Oligocene, intrusion-related breccia-pipe deposits including the currently active Cresson deposit. The Cripple Creek district, with a total gold content of 206 metric tons, is located in the southern Rocky Mountains, North American Cordillera, Colorado, United States. The ore deposits are localized within and adjacent to an 18 km^2 elliptical diatreme complex. The two primary styles of mineralization in the district are high-grade veins with related disseminated sulphides in the wallrocks, and low-grade disseminated deposits. The mineralization is hosted by heterolithic breccias, by Oligocene phonolite and phonotephrite alkalic intrusive dikes, and to a lesser extent by Precambrian granodiorite. Cresson is a large, low-grade disseminated deposit. Other smaller orebodies are mined at the Globe Hill and IronClad pits. Mineralized veins and vugs have a complex mineralogy of quartz, biotite, fluorite, K-feldspar, dolomite, calcite, ankerite, celestite, barite and roscoelite. Sulphide content is less than 3% and is characterized by pyrite, sphalerite, galena, calaverite, tetrahedrite, krennerite, sylvanite, petzite, stibnite, molybdenite, chalcopyrite and cinnabar. Veins and breccias are structurally controlled by shears, faults and fractures. Disseminated mineralization is localized within and adjacent to faults, fractures and dike margins. Hydrothermal alteration is better developed in the shallow hydrothermal breccias than in the deeper veins. Breccia clasts, matrix and wallrocks exhibit varying degree of chloritization and sericitization. Vein-related alteration consists of an inner potassic alteration envelope (adularia-dolomite-roscoelite), grading outward to a sericitic alteration (sericite-montmorillonite-magnetite-adularia-pyrite). Weak propylitic alteration is present throughout the district. The (partly inferred) metallic signature of the bulk of the ore is Au-Ag-Sb-Te-Pb-Zn.

3049 Croofoot/Lewis (renamed the Hycroft Mine) is a Pliocene to Pleistocene, epithermal low-sulphidation hot-spring Au-Ag deposit with a total gold content of 49 metric tons. It is located in the Sulphur district of the Great Basin and Range, North American Cordillera, Nevada, United States. NS-trending, high-angle normal Basin-and-Range-type faults are the dominant structures in the area. Quartz veins and disseminated sulphide bodies are hosted by Late Tertiary to Pleistocene rocks of the Sulphur Group, mainly altered Camel Conglomerate, Crofoot Breccia (hydrothermal eruption breccia), sandstones and felsic volcanics and tuffs. Ore mineralogy consists mainly of pyrite, marcasite, stibnite, chalcopyrite, galena, naumannite, sphalerite, acanthite and stromeyerite. Mineralized veins and alteration zones are structurally controlled, occurring within the hanging walls of NS-trending, moderately- to steeply-dipping normal faults such as the Central Fault. NW- and W-striking faults locally offset the NS-trending faults and related ore zones. Hydrothermal alteration is vertically zoned. A near-surface sinter zone and blanket of steam-heated advanced argillic (cristobalite-quartz±alunite±kaolinite±native sulphur±jarosite±hematite±cinnabar±gypsum) alteration grades into a basal acid leach oxidized advanced argillic zone (opal±alunite±kaolinite±hematite) and a silicified zone (opal-chalcedony-K-feldspar-marcasite-pyrite±stibnite±leucoxene) within the Camel Conglomerate and Crofoot Breccia, the latter alteration extending to greater depths along structures. Opal fragments, pods and veins of the basal acid leach zone carry the highest Au grades. This alteration extends at depth into the silicified zones, which host low-grade disseminated mineralization. Farther down and away from the silicified zone is an argillic alteration zone of illite-smectite-quartz-pyrite±chlorite±kaolinite±illite±calcite±pyrrhotite within the Camel Conglomerate. Zeolitic alteration (montmorillonite-mordenite-silica-kaolinite-smectite±jarosite±alunite) occurs adjacent to, or overprinting, silicified zones in the Crofoot Breccia, Camel Conglomerate and sinter areas. Late quartz-chalcedony veins cutting through altered zones carry some ore-grade mineralization. The metallic signature of the bulk of the ore is Au-Ag-Hg-As-Sb- Se-Tl.

3052 Dee and Rossi (Storm) are Cretaceous or Tertiary, sediment-hosted micron gold (Carlin type) Au-Ag deposits with a total gold content of 20 metric tons. They are located in the Bootstrap district at the northernmost extent of the Carlin Trend, Great Basin and Range, North American Cordillera, Nevada, United States. The main regional tectonic structures in the area are the Golconda Thrust fault and a close to tight NNE-trending antiform. Disseminated sulphide mineralization is hosted by limestones (often brecciated due to solution collapse), silty limestones and calcareous siltstones of the Ordovician to Devonian Vinini and Popovich formations, and by (inferred) Jurassic to Tertiary tonalite dikes such as the Arturo and the 49'er dikes. Sulphides, mainly pyrite and stibnite, with some native silver, occur in a gangue of quartz and barite. N- (Dee Fault) and NW-trending, high-angle dip-slip (probably reverse) faults and their intersections controlled the distribution of the mineralization and served as fluid conduits. The mineralization rarely extends more than a few metres away from the faults. Dykes occupy the faults and host small volumes of high grade ore. NE-trending, high-angle, normal Basin and Range faults displaced the ore horizons downward. Early decarbonatization of the limy units (which continued during and after the mineralization event) produced the collapse breccias. Silicification and pyritization along the faults are related to the main mineralizing event. Argillic alteration affected the limy units in a broader halo, and is represented by an assemblage of montmorillonite-kaolinite-illite±sericite. Where mineralized, dikes are sericitized and also silicified. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Tl.

3053 DeLamar is a Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 33 metric tons. It is located in the DeLamar-Silver City mining district, Columbia Plateau, North American Cordillera, Idaho, United States. The Northwest Fault, named for its parallelism with the regional NW trend of normal faults contemporaneous with Basin and Range faulting, and the Boulder Creek Caldera, are the two main regional tectonic features in the area. Mineralized, finely laminated veins are hosted by (in places porphyritic) rhyolite and latite flows of the Miocene Silver City Rhyolite unit. The principal gangue minerals in the veins are quartz and adularia, with lesser amounts of calcite, barite, fluorite and siderite. Ore mineralogy is mainly pyrite and marcasite, and lesser acanthite, proustite, pyrargyrite, polybasite, myargyrite, naumannite, chalcopyrite, galena, sphalerite, jamesonite and numerous Se-bearing minerals. In porphyritic rhyolite, closely spaced veinlets and fracture fillings form low-grade stockworks that constitute bulk tonnage ore. N-trending, high-angle normal faults such as the West, Central and East faults, and NW-trending, high-angle normal faults, are mineralized structures that served as fluid conduits and controlled the distribution of the alteration and mineralization. Alteration of the porphyritic host at DeLamar is pervasive and vertically zoned. Quartz-illite-pyrite-marcasite silicification-sericitization in the rhyolite host (and along faults) is overlain by argillic alteration of tuffaceous rocks, characterized by an impermeable assemblage of illite-montmorillonite-pyrite, resulting in ponding and deposition of ore. Above the argillic zone is a propylitic alteration zone of kaolinite-hematite-epidote-quartz. Some minor potassic metasomatism is present. Supergene advanced argillic alteration characterized by alunite-goethite-jarosite-kaolinite-illite was formed in the upper portions of the deposit. The metallic signature of the bulk of the ore is Ag-Au-As-Sb-Se.

3060 Florida Canyon is a Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 71 metric tons. It is located in the Imlay mining district of the Humboldt Range, Great Basin and Range, North American Cordillera, Nevada, United States. Regional tectonic structure in the area are: the Humboldt Range, a major N-trending anticlinorial structure formed during the Nevadan Orogeny, the Humboldt Structural Zone, a 200 km long, NE- and NNE-oriented zone of sinistral strike-slip and dip-slip faults, with which the Midas Trench Lineament and the N-trending Humboldt City Thrust Fault are associated. Quartz veins and stockworks are hosted by sub-greenschist grade, siliceous, locally calcareous and shaley siltstones, and mudstones of the

Late Triassic Grass Valley Formation. Gangue mineralogy consists mainly of quartz, with less abundant chalcedony, adularia, calcite, barite and fluorite. Ore mineralogy is dominated by pyrite (and limonite after pyrite), with lesser marcasite, arsenopyrite, pyrargyrite, pyrrhotite and stibnite. Structural control is provided by numerous NE-striking dextral shear zones, such as the Madre Vein and the Northeast Trend. A series of NS-oriented, parallel, high-angle normal Basin and Range-type faults also served as fluid conduits, and their intersections with the NE-trending shear zones are the loci of intense alteration and mineralization. The brittle nature of the host rocks exerted a lithological control over the fluid flow, whereas the less permeable lower package of phyllites and shales channeled the fluids upward to the more favorable horizons. Bedding plane partings locally controlled the distribution of veining. Pre-mineralization regional metamorphism altered the siliceous units by introducing clay minerals, and the more argillaceous units by transforming them to a quartz-sericite assemblage. Ore-related hydrothermal alteration of the hosts is pervasive and most intense within and adjacent to shear zones and fluid conduits. Pervasive kaolinitization with minor alunite (argillic alteration) mainly affected the host mudstones. Silicification occurs along fault zones and in patches, selectively replacing calcareous units. Extensive surface bleaching attests to acid leaching with development of supergene kaolinite and alunite from fluids that percolated downward into the fracture zones. Pervasive hematization is related to the same supergene process and is confined to silty units marginal to bleached areas. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Ba.

3062 Wharf Mine (including the Annie Creek mine and Foley Ridge pits) is an Early Tertiary or younger, intrusion-related manto gold deposit with a total gold content of 70 metric tons. It is located in the Bald Mountain mining district in the northern Black Hills of the Interior Platform, South Dakota, United States. The major regional structure in the area is the Lead-Deadwood dome, a WNW-elongated dome resulting from forceful emplacement of Lower Tertiary composite intrusive bodies into the Precambrian basement. Quartz veins and associated disseminated sulphides are hosted by glauconitic and calcareous sandstones and siltstones, and by limestones of the Cambrian Deadwood Formation. Lower Tertiary porphyritic monzonite sills also host mineralization Quartz and fluorite are the main gangue minerals. Pyrite and marcasite are the most abundant sulphides, with lesser arsenopyrite and minor selenite, sphalerite, galena, chalcopyrite and tellurides. The main controlling structures are widespread and continuous, NNE-trending, sub-vertical to vertical extension fractures related to doming and which cut all rocks types. The contacts of the porphyry sills with sedimentary rocks were also important fluid pathways. Lithological control is provided by quartz-poor, carbonate-rich units, which are highly favorable hosts. Widespread and intense silicification occured along igneous contacts, near and within the NE-trending fractures, and also within the thicker sills. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Se-Zn-Pb-Cu-Te.

3065 Genesis/Bluestar (also known as the Genesis Complex) is an Oligocene, intrusion-related, sediment-hosted micron gold (Carlin-type) deposit with a total gold content of 211 metric tons. It is located in the Lynn mining district of the northern Carlin Trend, Great Basin and Range, North American Cordillera, Nevada, United States. The Roberts Mountain Thrust, which stacked Ordovician rocks over Devonian rocks, and the Tuscarora Anticline are the two major tectonic structures in the area. Disseminated sulphide mineralization is hosted by altered silty limestones of the Middle Devonian Popovich Formation, by calcareous siltstones and mudstones of the Late Devonian Rodeo Creek Formation, and locally by biotite-feldspar porphyry dykes. Pyrite is the dominant sulphide mineral, with lesser sphalerite and stibnite. Structural control is provided by three sets of faults: 1) the NW-striking, high-angle normal Reindeer and Number 9 faults; 2) the crosscutting K-Fault and similar NE-striking, high-angle normal (and reverse) faults, and 3) by NS-striking, high-angle (normal or reverse) pre-mineral faults such as the Ridge Fault. Low-angle, post-mineral faults associated with the thrusting, and NNW-striking, steeply-dipping normal faults related to Basin and Range extension offset the mineralization. The K-Fault also hosts the K-dyke, a biotite-feldspar porphyry dyke dated at 28,3 Ma that is sparsely mineralized and which helped define the age of that least some of the mineralization. Lithological control is exerted by the limy units of the Popovich and Rodeo Creek formations, which were preferentially altered and mineralized. Emplacement of the 158 Ma Goldstrike Stock produced hornfels and skarns. The Goldstrick stock is affected by propylitic alteration. Early decarbonatization created permeability within the host. Pervasive jasperoid alteration in and adjacent to faults, as well as argillic alteration (illite-kaolinite-smectite), are the two dominant alteration types which are closely associated with gold mineralization. Minor quartz flooding is noted along fractures. Sericitic and argillic alteration of the dykes is very intense and associated with the mineralization event. Late-stage supergene oxidation is common along faults, joints and bedding planes. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Cu-Zn-Pb-Mo-Tl.

3066 Getchell is a Late Cretaceous or Middle to Late Eocene, intrusion-related sediment-hosted disseminated (Carlin-type) Au-Ag deposit with a total gold content of 241 metric tons. It is located in the Potosi mining district of the Getchell Trend, Great Basin and Range, North American Cordillera, Nevada, United States. The Anderson Canyon Fault is an important regional NS-oriented thrust fault in the area. Disseminated sulphides and quartz-carbonate veins are hosted by limestones and calcareous shales of the Lower Cambrian to Lower Ordovician Preble and Comus Formations, and by 90 Ma granodiorite sills and dykes. Gangue mineralogy of the veins consists of quartz and/or carbonate, barite and fluorite. Ore minerals are pyrite, marcasite, arsenopyrite, realgar and orpiment, with lesser stibnite, cinnabar, chalcopyrite and sphalerite, and rare getchellite, galkhaite and laffittite. Molybdenite and scheelite are unrelated to the mineralization but are closely associated with the granodiorite intrusions. The Getchell Fault, a N-trending, dextral strike-slip fault with minimal dip-slip movement, controls the distribution of the mineralization and acted as the main fluid channelway. Jasperoid alteration occurs in and along the fault and grades away from the fault into a decarbonatization halo in the limestones and calcareous rocks. Granodiorite intrusions are sericitized and chloritized near the fault. The metallic signature of the bulk of the ore is Au-As-S-W-Hg-Ag-Sb-Zn-Cu-Ce-Th.

3067 Gilt Edge is a Paleocene, intrusion-related porphyry Au-Ag deposit with a total gold content of 15 metric tons. It is located in the northern Black Hills of the Interior Platform, South Dakota, United States. The deposit is part of a larger EW-trending belt of Tertiary alkalic intrusions, which have formed a domal uplift elongated along a N- to NW-trending axis. Hydrothermal fault breccias, disseminated sulphides and stockwork veins are hosted by porphyritic and sometimes brecciated Paleocene syenite and quartz syenite intrusions. Quartz and fluorite are the main gangue minerals. Ore mineralogy consists of pyrite, marcasite, magnetite (in the oxide zone), acanthite, arsenopyrite, chalcopyrite, pyrrhotite, galena, molybdenite, sphalerite, bornite, chalcocite, covellite, calaverite, sylvanite, hessite and petzite. Emplacement of the intrusions was probably controlled by NE-trending, high-angle fracture zones such as the Dakota Maid and Rattlesnake fracture zones. Quartz-pyrite stockwork mineralization is restricted to the syenite porphyry and predated quartz syenite emplacement. Breccias are mainly clast-supported; they are best developed at the intersection of NE-trending, high-angle faults and fracture zones, and at the margins of the quartz syenite plutons (intrusive breccias). The syenite porphyry is affected by widespread potassic and argillic alteration. Argillic alteration (clay-sericite-quartz±pyrite) is also developed in the quartz syenite porphyry, but is mostly associated to faults and fracture zones and the margins of the quartz syenite stock. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Pb-Zn-As-Te-F.

3070 The Gold Quarry/Maggie Creek gold deposits are Oligocene, sediment-hosted micron gold (Carlin-type) deposits with a total gold content of 394 metric tons. They are located in the Maggie Creek subdistrict of the Carlin Trend, Great Basin and Range, North American Cordillera, Nevada, United States. Mining started in 1980 at Maggie Creek and in 1985 at Gold Quarry. In 1987, the Maggie Creek pit was encompassed within the Gold Quarry pit. The Roberts Mountains Thrust is the major regional structure in the area. An upper stockwork zone (Main ore zone) and a lower, stratabound zone of disseminated sulphides (West Deep orebody) are hosted by Ordovician to Lower Mississippian siltstones, mudstones, cherts, argillite and silty limestones units correlative to the Vinini and Rodeo Creek Formations. Ore mineralogy consists of marcasite and arsenopyrite in a gangue of quartz, sericite and barite (also presence of hydrocarbons). Structural control on the mineralization is exerted by many faults. The Main ore zone occurs at the intersection of the Gold Quarry fault, a NE-trending, steeply-dipping, sinistral/normal fault, and the Good Hope fault, a NW-trending reverse fault. Both faults are bounding structures controlling the spatial distribution of gold (mainly the Gold Quarry fault). Many smaller faults parallel these two faults and are also important ore controls. The NNW-striking, dextral strike-slip faults of the Kristalle fault system (which includes the Hangfire Fault) control high-grade ore zones. Intersections of the Hangfire Fault with the NNE-trending, E-dipping Grey and Challenger faults, acted as feeder conduits in the Deep West ore zone of the deposit. Intense decalcification was the earliest hydrothermal event to take place. This was followed by jasperoid alteration/silicification, most intense along high-angle faults. Barite deposition was also important. Argillic alteration, represented by kaolinite-alunite veins to which gold is also associated, was the last hydrothermal event to take place. The alunite is hypogene and has been dated at 30 Ma (Rota and Hausen, 1991). The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Tl-Cu-Pb-Ni-Zn. Rota (1993) proposed that the Gold Quarry deposit is the eroded remnants of a fossil epithermal/hotsprings system.

3072 Golden Sunlight is a Late Cretaceous, intrusion-related breccia pipe Au-Ag-Cu deposit with a total gold content of 31 metric tons. It is located in the Whitehall district of the Northern Rocky Mountains, central Montana alkalic belt, North American Cordillera, Montana, United States. The major regional structure in the area is the dextral strike-slip(?) Great Falls Tectonic Zone. Hydrothermal breccias, with a pyrite-rich matrix, and mineralized quartz veins are hosted by the Mineral Hill breccia, which intrudes latite porphyry, lamprophyres and surrounding shales. Gangue minerals are quartz, sericite, kaolinite, barite, dolomite, fluorite, magnesite and dickite. Ore mineralogy is complex, and consists mainly of pyrite, tetrahedrite, chalcopyrite, chalcocite, covellite, calaverite, chalcanthite, bismuth tellurides and sulphosalts, molybdenite and other telluride species. The Mineral Hill breccia body hosts the major part of the mineralization and is tilted along the eastern limb of the Sunlight syncline. Three sets of dextral strike-slip faults, with minor dip-slip movement, control the distribution of the mineralized veins. The breccia contacts constitute high-grade ore zones; these are complexly deformed and extremely fractured, and are also intruded by latites and lamprophyre. The Corridor Fault is a low-angle, dextral strike-slip fault which offsets the mineralization. Hydrothermal alteration is limited to sericitic alteration associated with late-stage veins in the Mineral Hill breccia pipe. The metallic signature of the bulk of the ore is Au-Ag-Cu-Bi-Te-V-F-Mo. The Golden Sunlight deposit and Mineral Hill breccia pipe are spatially and genetically related to a Late Cretaceous, high-level alkaline to subalkaline porphyry-Mo system (Foster and Childs, 1993; Spry *et al.*, 1996). Spry *et al.* (1999) classified Golden Sunlight as a low-sulphidation, epithermal deposit.

3075 Goldstrike (Betze-Post) is a Middle to Late Eocene, intrusion-related, sediment-hosted micron gold (Carlin-type) deposit with a total gold content of 1175 metric tons. It is located in the Carlin Trend of the Great Basin and Range, North American Cordillera, Nevada, United States. The Roberts Mountains Thrust and the Tuscarora Anticline are the two major regional structures affecting the area. The deposit is hosted mainly by argillaceous and carbonaceous limestones, calcareous mudstones and silty limestones of the Siluro-Devonian Roberts Mountains and Devonian Popovich Formations, along the northern margin of the 158 Ma Goldstrike diorite intrusion. Mineralization consists of disseminated sulphides in tabular zones of hydrothermal, tectonic and sedimentary-collapse breccias (the latter caused by volume loss related to decalcification of the host rock). Ore mineralogy is composed of pyrite, marcasite, arsenopyrite, realgar, orpiment, stibnite, sphalerite and minor tetrahedrite and chalcopyrite. Gangue mineralogy of the breccia-type ore consists of quartz, barite, calcite, illite and sericite. A series of NNW-striking, sinistral normal faults related to the Post Fault system and the Buzzard Fault, are important structural controls on the orebodies. Perhaps the most important ore controls are the NW-trending, assymetrical Post Anticline (a local expression of the Tuscarora Anticline) and North Betze Anticline. Some of the best ore zones occur in the crests of the folds, expecially near the Goldstrike diorite intrusive front and related sills. Decarbonatization and silicification are the two main hydrothermal alteration related to the Goldstrike deposit. Some skarn and hornfel development is associated with the Goldstrike diorite emplacement. Partial to complete removal of carbonate material led to enhanced porosity and is prior, or coeval with, deposition of fine-grained pyrite (early-stage gold deposition). Main-stage gold deposition is dominated by argillic alteration (illite-clay-sericite) and deposition of arsenian pyrite, with silicification and jasperoid alteration along faults and brecciated rocks. Late-stage mineralization is marked by abundant silicification and argillic alteration (represented by kaolinite-smectite-halloysite), and a large assemblage of hydrothermal minerals such as stibnite, barite, realgar, orpiment, and nickel, copper, zinc and mercury sulphides and selenides. Sericitization and sulphidation of the Goldstrike diorite probably accompanied the decalcification of the sedimentary rocks. The metallic signature of the disseminated ore is Au-Ag-As-Hg-Cr-Zn-Cu. The metallic signature of the breccia ore is Au-Ag-As-Sb-Hg-Ni-Co-Cr-Zn-Cu-Tl-Ba. A 38 Ma biotite-feldspar porphyry dyke is thought to be slightly younger than the mineralization (Leonardson and Rahn, 1996).

3080 Greens Creek is a Late Triassic, volcanogenic massive sulphide Zn-Ag-Au-Pb-Cu deposit with a total gold content of 47 metric tons. It is located on Admiralty Island near the town of Juneau, Wrangellia Terrane, North American Cordillera, Alaska, United States. Three or four folding events have obscured the original stratigraphic relations. The deposit is located in the nose of a large anticlinorium (the main tectonic structure in the area). The structural hanging wall of the deposit is a greenschist grade, thinly laminated quartz-carbonate-mica phyllite (interpreted as altered basalts or basaltic sediments), the footwall is a black graphitic meta-argillite. Mineralization consists of two main types. The first type, massive and (uncommon) graphitic black ore, consists of massive to semi-massive sulphide lenses of pyrite, low-Fe sphalerite and galena, with lesser chalcopyrite, tetrahedrite, freibergite and electrum. Gangue minerals associated with this type of ore are quartz, carbonate and minor barite. The second type, white ore, consists of disseminated sulphides (commonly chalcopyrite-bornite) in siliceous replacement zones, sulphide-rich veinlets of silver sulphides and electrum, and banded baritic ore. The main ore minerals of the white ore are tetrahedrite-tennantite, bornite, freibergite, galena, sphalerite, chalcopyrite and acanthite. Randomly-oriented white quartz veins are closely associated with white ore contained in a carbonate gangue. Sulphide lenses are localized along the phyllite-argillite contact. The Maki Fault is a SE-trending, steeply-dipping late fault that cuts through the deposit but is unmineralized. Intense proximal quartz-sericite-pyrite alteration occurs near the deposit, with increasingly intense carbonatization near the orebodies. These proximal alteration zones grade away to a distal chlorite-calcite alteration assemblage. The metallic signature of the bulk of the ore is Au-Ag-Zn-Pb-Ba-Cu.

3083 Hayden Hill is a Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 23 metric tons. It is located in the Hayden Hill district (discovered in the 1870s), Great Basin and Range, North American Cordillera, California, United States. The northern extension of the Walker Lane structural zone is the prominent tectonic structure in the area. Banded quartz-adularia veins, hydrothermal breccias and stockworks are hosted by dacite breccia, overlying tuff breccia, and siltstones of the Miocene Turner Creek Formation, and by the poorly-bedded, unsorted tuff of Dago Springs. Gangue mineralogy of the low-grade, sulphide-rich (up to 40% pyrite) stockworks and hydrothermal breccias consists of chalcedony, quartz, and adularia. The gangue minerals of the high-grade veins are quartz and adularia with lesser barite; ore mineralogy consists of pyrite and cinnabar, and traces of chalcopyrite, sphalerite, and galena. “Rubble ore”, consisting of iron and manganese oxides and clays with free gold, was mined from unconsolidated crushed rock and vein material. Mineralization is structurally controlled by NW-trending, steeply-dipping, dextral strike-slip faults that were active both before and after the mineralization event. Also of importance, are two sets of NE- and N-trending, pre-mineralization, normal faults along which occur discontinuous zones of breccia-type mineralization. Intense silicification and potassic alteration (quartz-adularia-pyrite) is centered on the orebodies. This grades outward to haloes of argillic and sericitic alterations, which also occur along faults cutting across the orebodies. Local propylitic (chlorite-calcite-epidote) alteration is present in stratigraphically lower dacitic flows. The metallic signature of the bulk of the ore (partly inferred from its mineralogy) is Au-Ag-As-Mn-Hg-Ba.

3085 Homestake is a Proterozoic, iron-formation-hosted vein and disseminated Au-Ag deposit with a total gold content of 1237 metric tons. It is located in the Whitewood mining district of the Black Hills, Interior Platform, South Dakota, United States. The area is heavily folded and deformed, and the most notable structural feature is the Lead-Poorman Anticlinorium. The deposit is hosted almost exclusively by the upper greenschist to lower amphibolite grade siderite or grunerite schists and phyllites (derived from carbonate facies iron formation) of the Homestake Formation. Mineralization consists of stratabound massive sulphide lenses in synclinal minor folds (ore ledges), quartz veins within shear zones (shear ore), and associated disseminated sulphides in the shear zone wallrocks (replacement ore). Minor anticlinal zones are devoid of ore. Shear ore is localized in dilated segments of late-stage, ductile-brittle, dip-slip shears developed on bedding planes. Replacement ore is associated with chloritization and sulphidation of the shear zone wallrocks. Massive sulphide lenses are composed of pyrrhotite and arsenopyrite, with minor pyrite, and rare galena, sphalerite, loellingite, and chalcopyrite, in a matrix of quartz, chlorite, siderite, biotite and minor garnet, ankerite, muscovite and albite. Shear ore consists of arsenopyrite and minor pyrrhotite in a gangue of quartz and associated chlorite and siderite. Gold grade in shear ore is generally high. Replacement ore is characterized by disseminated pyrrhotite which replaced siderite-rich beds, and occurs in discontinuous layers along foliation surfaces. Chlorite-siderite (chloritization) and sulphidation are the two hydrothermal alteration types associated with the shears and shear-replacement ores. Sericitized, bleached zones represent fluid flow paths along individual shears or splays related to the shear ore. Bleached zones are locally mineralized and carry low, but anomalous, gold values with arsenopyrite and pyrrhotite. The metallic signature of the bulk of the ore is Au-Ag-As. Caddey *et al.* (1991) favor a postpeak metamorphic age (peak metamorphic activity at 1.84 Ga.) and an epigenetic origin for the gold-ore mineralization, which may be related to magmatic activity and early stages of emplacement of the Harney Peak Granite at 1.72 Ga.

3087 Ivanhoe-Hollister is a Miocene, hot-spring (low-sulphidation) epithermal gold deposit with a total gold content of 2 metric tons and a resource of 29 metric tons. It is located in the historic Ivanhoe Hg-mining district along the Carlin Trend, Great Basin and Range, North American Cordillera, Nevada, United States. The Roberts Mountains Thrust Fault is the dominant tectonic structure of the area. Disseminated sulphides and bonanza-grade veins (recently discovered and probably corresponding to a deeper low-sulphidation system underneath the hot-spring style mineralization) are hosted by altered, Miocene intermediate tuffs, ash-fall tuffs, basaltic andesites and basalts. Sinters are present in the volcanic rocks. Ore minerals are mainly pyrite, marcasite, chalcopyrite, cinnabar, stibnite, realgar, tetrahedrite, tennantite, sphalerite, and lesser arsenopyrite, covellite, galena, millerite and pyrrhotite. Within the oxide zone, goethite and limonite are the main ore-bearing minerals. The zone of supergene oxidation extends vertically to depth of about 100 metres. There are multiple structural controls on the mineralization: 1) intersections of NW- and NE-striking (and minor E-W) normal faults; 2) favorable lithology (the tuffaceous units) and the presence of impermeable claystone interbeds within the volcanic rocks; 3) the disconformity between Paleozoic Valmy Formation and overlying Tertiary tuffs and andesites; and 4) the flow margins in the basalts and basaltic andesites. An E-trending, nearly vertical caldera-margin fault represents the southern boundary of the known ore zones. Shallow, supergene advanced argillic alteration occurs within the volcanic rocks and is characterized by an alunite-kaolinite-dickite-chalcedony-opal assemblage in the oxidized zone. This grades at depth into argillic alteration represented by an assemblage of adularia-montmorillonite-chalcedony-chlorite-pyrite-sericite-kaolinite-alunite in the sulphide zone. Silicification is pervasive around the sinter zones and beneath the sinters, and also along structures. Widespread propylitic alteration (nontronite-chlorite-calcite-zeolite) affected the basalts and other volcanic rocks. The metallic signature of the bulk of the ore is Au-Ag-As-Hg-Mn-Cd-Co-Cu-Pb-Zn-Ba-Mo-Te-Tl.

3088 Jamestown is a Cretaceous, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 25 metric tons. It is located in the Mother Lode district, Great Valley area, North American Cordillera, California, United States. The Melones fault zone, a high-angle reverse fault, is the dominant tectonic structure in the area, and is parallel to the general orientation of the Mother Lode Gold Belt. Quartz veins and associated (low-grade) disseminated sulphides are hosted by Jurassic, (altered and sheared) ankeritic and quartz-carbonate-mariposite schists, serpentinite and black graphitic slate. Gangue minerals are quartz, feldspar, calcium, magnesium and iron carbonates, with minor ferromagnesian silicates and barite. Pyrite is the dominant sulphide, together with chalcopyrite, galena, sphalerite and tetrahedrite, minor bravoite, cobaltite, gersdorffite and millerite, and rare tellurides such as coloradoite, hessite, melonite, petzite and native tellurium. The primary ore-controlling structures are NNW-trending, steeply-dipping shear zones parallel to the Melones fault zone. These shear zones are the loci of mineralized quartz veins and hydrothermal alteration, and in places have also been intruded by igneous rocks. Mineralized, vein-filled tensional joints (extensional quartz veins) developed during lateral compressional deformation. Alteration of the host schists and serpentinite is intense. Sericitization and carbonate alteration (ankeritization and talc-carbonate alteration) are the dominant alteration types. Minor silicification was noted. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Te-Ni-Co.

3090 Jerritt Canyon is an Eocene, sediment-hosted micron gold (Carlin-type) deposit with a total gold content of 241 metric tons. It is located in the Independance Mountains district of the Great Basin and Range, North American Cordillera, Nevada, United States. The Roberts Mountains Thrust is the major regional structure in the area. Disseminated sulphides are hosted by carbonaceous, pyritic and laminated calcarareous silstones of the Silurian-Devonian Roberts Mountains Formation and by argillaceous, dolomitic limestones and cherts of the Hanson Creek Formation. A minor part of the ore is also hosted by andesitic and gabbroic dykes, the latter dated at 40,8±0,1 Ma. Ore mineralogy consists dominantly of pyrite, marcasite and arsenopyrite, with native arsenic, realgar, orpiment, cinnabar and lorandite in lesser amounts. Gangue minerals are quartz, calcite, dolomite and illite, with rare kaolinite and barite. Realgar-calcite veins are related to mineralization, and grade from realgar-only veins in high-grade ore zones to realgar-calcite in average-grade zones, and to calcite-only veins in barren rocks. Ore-controlling structures consist of numerous NE-, NNE- and NW-striking, high-angle normal faults, high-angle reverse faults, and anticlinal folds. Intersections of these structures with one another localized the high-grade zones. The presence of permeable and reactive lithologies such as limestones and calcareous siltstones was also an ore-controlling factor. Alteration is zoned, with a proximal zone of jasperoid and, in places, silicic alteration, grading outward to the highest grade zones of decalcification and sulphidation together with lesser silicification and dolomitization. Intrusive dykes are affected by argillic alteration and sulphidation of iron oxides as well. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Tl±Se±Te±W±Zn±Cu±Pb.

3097 Lone Tree Complex is an Oligocene Au-Ag deposit of probable low-sulphidation, epithermal affinity, with a total gold content of 126 metric tons. It is located in the Battle Mountain mining district of the Great Basin and Range province, North American Cordillera, Nevada, United States. The Roberts Mountains Thrust fault is the major regional tectonic structure in the area. Disseminated sulphides, stockwork zones and hydrothermal breccias are hosted by three units: quartzite of the Ordovician Valmy Formation, siltstone and calcareous-lithic sandstones of the Pennsylvanian Antler Sequence, and calcareous siltstones and sandstones of the Pennsylvanian-Permian Havalla Sequence. Tertiary quartz porphyry dykes are a minor ore host. Ore minerals are arsenopyrite, pyrite, marcasite, chalcopyrite and iron oxides such as goethite and limonite. Gangue minerals of the stockworks and breccias are quartz, kaolinite and barite. NNW- and NNE-trending, high-angle normal (possibly oblique-slip) faults (such as the Powerline Fault) and their intersections are the most important ore-controlling structures. Some mineralized, low-angle structures like the Redwood Fault are thought to be reactivated structures, and pre-date the Sonoma Orogeny. Crackle-breccias occur in more brittle, silicified rocks. Proximal hydrothermal alteration consists of potassic alteration in the Antler and Valmy rocks.

This grades outward to silicification (of the Antler and Valmy rocks), to an outer halo of argillic alteration in the Havallah sediments. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg±Cu±Pb±Zn±Mo. According to Braginton (1996), the alteration signature, mineral chemistry and lack of jasperoid alteration suggest a low-sulphidation epithermal environment, but low overall base metal content and arsenic enrichment suggest similarities with Carlin systems.

3102 Marigold is a Tertiary (Middle Eocene to Oligocene?) sediment-hosted, micron gold (Carlin type) Au-Ag deposit with a total gold content of 105 metric tons. It is located in the Battle Mountain mining district of the Great Basin and Range province, American Cordillera, Nevada, United States. The Golconda Thrust is the major regional tectonic structure in the area. Disseminated sulphides, carbonate veins and hydrothermal breccias are hosted by calcareous silstones and sandstones, conglomerate (with a calcareous matrix) and limestone of the Pennsylvanian-Permian Antler Sequence, and by quartzite and argillite of the Ordovician Valmy Formation. Gangue minerals are mainly quartz, calcite and barite, with lesser ankerite. Pyrite is the main ore mineral. Mineralization is structurally controlled by basin and range-related, N-trending normal faults that have formed horst and graben structures, and by NW-trending faults with little or no visible displacement. The intersection of those two sets of faults localized the higher grade ore zones. Imbricated thrusts in the Valmy Formation are also ore-controlling structures. Mineralization is lithologically controlled by calcareous beds of clastic sediments or impure carbonates, which are highly porous and subject to decalcification alteration that creates more porosity. Hydrothermal alteration consists of early decalcification of the limy units, followed by silicification and jasperoid alteration. Distal argillic alteration (generally barren) affected the Valmy shales below and the Havallah siltstones above the mineralization. Pervasive supergene oxidation affected the mineralized zones and is represented by a jarosite-hematite-goethite that correlates well with gold values. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Tl-Ba. Sulphur isotopic data suggests that barite was derived from several magmatic or deep-seated crustal sources (Howe *et al.*, 1995).

3105 McCoy/Cove is an Eocene, intrusion-related Au-Ag skarn and sediment-hosted, micron gold deposit with a total gold content of 109 metric tons. It is located in the McCoy mining district near Battle Mountain, Great Basin and Range, North American Cordillera, Nevada, United States. Gold mineralization at McCoy consists of disseminated to semi-massive sulphides in exoskarns hosted by altered limestones, dolostones and calcareous siltstones, and of fracture-controlled sulphide-rich veins and veinlets hosted by quartzite and siliceous conglomerates of the Middle to Late Triassic Augusta Mountain Formation (Star Peak Group). Sulphide-rich veins and veinlets and Carlin-style disseminated sulphides at Cove are hosted by dolostones and limestones of the Augusta Mountain Formation. The Brown Stock is the most important phase of igneous activity in the area; it is represented by a 40 Ma, biotite-hornblende granodiorite to tonalite stock and associated dikes and sills. Emplacement of the stock was controlled by intersecting faults. Prograde exoskarns and endoskarns at McCoy are very similar in mineralogy (garnet-pyroxene-epidote-idocrase-K-feldspar assemblage), and are both fracture-controlled. Retrograde skarn alteration (chlorite-calcite-quartz assemblage, with less abundant hydrous minerals) is extensive and associated with the early-stage of gold mineralization. Ore minerals are pyrite, chalcopyrite, sphalerite, galena, marcasite, arsenopyrite, pyrrhotite, hedleyite, stannite, chalcocite, magnetite, malachite and chrysocolla. NE-striking, normal faults are the main structures controlling the mineralization and alteration. NW-striking normal faults exert a lesser control. Ore mineralogy in radial and cockscomb sulphide-rich veins and veinlets at Cove consists of dominantly pyrite, galena and sphalerite, with lesser electrum, canfieldite, acanthite, cassiterite, chalcopyrite, arsenopyrite, tetrahedrite, tennantite, pyrrhotite, stromeyerite, marcasite and many other sulphosalts. Gangue mineralogy is mainly quartz, and carbonate minerals (calcite, dolomite, rhodochrosite). Carlin-style ore consists of (arsenian) pyrite, stibnite, realgar and orpiment in a gangue of calcite and dolomite. Cove is centered on a broad NW-trending, gently-plunging anticline (Cove anticline); related bedding-parallel faults occurred by flexural slip during folding. N-trending (Lighthouse fault array) and NE-striking (Cay, Bay, Gold Dome, Mackinaw, Rainbow faults to name a few), steeply-dipping normal faults showing multiple episodes of reactivation are commonly mineralized and altered along their lengths. A horst developed between the Lighthouse fault array and the Bay fault served as a structural high to localize fluid flow. Semi-permeable intrusive dykes such as the ones along the NE-trending Bay fault localized fluid flow and deposition in their footwalls. Shale beds served as a barrier to ascending fluids. Reactive carbonate lithologies are important lithological controls, and have concentrated gold deposition. Intrusive rocks at Cove are affected by early biotitization, and propylitic alteration. Sediments are affected by strong decarbonatization, followed by decalcification-dolomitization forming dissolution breccias and greatly enhancing porosity. Subsequent ore-related, structurally-controlled jasperoid alteration (cryptocristalline quartz-adularia-pyrite) is most pervasive in the calcareous units. The latter alteration also formed subsequent to retrograde skarn alteration. Silicification (jasperoid) and sericitization (quartz-sericite-pyrite) have affected all rock types, and are associated with the Carlin-style and sulphide-rich veinlets at Cove. Late, barren carbonatization is noted as calcite veins. Extensive supergene argillitization (kaolinite-smectite) and oxidation (with copper oxides) are most intense adjacent to structures and lithological contacts. The metallic signature of the bulk of the ore is Au-Ag-As-Bi-Te-Hg-Sb-Tl-Se-Pb-Zn. It is thought that Cove may represent a distal expression of the McCoy skarn, superimposed over a (volumetrically more important) Carlin-style mineralization (Johnston, 2000).

3106 McLaughlin is a Pliocene-Pleistocene, low-sulphidation epithermal hot spring-type Au-Ag-Hg deposit with a total gold content of 105 metric tons. It is located in the Knoxville mining district of the northern Coast Ranges of the North American Cordillera, California, United States. The major regional structure in the area is the NW-striking, dextral strike-slip Barlett Springs Fault Zone, which shows a complex, polyphased deformation history. Disseminated sulphides, and often crustiform sheeted veins and vein swarms are hosted by Middle Jurassic tholeiitic basalts and serpentinite-matrix polymictic melange of the Coast Range ophiolite, by Pliocene basaltic andesites of the Clear Lake Volcanic Field, and by sediments of the Upper Jurassic Knoxville Formation. Gangue mineralogy consists of opal, quartz, chalcedony and adularia. Ore minerals are pyrite, cinnabar, pyrargyrite, miargyrite, realgar, arsenopyrite, sphalerite, chalcopyrite, stibnite, orpiment, galena and polybasite. Mineralization is distributed along the Stony Creek fault, a shallowly- to moderately-dipping fault that marks the upper contact of the ophiolite with the underlying Knoxville Formation sediments. The sheeted vein complex forms a pipe-like orebody that is localized by the competency contrast between the basalts and the polymictic melange, and extends upward into silica sinter. Hydrothermal breccias are localized near the sinter zone and carry high-grade disseminated mineralization. Alteration was pervasive in the sinter area, with intense silica-carbonate alteration. Potassic metasomatism consists of pervasive adularia disseminations in the groundmass and along the vein selvages. This grades into argillic alteration (montmorillonite-sericite) of both the sedimentary and volcanic hosts.

Supergene, steam-heated advanced argillic alteration (alunite-kaolinite) occurs adjacent to the sinter. The metallic signature of the bulk of the ore is Au-Ag-Hg-Cu-Zn-Pb-Sb-As-Tl-B-Ti-W.

3107 Meikle is a Middle to Late Eocene, intrusion-related, sediment-hosted micron gold (Carlin-type) deposit with a total gold content of 269 metric tons. It is located just 2 km north of the Goldstrike Betze-Post deposit in the Carlin Trend, within the Great Basin and Range of the North American Cordillera, Nevada, United States. The two major regional tectonic structures in the area are the Roberts Mountains Thrust and the Tuscarora Anticline. Breccia ore and disseminated sulphides are hosted almost entirely by the Devonian Popovich Formation in a complex series of collapse, tectonic and hydrothermal breccias and calcareous mudstones. Jurassic lamprophyre and granodiorite dykes, monzonite intrusions, and Eocene tonalite (biotite-feldspar porphyry) dykes also host some mineralization. The breccias are generally heterolithic, and contain clasts from intrusive rocks and all other formations, except for the Carlin Formation. Ore minerals are pyrite, marcasite, cinnabar, sphalerite and stibnite. NNW-striking, high-angle sinistral-normal faults of the Post Fault system provided the main conduits for intrusive rocks and hydrothermal fluids. Most orebodies occur in the footwall of the Post Fault. The NW-trending, assymetrical Post Anticline is also an important ore control. Decalcification of the limy units led to solution/collapse breccia formation. Another decalcification episode, with formation of collapse breccias, is related to Jurassic intrusive activity prior to gold deposition. Intense silicification and extensive pyritization occured in the breccia zones and along structures. Proximal kaoline-dominated argillic alteration near the ore zones grades outward into an illite-dominant assemblage. Tonalitic dykes dated at 39.2 Ma are also affected by gold-bearing argillic alteration (characterized by an assemblage of ìllite-smectite-kaolinite-carbonate-sulphides) dated at 44.7 Ma. The small difference between these two ages is attributed to recoil loss of Ar during irradiation, and is thought to indicate that mineralization and illite alteration closely followed dyke intrusion (Ressel *et al.*, 2000). The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Se-Mo-W-Tl.

3108 Mercur is a Late Jurassic to Early Cretaceous, sediment-hosted, micron gold (Carlin type) deposit with a total gold content of 81 metric tons. It is located in the Mercur mining district, 24 km south of the Bingham Copper porphyry Cu mine, in the Oquirrh Mountains within the Great Basin and Range, North American Cordillera, Utah, United States. The Mercur deposit occurs on the east limb of the Ophir anticline, a broad NW-trending, doubly-plunging anticline, which is a fault-propagated fold resulting from the action of the Charleston-Nesbo thrust fault during the Sevier orogeny. Disseminated sulphides are hosted by thick to thin-bedded Mississippian fossiliferous limestones, silty limestones and siltstones of the Mercur Member Beds, and by sandstones of the Magazine Sandstone Beds. Ore mineralogy consists of pyrite (limonite), realgar, marcasite, orpiment, stibnite, jarosite and Tl-bearing minerals in a quartz matrix. Local gold-bearing pyrite-orpiment-organics±marcasite veins with minor calcite, cinnabar, sericite and chalcedony cut the disseminated ore. Structural control is provided by two sets of ENE-trending (Carrie Steele Fault) and WNW-trending (Twist Fault Zone, Lulu Grabben), steeply-dipping, normal-oblique faults resulting from flexure within the Ophir anticline. The silty, bioclastic beds of the Mercur Member, capped by the impermeable Long Trail Shales, localized most of the mineralization. Early decalcification of the basal Mercur Member Beds limy units prepared the hosts by creating secondary permeability. Pervasive jasperoid alteration is stratabound within the decalcified beds and also occurs along faults. This grades into an argillic alteration halo of illite(-smectite)-kaolinite-quartz± chlorite±Fe oxides±pyrite, extending into the shales above. Partly hypogene oxidation is characterized by limonite, jarosite and hematite, but is difficult to differentiate from supergene oxidation. The metallic signature of the bulk of the ore is Au-Ag-As-Hg-Sb-Ba-Tl. Dating of argillic alteration by Wilson and Parry (1995) gave a Late Jurassic to Early Cretaceous age with no relationship to Tertiary intrusive rocks. However, Mako (1999) proposed that the Mercur gold deposit represent the late stage of distal hydrothermal activity related to a Tertiary-age magma chamber at depth.

3109 Mesquite is an Oligocene, low-sulphidation epithermal gold deposit with a total gold content of 47 metric tons. It is located in the Mesquite mining district of the Salton Trough, North American Cordillera, California, United States. The major regional tectonic structures in the area are high-angle, Oligocene dextral strike-lip district-scale faults, and the Chocolate Mountains Thrust Fault. Banded (and in places brecciated) quartz veins and carbonate veins are hosted by amphibolite-grade biotite gneiss and hornblende-biotite gneiss. Mafic gneiss, leucocratic granite, pegmatite, and aplite which have intruded the gneisses are less mineralized. Early banded quartz veins (and related quartz-cemented breccias) are composed of quartz-adularia-pyrite-electrum. These are cut by ankerite-dolomite-pyrite veins. Mineralogy of the shallow, oxidized ore consists of iron oxides, jarosite, biotite and chlorite. Mineralization is strongly controlled by three sets of reactivated dextral strike-slip-normal faults, and by fault offsets and jogs resulting from fault movement. Post-mineralization, high-angle, sinistral oblique-slip faults offset the orebodies. Weak sericitization occurs in the selvages of the quartz-adularia veins and along the faults. Minor, narrow zones of silicification occur around siliceous-matrix breccia veins. The metallic signature of the (non-oxidized) ore is Au-Ag-As-Mo-Pb-Sb-Cu-Te.

3116 Carlin is a Late Tertiary, sediment-hosted micron gold deposit (type deposit) with a total gold content of 229 metric tons. It is located in the Carlin Trend (Lynn-Pinon mineral belt) of the Great Basin and Range, part of the North American Cordillera geological province, Nevada, United States. The nearby Roberts Mountains Thrust fault and Tuscacora Anticline are major regional structures which played key roles in the localization of the Carlin deposit. Disseminated sulphide mineralization is mainly hosted by argillaceous and silty calcarenites, argillaceous and calcareous siltstones and limestones of the Siluro-Devonian Roberts Mountain Formation, which are exposed through a structural window in the Roberts Mountains Thrust. Ore mineralogy consists of pyrite, orpiment, realgar and stibnite, along with barite. Host lithologies exerted a strong influence on the distribution of the mineralization. Ore also occurs locally along the Roberts Mountain Thrust and other structures that crosscut Popovic limestones and the Ordovician Vinini Formation. The Castle Reef Fault, a NW-striking, dextral strike-slip fault is also the locus of mineralization in the East Pit. Numerous high-angle normal and dextral strike-slip faults bound the deposit. Hydrothermal alteration is intense, with decalcification occurring throughout the Roberts Mountains Formation and within the deposit. Jasperoid alteration and silicification occur along inflow zones such as permeable beds and structural conduits. The jasperoid grades away to argillic alteration (also present within intrusive dykes) and then to silicic alteration. The last alteration zone is a decarbonatization halo which consists of two parts, one of which is a proximal part where both calcite and dolomite have been dissolved (intense decarbonatization), and the other a distal part where only calcite was removed (distal alteration). Although gold is associated with all the alteration types, it occurs mainly in zones where both calcite and dolomite have been removed. The metallic signature of the bulk of the ore is Au-Ag-Ba-As-Sb-Hg.

3119 Ortiz (or Cunningham Hill Mine) is an Oligocene, intrusion-related breccia-pipe Au-Ag deposit with a total gold content of 9 metric tons and a resource of 54 metric tons. It is located in the Old Placers (also called Dolores) district of the Ortiz Mountains, North American Cordillera, New Mexico, United States. The Tijeras-Canoncito fault system is a regional, sinistral strike-slip fault system with recurrent movement dating back to the Precambrian. The Ortiz diatreme, a volcanic vent breccia, is localized along this fault system. Disseminated suphide mineralization is hosted by a breccia-pipe consisting mainly of quartzite-sandstone and argillite clasts from the Upper Cretaceous Mesa Verde Group sediments, and 10% of monzodiorite and quartz monzodiorite sill fragments. Mineralization also occurs along the pipe margins, in "crackle breccias" of fractured sills and sandstone beds. Disseminated sulphides in the breccia matrix and vugs; such as pyrite, pyrrhotite, sphalerite, scheelite, chalcopyrite, arsenopyrite and galena, have precipitated together with quartz, adularia, calcite, siderite and mariposite. Supergene oxidation has produced common hematite, limonite and jarosite in the shallower levels. Important controls to sill emplacement and mineralization distribution are the Ortis Shear zone, and the NE-trending Golden Fault Zone (and subsidiary faults). The main ore-controlling feature within the pipe is the competency contrast between the sandstone and shale beds relict stratigraphy. The sandstone breccia is more fractured and generated more porosity then shale breccia; the latter behaved in a ductile fashion and did not fracture, hence it acted as an impermeable barrier and is typically devoid of cavities and mineralization. Alteration varies according to depth within the breccia. Sedimentary clasts in deep breccia are decarbonized and converted to hornfels, igneous sill clasts are affected by silicification, sericitic and potassic alteration. Alteration in the shallow breccia is restricted by the presence of the underlying shale breccia, and is characterized by sericitic and propylitic alteration of sill clasts, with almost no alteration of the sedimentary clasts. The metallic signature of the bulk of the ore is Au-Ag-Zn-Cu-Pb-W.

3121 Paradise Peak is a Miocene, high-sulphidation epithermal Au-Ag-Hg deposit with a total gold content of 82 metric tons. It is located within the Paradise Peak district at the southwestern end of the Paradise Range, Great Basin and Range, North American Cordillera, Nevada, United States. The Walker Lane Structural Zone, a NW-trending, dextral strike-slip wrench fault zone, and the Sheep Canyon Fault, a low-angle normal fault, are the two dominant tectonic structures in the area. Mineralization is hosted mainly by altered felsic welded ash-flow tuffs at the base of the Oligocene-Miocene Younger Andesite Unit. Andesite flows enclosing the tuffs are altered, but generally unmineralized. Hydrothermal breccias are an important, high-grade, mineralization style; they occur as heterolithic black matrix breccias within tuffs. A lower andesite sequence hosts low-grade, porphyry-style quartz-pyrite-tourmaline-chalcopyrite-molybdenite stockwork mineralization. Ore is structurally controlled by three sets of faults: 1) pre- to syn-mineralization NW- to WNW-striking, steeply-dipping normal faults that delimit the orebodies and associated alteration; 2) ENE- and NNE-trending, steep, normal faults that also localized fluid circulation; and 3) late, low-angle, normal faults (detachment faults) that lie under and above the deposits, and that have detached some of the deposits from their feeder zones and emplaced unaltered rocks over them. Hydrothermal alteration is pervasive and intense in the ore zones and along structures. Hydrothermal breccias and tuffs have been affected by silicification. Silicified tuffs are bordered above and below by (hypogene) quartz-alunite altered andesite flows. This alteration grades outward to an argillic alteration zone represented by kaolinite and smectite-illite-chlorite assemblages. Overprinting Hg-bearing zones of supergene/steam-heated silicic acid-leach alteration (with cristobalite) are also present; they are locally associated with supergene alunite and/or kaolinite. Hydrothermal alteration gradually grades away to regional propylitic alteration. Sericitic and pyritic alteration is associated with the stockwork mineralization. The metallic signature of the bulk of the epithermal ore is Au-Ag-Bi-Hg-Pb-Sb-As-Mo-Cu.

3126 Pinson and Preble are probable Eocene, sediment-hosted micron gold Au-Ag deposits (Carlin type) with a total gold content of 32 metric tons. They are located in the Potosi mining district along the Getchell Trend, Great Basin and Range, American Cordillera, north-central Nevada, United States. NE-trending, moderately-dipping normal faults of the Getchell Fault system are the dominant tectonic structures in the area. The Anderson Canyon Fault is another important regional NS-oriented thrust fault. Although distant of 15 km, their production has at times been reported as a single figure, however the bulk of the production came from the Pinson.deposit. Disseminated sulphides at Pinson are hosted by limestone, siltstone, and calcareous shale of the Middle to Late Ordovician Comus Formation. Disseminated sulphides at Preble are hosted by silty limestone, carbonaceous and calcareous shale of the Middle Cambrian to Early Ordovician Preble Formation. Both deposits have been affected by contact metamorphism from the 90 Ma granodiorite stock. Ore mineralogy is dominated by pyrite and (supergene) iron oxides, with minor to rare marcasite, chalcopyrite, arsenopyrite, sphalerite, realgar, stibnite, cinnabar, geocronite, famatinite, bournonite, covellite and native copper. Gangue mineralogy consists of kaolinite, sericite, calcite, quartz and barite. Mineralization is structurally controlled by two sets of Basin and Range extension (normal) faults and their intersections, they are: NE-trending, moderately-dipping en echelon faults (with late Quaternary movement), and NW- to NNW-trending, moderately-dipping faults. The NE-trending faults follow the Comus-Preble formations contact, which localized deformation and fluid flow, for up to 20 km, before cutting across the Comus Formation. The Pinson deposit is located on the western flank of a NE-trending, gently NE-plunging isoclinal anticlinal-synclinal pair. Hydrothermal alteration consists of initial pre-ore decalcification of the limestone and calcareous units, followed by syn-ore jasperoid alteration and silicification, with sericitic and argillic (kaolinite-montmorillonite) alteration of intermediate dykes (which are weakly mineralized) and host shales. Calc-silicate alteration (wollastonite-tremolite-diopside) occurs in the calcareous units closer to the granodiorite stock, as well as biorite-cordierite hornfels. Supergene oxidation has affected the rocks down to depths of 60 metres. The metallic signature of the bulk of the ore is Au-Sb-As-Hg-Ba-Tl.

3131 Quartz Mountain is a Miocene, low-sulphidation epithermal hot-spring gold deposit with a total gold resource of 85 metric tons. It is located in the Quartz Montain district of the Columbia Plateau, Great Basin and Range, North American Cordillera, Oregon, United States. The major regional structure in the area is the McLoughlin lineament, a 200 km-long, NW-trending fault zone of dextral offset and along which intrusive rocks are aligned. Gold ore occurs in hot-spring centers and vent-breccias, stockworks and hydrothermal breccias hosted by primarily Late Miocene porphyritic rhyolite domes and adjacent tuffs (vitrophyres), and in banded quartz-adularia veins hosted by basalt flows. Gangue mineralogy is mainly quartz and/or chalcedony, with lesser adularia. Barite is common in the uppermost parts of the deposit. Ore minerals (in decreasing order of abundance) are: pyrite, marcasite, arsenopyrite, pyrrhotite, chalcopyrite, cinnabar, stibnite, sphalerite, galena, tetrahedrite, acanthite, pyrargyrite and bismuth tellurides. Breccias occur at the contact between the rhyolite dome and its wall rocks. Quartz-adularia veins in basaltic rocks are generally subhorizontal, and adjacent or parallel to the tuff-lava contacts.

Discontinuous veins and stockworks are localized in steep, narrower fractures and also flat-lying fractures within the rhyolite. Disseminated mineralization forms stratabound zones in altered tuff and basaltic agglomerates, and exploited pre-existing pore space vesicles in lava, interstices in volcaniclastic rocks and secondary pore space created by breakdown of igneous minerals and glass. Hydrothermal alteration is vertically and laterally zoned in the domes. A shallow acid-leach silicic alteration occur at the core of the system, and is characterized by an assemblage of opal-chalcedony-quartz-kaolinite±cinnabar±alunite. This extends downward into a silicified and K-metasomatism zone (quartz-Kspar±illite), and interfingers at depth with an argillic (illite-quartz) alteration zone. Sericitic alteration occurs in deeper parts of the deposit. Laterally from the silicic core, alteration grades outward to a quartz-K-feldspar-montmorillonite-illite±smectite±chlorite assemblage. Propylitic alteration is present at the fringe of the deposit. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Ba-Bi. Hot-spring-type mineralization is represented by shallow hotspring centers and vent breccias, whereas low-sulphidation mineralization is illustrated by the quartz-adularia veins.

3132 Twin Creeks is a Middle Eocene, sediment-hosted, micron gold (Carlin-type) deposit with a total gold content of 402 metric tons. It is located in the Potosi mining district (Getchell Trend) of the Great Basin and Range, North American Cordillera, Nevada, United States. The Chimney Creek and Rabbit Creek mines were combined in 1990 to create the Twin Creek deposit. The major regional structures in the area are the Roberts Mountains Thrust Fault, the Golconda Thrust Fault and the Conolea Anticline, a NW-plunging, open to isoclinal assymetric fold. Disseminated sulphides at Rabbit Creek are hosted by calcareous shales and siltstones, pillowed basaltic flows, and basaltic hydroclastic tuffs of the Ordovician Comus Formation. Mineralization at Chimney Creek is hosted by the Pennsylvanian-Permian Etchart Limestone calcareous/dolomitic sandstones and siltstones, and the basalts of the Mississippian Goughs Canyon Formation. Ore minerals, where unoxidized, are orpiment, pyrite, arsenopyrite, realgar, cinnabar, stibnite and minor getchellite. Quartz, adularia and sericite are the main gangue minerals. The hinge zones of small scale anticlines and high-angle, dextral-normal, NE-SW-striking faults are important ore-controlling structures which have acted as fluid conduits. Reactive, limy units are an important stratigraphic ore-controlling feature. Basaltic rocks have been affected by either propylitic alteration or greenschist grade metamorphism. They are overprinted by phyllic alteration (sericitization) along faults and fractures (feeder pipes) and bear ore-grade mineralization near their contact with the limy units. Carbonate dissolution (decarbonatization) and jasperoid alteration are intense and pervasive, and occurred immediately above (and laterally from) the feeder structures. This grades distally to a decalcification zone (calcite removal). Later overprinting silicification occured along faults. Late, supergene oxidation is widespread throughout the deposit. The metal signature of the bulk of the ore is Au-Ag-As-Sb-Hg. Groff *et al.* (1997) proposed that Carlin-type orebodies at Getchell and Twin Creeks formed as a result of overprinting 83 Ma quartz-pyrite-kaolinite-gold mineralization by 42 Ma orpiment-stibnite-pyrite-gold mineralization.

3134 The Randsburg Au-Ag-W district contains Miocene(?) low-sulphidation epithermal deposits with a total gold content of 45 metric tons. It is located within the Mohave desert just south of the Great Basin and Range, North American Cordillera, California, United States. The EW-oriented Garlock fault is a major structure in the area, and bounds the southern limit of the Great Basin and Range province. Mineralization is hosted by sediment-derived schists and Late Jurassic(?) quartz monzonite that intruded the schists. Miocene diabase and granitic dykes host traces of mineralization and may be genetically related to it. Historic orebodies were high-grade veins along faults and disseminated sulphides within fault gouge material. The orebody currently mined consists of low-grade stockworks and associated disseminated sulphides hosted by the quartz monzonite. Gangue mineralogy of the veins and stockworks is composed of quartz, chalcedony, opal and calcite. Arsenopyrite is the main ore mineral, with lesser pyrite, scheelite, miargyrite, pyrargyrite, polybasite, and proustite, and rare galena, chalcopyrite, sphalerite and mariposite. The main vein-controlling structures are NS- and NE-trending faults related to Miocene deformation. Stockwork-style mineralization is located at fault intersections and zones of intense fracturing. Faults also contain most of the gouge-type orebodies; these occur below "pre-mineral" shallow-dipping faults which cap the veins. NW-trending faults (Hanging Wall and Footwall faults) and the NE-trending Jupiter fault bound a triangular block of quartz monzonite which hosts the present-day orebody. There are no data available on hydrothermal alteration, although some bleaching of the quartz monzonite is evident. However, supergene oxidation is pervasive down to the third level of the workings (about 100 metres). The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-W.

3135 Denton-Rawhide is a Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 42 metric tons. It is located in the Regent mining district of the Great Basin and Range, North American Cordillera, Nevada, United States. The main regional tectonic structure in the area is the Walker Lane Structural Zone, a NW-trending, dextral strike-slip fault. A large caldera system occurs along the NE margin of the Walker Lane Structural Zone. Mineralization is hosted by Miocene rhyolites, granite dykes, andesites, tuffs and other volcaniclastic rocks. Disseminated sulphides are hosted by porous, poorly-welded lithic tuffs and volcaniclastic sediments, whereas sheeted veins and stockwork zones are fracture-controlled, and hosted by the more brittle rocks such as the rhyolite and andesite flow units. Gangue mineralogy of the mineralized veins is mainly composed of quartz and adularia, with lesser chalcedony. Ore mineralogy consists of pyrite, argentite, acanthite, cerargyrite, embolite, and aguilarite with less abundant chalcopyrite, galena, sphalerite, pyrrhotite, marcasite, molybdenite, pyrargyrite, pearceite, tetrahedrite, argentojarosite and jalpaite. Veins occur mainly in NS- and NE-trending, moderate to high-angle, respectively dextral strike-slip and dextral-normal faults. A NW trend is inferred from the distribution and alignment of the ore zones and is attributed to NW-trending, dextral Riedel-type splay faults of the Walker Lane Structural Zone. Intersections of those fault structures coincide with bulk-mineable orebodies. Hydrothermal alteration consists of proximal silicification and associated potassic alteration (quartz-adularia-pyrite and lesser apatite), which are closely associated with mineralization and are very intense in some areas. Some illite is present in rocks affected by silicification, but disappears with increased intensity of the alteration. Barren, intermediate argillic alteration forms a broad halo of illite-kaolinite-chlorite-calcite (with lesser mixed-layer illite-smectite and montmorillonite) around the silicification and potassic alteration zones, and grades away to a distal, weak smectite-kaolinite-montmorillonite assemblage. Limited advanced argillic alteration is associated with late veins of kaolinite-alunite-chalcedony and is represented by a kaolinite-alunite-quartz-chalcedony assemblage along the veins selvages and within strongly argillized areas. Advanced argillic alteration may be related to supergene processes. The metallic signature of the bulk of the ore is Au-Ag-As-Hg-Cu-Pb-W-Ba-Sb-Zn-Mo.

3139 Ridgeway is a Late Proterozoic, probable intrusion-related, non-carbonate-hosted stockwork-disseminated Au-Ag deposit with a total gold content of 53 metric tons. It is located in the Ridgeway mining district, within the Carolina Slate Belt of the southern Appalachian Piedmont, South Carolina, United States. Major structures in the area include the NE-trending Modoc Fault Zone, a thrust fault that marks the boundary between the Carolina Slate Belt and Kiokee Belt, the Cedar Creek Shear Zone, a NE-trending zone of intense cleavage development, and an EW-trending transition zone between an older volcanic terrane to the north and a younger sedimentary terrane to the south. Quartz veins and veinlets, quartz stockworks and some replacement and hydrothermal breccias are hosted by deformed and altered, lower greenschist grade, Late Proterozoic to Cambrian sediments (laminated siltstones and greywackes) and transitional volcanics (felsic ash-flow tuffs, lapilli tuffs and mafic lapilli tuffs) of the Bear Creek turbidites. Gangue minerals are quartz, adularia, albite and magnetite. Ore mineralogy is dominated by pyrite, with trace amounts of molybdenite, chalcopyrite, arsenopyrite and pyrrhotite. Ore has been remobilized into cleavage-dominant zones related to F_2 upright and isoclinal folds (such as the Lake Murray and Irmo antiforms) and related S_2 penetrative slaty cleavage. Other ore-controlling structures (and fluid conduits) are early, moderately-dipping reverse shear zones (later reactivated as normal brittle faults) and NE-trending, normal and sinistral-normal shear zones. NS-trending, steeply-dipping reverse faults, and minor sinistral strike-slip faults, are also locally important, but post-date the mineralization event. Hydrothermal alteration is intense and pervasive in the host unit. Silicification and sericitization (quartz-sericite-pyrite) are closely associated with the ore zones. The presence of minor adularia within the silicified zones represents minor, contemporaneous K-metasomatism. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Mo-As-Cu. The genesis and exact classification of the Ridgeway deposit is much debated, although it is clear that the presence of mineralization predates the S_2 cleavage, and that some part of the quartz-pyrite-gold ore is a chemical precipitate. Foley *et al.* (2001) presented strong evidence for a model whereby the gold-bearing sulphide ores formed during felsic volcanism prior to tectonism, and were subsequently remobilized and concentrated into structurally favorable sites during metamorphism. Foley *et al.* (2001) proposed that Ridgeway (like Haile and Barite Hill) is a shallow-water, submerged equivalent of the high-sulphidation epithermal Brewer deposit a few kilometres away.

3144 Round Mountain (Smoky Valley) is a low-sulphidation epithermal Au-Ag deposit with a total gold content of 372 metric tons. It is located at the western edge of the Toquima Range in the Great Basin and Range, North American Cordillera, Nevada, United States. The Toquima Caldera Complex is the dominant tectonic feature in the area. Sheeted quartz-feldspar veins and associated disseminated sulphides are hosted by the Late Oligocene (25.6 Ma), unwelded to densely welded, Round Mountain felsic ash flow tuff. Mineralization occurs as sheeted vein sets and local disseminated sulphides within the welded tuff, whereas poorly welded (incompetent) tuff hosts stratabound disseminated sulphides. Sheeted veins are commonly brecciated, and late veins carry cockscomb textures. Gangue mineralogy is dominated by quartz and adularia, with lesser albite and calcite, and minor rutile. Ore minerals are pyrite, tellurides, sphalerite, galena, chalcopyrite, pyrrhotite, tetrahedrite, pyrargyrite, arsenopyrite, marcasite and realgar. NW-striking, moderately- to steeply-dipping oblique faults control the distribution of mineralized veins and related alteration. Hydrothermal alteration of the felsic tuff is zoned. Proximal potassic alteration (quartz-Kspar-sericite-pyrite-calcite-rutile) is strongest in poorly welded tuff and coincides with economic gold grades. This grades outward to an early, pre-ore outer propylitic (quartz-Kspar-albite-chlorite-pyrite-calcite-rutile±epidote) alteration halo along the NW-trending faults and joint set. Alteration around late, high-grade cockscomb quartz veins and sinter zones consists of a proximal silicification assemblage of quartz-chalcedony-adularia, grading outward to a pervasive intermediate argillic alteration (illite-smectite with local alunite-kaolinite). The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Te-Tl-Hg-Mo-Mn-W.

3156 Sleeper is a Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 52 metric tons. It is located in the Awakening mining district of the Great Basin and Range province, North American Cordillera, Nevada, United States. NNE-striking ‘range front’ normal faults are the dominant tectonic structures in the area. Quartz veins, hydrothermal breccias and quartz stockworks are hosted by altered and porphyritic Miocene rhyolite, lapilli tuff, andesite and minor sedimentary rocks. Gangue mineralogy consists mainly of quartz and adularia, with minor carbonate and barite. Ore minerals are pyrite, marcasite and stibnite. Supergene processes have redistributed gold and silver, the former in fractures and the latter in halide minerals and cerargyrite. Three sets of faults are important structural controls: 1) NNE-trending, moderately-dipping, normal dip-slip faults, 2) NW-trending, steeply-dipping normal faults, and 3) NS-trending normal faults and fractures within the breccia. Normal faults first acted as conduits for silicification of the volcanic rocks, and then were reactivated to form veins and conduits for breccia-stockwork mineralization. Zones of pervasive silicification are centered on the breccia orebody. The intensity of the silicification decreases outward, grading into silicified fault zones and stratiform horizons. Silicification zones are surrounded by widespread, argillic alteration represented by kaolinite-illite-montmorillonite-smectite-pyrite and typically devoid of ore. Silicic alteration with vuggy silica occurs locally along faults adjacent to silicifed zones. Supergene advanced argillic alteration (kaolinite-natroalunite-hematite-natrojarosite-chalcedony) forms a blanket over the deposit. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Cr-Hg.

3187 Zortman-Landusky is a Paleocene, low sulphidation epithermal Au-Ag deposit with a total gold content of 88 metric tons. It is located in the Little Rocky Mountains within the Central Montana Alkalic province, North American Cordillera, Montana, United States. Mineralization is hosted by Late Cretaceous to Paleocene, porphyritic quartz syenite, quartz monzonite and granodiorite. Precambrian gneisses are a lesser ore host. Oxidized, low-grade stockworks and hydrothermal (phreatic) breccias, along with disseminated sulphides near the surface, change at depth to narrow veins and restricted high-grade stockworks. Gangue minerals are quartz, adularia, kaolinite, calcite and fluorite. Iron and manganese oxides are the main ore minerals in the oxide zone, whereas ore minerals at depth consists of sulphides and tellurides such as pyrite, marcasite, sylvanite, calaverite, hessite, arsenopyrite, chalcopyrite, molybdenite, sphalerite, galena, covellite, freibergite and native bismuth. Mineralization is structurally controlled by steeply-dipping, NNW- and NE-trending faults and shear zones. Multiple sets of pre- and post-mineralization fractures are also present. Hydrothermal alteration consists of potassic alteration (characterized by orthoclase and sericite) and pyritization along mineralized structures. Late silicification of most of the host rocks and along fault zones is associated with a gold-bearing hydrothermal event. Weak but widespread intermediate argillic alteration (with illite) occured in, and adjacent to, the orebodies. Minor chlorite alteration is present. The lack of zonation within the alteration is inferred to be related to rapid cooling and large influx of meteoric waters (Wilson and Kyser, 1988). The metallic signature of the bulk of the ore is Au-Ag-As-Hg-Sb-Te-F-Pb-Zn-Mo-Rb.

3194 Crown Jewel (also known as Buckhorn Mountain) is a Late Cretaceous, intrusion-related gold skarn deposit with a total gold content of 31 metric tons. It is located in the Myers Creek district of the Northern Rocky Mountains, North American Cordillera, Washington State, United States. The gold skarn system is related to the Cretaceous Buckhorn Mountain diorite to granodiorite pluton, and associated dikes and sills. Semi-massive sulphides and sulphide-rich veins and veinlets are hosted by marble, calcareous shale and calcareous siltstone of the Pennsylvanian to Triassic Anarchist Group, by a granodiorite intrusion, and by calcareous phyllites and andesite flows of the Kobau Formation. Ore minerals are magnetite, pyrrhotite, pyrite, marcasite, chalcopyrite, bismuthinite, cobaltite, native bismuth, and arsenopyrite. Distal ore zones are associated with plagioclase porphyry dikes and sills which acted as fluid pathways. Early biotite-pyroxene hornfels in the sediments gave way to a prograde exoskarn assemblage of pyroxene-garnet-magnetite, where mineralogy is controlled by the protolith. Endoskarn is rarer, occurring within granodiorite dikes and represented by an assemblage of garnet-epidote-quartz-K-feldspar-calcite-zoisite-pyroxene. Superimposed retrograde alteration in the sedimentary rocks and andesites is characterized by an epidote-calcite-quartz-amphibole-zoisite assemblage. Potassic alteration affected the igneous rocks, accompanied by argillic alteration and small-scale albitization along their borders. Late-stage and relatively minor propylitic and sericitic alteration affecting the intrusions and the andesites occur at some places. The metallic signature of the bulk of the ore is Au-Ag-Cu-Bi-Co.

3203 The Grass Valley district comprises many quartz-carbonate shear-zone-related gold deposits (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 632 metric tons. It is located in the Grass Valley area, Great Basin and Range, North American Cordillera, Nevada, United States. The Sierra Nevada Batholith is a dominant geological feature of the area. The mineralization consists of two major groups of quartz veins, one hosted by granodiorite and diabase, the other by serpentinite and amphibolite. The mineralized quartz veins are narrow, with highly variable Au grades. Gangue mineralogy consists of quartz and carbonate with accessory sericite, chlorite and leucoxene. Ore minerals are pyrite, galena, chalcopyrite, scheelite, arsenopyrite, sphalerite, pyrrhotite and cinnabar. Structural control is provided by two sets of EW- and NS-trending, minor, low-angle, brittle thrust faults. Most alteration assemblages are restricted to the veins selvages. Carbonate-sericite alteration is the most common, along with pyritization. Chloritization is also reported. Minor silicification of limited extent occurs in places. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Pb-W-As-Cu-Zn.

3206 The Mother Lode System is a 193 km long, 1-1.5 km-wide belt of tectonically and structurally controlled quartz-carbonate shear-zone-related gold deposits (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998), with a total gold content of 208 metric tons. It is located on the western foothills of the Sierra Nevada, North American Cordillera, California, United States. The three regional tectonic structures along which the Mother Lode deposits occur are: 1) the Melones Fault Zone, a ductile thrust with late lateral movement; 2) the Bear Mountains Fault Zone, and 3) the Sonora fault. The southern deposits are hosted mainly by altered serpentinite melange, whereas the northern ones are hosted by black shale-dominated turbiditic rocks, pillowed basalts and andesites, and by mafic and intermediate volcaniclastics. Mineralization consists of quartz-carbonate veins, and associated disseminated sulphides within altered wallrocks. Gangue mineralogy of the veins consists of quartz, dolomite, sericite and chlorite. Ore minerals are pyrite, arsenopyrite, galena, chalcopyrite, sphalerite, tetrahedrite, and several tellurides (with which gold is mostly associated, particularly hessite and petzite). Minor, brittle, high-angle faults (parallel to the regional trend) with reverse and strike-slip movements control the distribution of the orebodies. Post-ore, high- and low-angle brittle thrust faults offset and displaced the mineralization. Serpentinization of the rocks occurred prior to, and is unrelated to, gold deposition. Carbonatization (ankeritization) and sericitization of the veins wallrocks are the two main alteration processes, and are characterized by an ankerite-sericite-talc-chlorite-pyrite-arsenopyrite+/-quartz assemblage.

3211 True North is a Late Cretaceous, probable intrusion-related non-carbonate-hosted stockwork and disseminated style of gold deposit, with a total gold content of 55 metric tons. It is located in the Fairbanks district of the Chatanika Terrane within the Yukon-Tanana Terrane, North American Cordillera, Alaska, United States. The NE-trending, high-angle dextral strike-slip Tintina and Denali fault systems are the major regional structures and respectively bound the Yukon-Tanana Terrane on its northern and southern borders. Quartz stockworks and replacement disseminated sulphide mineralization are hosted by Early to Middle Proterozoic, eclogite facies graphitic quartz-mica schists and phyllitic slates. Late Cretaceous felsic intrusions also host some mineralization. Quartz is the dominant gangue mineral, with lesser calcite and ankerite. Ore mineralogy is composed essentially of stibnite and arsenopyrite. A portion of the ore is oxidized. Mineralization is structurally controlled by NE-trending, flat-lying thrust faults related to the larger NE-trending, low-angle brittle thrust fault located between the eclogite facies Chatanika Terrane and the underlying amphibolite facies Clear Sequence-Fairbanks Schist. The lithological contact between the schists and the eclogites also localized mineralization due to the competency (and oxidation state?) contrast. Graphitic schists and slates are preferentially replaced. Hydrothermal alteration consists of carbonatization around the mineralized areas and along fault zones, sericitic alteration characterized by mariposite-fuchsite-sericite, and silicification. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Bi. The True North deposit is still at the developing stage, hence geological information available is fragmental. It is unclear whether the calcareous eclogites are the product of metamorphic replacement or ore-related hydrothermal alteration. McCoy *et al.* (1997) and Thompson and Newberry (2000) suggested that the True North deposit is a high-level, Late Cretaceous intrusion-related deposit.

3213 Fort Knox is a Late Cretaceous, intrusion-related porphyry gold (sheeted veinlets) deposit with a total gold content of 90 metric tons. It is located in the Fairbanks mining district of the Yukon-Tanana Terrane, North American Cordillera, Alaska, United States. The NE-trending, high-angle dextral strike-slip Tintina and Denali fault systems are the major regional structures of the area, bounding the Yukon-Tanana Terrane on its northern and southern borders respectively. Mineralization at Fort Knox is hosted entirely by the Fort Knox Pluton, a multiphase, fine- to coarse-grained porphyritic subalkaline granite intrusion. Orebodies consists of early pegmatite veins of K-feldspar-albite-biotite-hornblende, sheeted quartz±K-feldspar veinlets and late shear veins of quartz-K-feldspar-sericite-tourmaline-ankerite. Ore mineralogy (with sulphides averaging less than 0,5 vol%) consists of mainly pyrite, marcasite, pyrrhotite, arsenopyrite, bismuthinite and molybdenite. Gold is intimately associated to Bi minerals, such as bismuthinite, tetradymite and tellurobismuthite. Scheelite, wolframite, cassiterite, bismite, eulytite, maldonite, native Bi and stibnite are also present. Low-temperature fracture coatings and chalcedonic veins and breccias are also mineralized. The dominant structural controls are SW-NW-trending, moderately- to shallowly-dipping shear zones and their subsidiaries. Shear-related dilational zones are favorable sites for gold deposition. Lithological (intrusive) contacts between the different intrusive phases also localized shear distribution. Pegmatite veins have a very thin (1 cm thick) potassic alteration halo of secondary biotite and K-feldspar, which grades into a phyllic envelope of sericite±pyrite. Quartz veins developed thin albitic alteration haloes and phyllic envelopes. Argillic alteration is associated with the chalcedonic veins and breccias. The metallic signature of the bulk of the ore is Au-Bi-Te-W-Mo. Fort Knox is thought to be part of an under-recognized, sub-type of intrusion-related gold deposits associated with tungsten-tin provinces (Thompson *et al.*, 1999).

3214 Kensington is an Early Eocene, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 33 metric tons. It is located in the Berners Bay district at the north end of the Juneau gold belt within the Wrangellia terrane, North American Cordillera, Alaska, United States. The Sundum Thrust Fault marks the boundary between the Taku and Yukon-Tanana terranes, whereas the Fanshaw Thrust Fault marks the boundary between the Taku Terrane and Gavina belt. Those are the two major tectonic structures in the area. Shear and tension (locally sheeted) quartz-carbonate veins are hosted by Early Cretaceous quartz monzodiorite of the Jualin Diorite and intruded metabasalts of the Wrangellia terrane, and to a lesser extent by some metasediments of the Gavina belt. Gangue minerals are mainly quartz, ferroan dolomite, albite, chlorite and muscovite, and lesser tourmaline, rutile and apatite. Pyrite is the most abundant sulphide (1-2% of total vein material), together with minor amounts of chalcopyrite, and trace amounts of galena, sphalerite, arsenopyrite, tetrahedrite, calaverite, hessite and petzite. Structural control on the mineralization is exerted by steep, ductile-brittle reverse and sinistral-oblique reverse chloritic shear zones. The Jualin Diorite acted as a competent body within less competent rocks, and localized most of the veins. Prior to the mineralizing event, the quartz monzodiorite was subjected to propylitic alteration, characterized by a calcite-epidote-sphene assemblage. Sericitization and albitization of the calcic plagioclase within the Jualin Diorite is also a pre-mineralization alteration event. The shear zones are chloritized and sericitized along their lengths, whereas carbonatization by ferroan dolomite extends up to 3 metres laterally from the veins. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-W-B.

3217 The Alleghany Au-Ag district encompasses more than 40 golds deposits which were mined mainly between the years 1860 and 1965, and which have a total gold content of 89 metric tons. The gold deposits are Cretaceous quartz-carbonate shear-zone-related deposits (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) located in the Sierra Nevada Foothills, North American Cordillera, California, United States. The main regional tectonic structure in the area is the Melones Fault zone, a NNW-oriented ductile thrust with later lateral movement that is part of the Foothills Fault System. Mineralized quartz veins are hosted by a variety of Early Paleozoic to Cretaceous rocks, but mainly by serpentinite bodies, amphibolites, granite and amphibolite-grade sediments. Disseminated sulphides occur mainly within associated granites and metasediments. Gangue minerals in the veins are quartz, albite, ankerite, calcite, dolomite, muscovite, chlorite, rutile, graphite, mariposite and montmorillonite. Ore minerals are mainly pyrite and arsenopyrite, with lesser galena, gersdorffite, sphalerite, tetrahedrite, chalcopyrite, boulangerite, and tellurides such as hessite, altaite and petzite. Veins are localized by minor, NNW-trending, moderately- to steeply-dipping reverse fault zones parallel to the Melones Fault zone (such as the Oriental, Alta and Carrolson faults). The quartz veins commonly contain the largest concentrations of gold at or near their intersections with altered ultramafic rocks. The veins are brecciated locally by minor cross faults. Alteration mineralogy is strongly dependant on the nature of the host rocks, and symmetric wallrock alteration halos parallel the veins in all hosts. Carbonate alteration increases in intensity toward the veins, gradually giving way to albitization or sericitization adjacent to the veins. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Pb-Ni-Co-Zn-Sb-Te.

4066 Ken Snyder is a high-grade Miocene, low-sulphidation epithermal Au-Ag deposit with a total gold content of 87 metric tons. It is located in the Midas district (old Gold Circle mining district) of the Northern Nevada Rift, Great Basin and Range, North American Cordillera, Nevada, United States. Doming of the area suggests caldera-related resurgence, but no caldera has been found yet. Volcanic rocks of the district are folded into a broad NNW-trending, gently SE-plunging anticline. Typically banded quartz-feldspar veins and veinlets are hosted mainly by Miocene rhyolite flows and felsic pyroclastics (lapilli tuffs, ash-flow tuffs, lithic vitric tuffs) rocks. Gangue mineralogy consists of quartz (opal-chalcedony), calcite and adularia, with minor sericite. Ore minerals are pyrite, tetrahedrite, proustite, chalcopyrite, sphalerite, naumannite, aguilarite, fischesserite, stromeyerite, and other rare Cu or Cu-Fe selenides. Quartz-adularia veins are structurally controlled by NS- to NNW-trending, steeply-dipping to subvertical normal-dextral faults (such as the Colorado Grande vein in the fault of the same name), and by NW-striking, high-angle, normal-dextral faults (splaying from the NS-trending, such as the Gold Crown vein). Quartz-adularia veins are also localized at the fractured contact between rhyolite and andesite flows. Higher-grade ore is located below a lacustrine sediment horizon (or below gabbro sills), which may have acted as an aquitard and played a role in the ponding of the ore fluid. Pre- and post-mineral E-trending, high-angle normal faults reactivated during the formation of the Midas Trough (at about 6 Ma) are ubiquitous in the area. Wallrock alteration is predominantly propylitic (chlorite-calcite-epidote-pyrite-kaolinite). Secondary biotite in gabbroic sills may be related to a less well-known potassic alteration event (Goldstrand and Schmidt, 2000). Silicification of the host rocks is locally intense and pervasive near the orebodies. Strong argillic alteration affected the lapilli tuffs in the upper part of the hanging wall of the Colorado Grande and Gold Crown veins. Supergene oxidation (goethite-hematite) extends to depths of 30 metres below surface. The metallic signature of the bulk of the ore is Au-Ag-Se-Cu-Te-F.

4070 Tonkin Springs is an Oligocene, intrusion-related, sediment-hosted micron gold (Carlin-type) Au-Ag deposit with a total gold content of 21 metric tons. It is located in the Antelope district of the Battle Mountain Trend, Great Basin and Range, North American Cordillera, Nevada, United States. The two dominant regional structures in the area are the Roberts Moutain Thrust and the Tuscarora Anticline. Disseminated sulphides and minor quartz-carbonate veins are hosted by altered limestones, silty limestones and siltstones of the Ordovician Vinini Formation and Devonian Devils Gate Limestones. Gangue minerals are quartz, calcite and barite. Ore minerals are mainly pyrite and arsenopyrite, with lesser realgar, orpiment, cinnabar, sphalerite and stibnite. Strong structural control on the mineralization is exerted by a low-angle, intrusive-filled thrust fault at the contact between Devils Gate Limestone and underlying Vinini sediments. The granodiorite sill emplaced along the thrust fault is mineralized, and inferred to have acted as an impermeable cap rock to the hydrothermal system, causing adjacent sediments to be mineralized. Other structural controls are two sets of mineralized normal faults; a NNW-striking set of normal faults co-linear with the axis of the Cortez trend, and a ENE-striking set of steep to vertical normal faults which controlled the mineralization in the pits. Intersections of those two sets define NS-oriented anomalies and traces of mineralization. Anticlinal fold closures resulted in ponding of mineralization. The limy hosts were affected by early decalcification responsible for the “sandy limestone” texture. Widespread jasperoid alteration is closely associated with the mineralization. Argillic alteration then affected the silicified sediments and the igneous rocks, and is usually unmineralized. Late carbonatization completed the alteration sequence. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Zn-Ba.

4073 Bootstrap/Capstone is a Late Eocene sediment-hosted, micron gold (Carlin-type) Au-Ag deposit with a total gold content of 70 metric tons. It is located in the Bootstrap mining district in the north part of the Carlin Trend, Great Basin and Range, North American Cordillera, Nevada, United States. The Roberts Mountains Thrust and the Tuscarora anticline are the main regional structures in the area. Disseminated sulphides are hosted by altered Devonian mudstones and calcareous siltstones of the Bootstrap Limestones, whereas a quartz stockwork is hosted by Tertiary tonalite dikes intruded along faults. Orebodies at Bootstrap are controlled by N-striking, high-angle (normal?) faults developed along a competency contrast between massive limestones and siliceous sediments of platform-slope talus debris, along which dikes were emplaced. Orebodies at Capstone are localized at intersections of NW-trending, steeply-dipping normal faults and NE-trending, high-angle faults. Both systems are locally intruded by dikes. Thinly-bedded siliceous sediments immediately above massive limestone constitute a lesser stratigraphical control. Early decarbonatization prepared the host rocks. Dense and brecciated jasperoid alteration occurs within the sediments, in the zones where dykes are absent. Limited silicification and quartz veins form a halo around faults and sericitized dykes, and also around jasperoid zones. This alteration diminishes laterally in intensity and grades into an illite-sericite-kaolinite argillic alteration at Bootstrap, whereas argillic alteration at Capstone appears to overprint silicification near dikes and structures. Decarbonatized rocks form the outermost alteration halo. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-Sb-As.

4074 Pipeline (Cortez Joint Venture) is an Eocene(?), sediment-hosted, micron gold (Carlin-type) deposit with a total gold content of 626 metric tons. It is located in the Battle Mountain Trend (Cortez area), Great Basin and Range, North American Cordillera, Nevada, United States. The Roberts Mountains Thrust is the major regional structure in the area. Stratabound, disseminated sulphide ore is hosted by calcareous to dolomitic, thinly laminated siltstone of the Silurian Roberts Mountains Formation. Pyrite is the dominant ore mineral. Gangue mineralogy consists of quartz, hematite, illite and sericite. The main ore-controlling structure is a low-angle shear zone, which could be a zone of imbricate thrusting sub-parallel to the Roberts Mountains Thrust. The NNW-striking, steeply-dipping Pipeline and the NE-striking, steeply-dipping Fence faults were the principal fluid conduits, and intersections of the two localized high-grade ore zones. Decarbonatization of the limy units was followed by intense, ore-related pervasive bedding replacement silicification and argillic alteration. Supergene oxidation of the iron sulphides is pervasive to a maximum depth of 245 metres below surface. Contact metamorphism from the Gold Acres quartz monzonite stock produced fine-grained disseminated calc-silicate (skarn) zones. The metallic signature of the bulk of the ore is Au-As-Hg-Sb(-Tl-V-Mo-B-W-Cd-Ni-Cu). Blamey and Norman (2000) suggested, from fluid inclusion data, that ore deposition at

Pipeline is the product os a single hydrothermal event, wherein ore solutions dissolved calcite and deposited gold and pyrite. They proposed that the slightly acidic fluids ore fluid are dominated by a magmatic component, and that ore deposition was the result of sulphidation.
4078 Coeur Rochester (or Nenzel Hill) is a Late Cretaceous, low-sulphidation epithermal Au-Ag deposit with a total gold content of 48 metric tons. It is located in the Rochester mining district of the Humboldt Range, Great Basin and Range, North American Cordillera, Nevada, United States. The main regional tectonic structures in the district are the Black Ridge fault zone and a NE-striking, assymetrical anticline. High-grade, laminar quartz veins (now largely mined out) and low-grade disseminated sulphides (in oxidized-weathering zones) are hosted by Permian to Early Triassic rhyolites of the Koipato Group and by related granitic intrusions. Gangue minerals of the veins are quartz, K-feldspar and sericite. Ore minerals are pyrite, sphalerite, tetrahedrite, arsenopyrite, chalcopyrite, galena, covellite, chalcocite, stromeyerite, polybasite, pyrargyrite, acanthite and rare pyrrhotite, teallite and owyeeite. Acanthite and chloargyrite are the two most abundant silver phases in the weathered zones. Mineralized veins are localized by N- to NNE-striking, steeply-dipping (listric at depth) normal faults in the crest and flanks of folds. The intersection of a broad westerly vein trend with an easterly vein trend forms high-grade ore shoots. Further ore enhancement occurs where the vein sets intersect the contact between the Rochester Rhyolite and the Weaver Formation epiclastic rocks. Contact metamorphism related to Late Cretaceous pluton emplacement is represented by a broad regional quartz-sericite-pyrite assemblage that affects the co-magmatic Koipato rhyolites and is difficult to separate from the hydrothermal alteration related to ore formation. Hydrothermal alteration is characterized by an assemblage of quartz-sericite-pyrite±K-feldspar, with silicification centered on the orebodies. The metallic signature of the bulk of the ore is Ag-Au-As-Sb-Pb-Cu-Zn. The Rochester district is thought to represent the lower (deeper) parts of an epithermal system (Vikre, 1981).

4080 The Comstock Lode Au-Ag-(Cu-Zn-Pb) district consists of Miocene, low-sulphidation epithermal deposits with a total gold content of 258 metric tons. It is located in the Comstock Lode-Silver City district, Great Basin and Range, North American Cordillera, Nevada, United States. The boom mining years (especially the Great Bonanza mining years) were from 1860 to 1880, but mining continued until 1955, with some sporadic mining until 1981. The Comstock Lode mines are aligned along the Comstock fault, a regional normal fault which is the dominant structure in the area. Mineralized veins and stockworks of the Comstock Lode are hosted by Miocene andesite, dacite, rhyodacite and rhyolite volcanic rocks of the Alta and Kate Peak Formations. Gangue mineralogy of the veins consists of quartz, calcite, adularia, albite, sericite and chlorite. Ore mineralogy consists of pyrite, sphalerite, galena, chalcopyrite, acanthite, argentite, electrum, polybasite, pyrargyrite, stephanite and tetrahedrite. Vein distribution is controlled by the Comstock normal fault and related splays and branches. Hydrothermal alteration is complex and zoned. Intense proximal advanced argillic alteration (alunite-jarosite-pyrophyllite-diaspore) and associated quartz-pyrite silicification grades outward to an argillic alteration represented by an assemblage of kaolinite-illite-montmorillonite-quartz-pyrite. The disappearance of calcite marks the change from argillic to propylitic alteration, which constitutes the distal alteration. The distal propylitic alteration is globally represented by montmorillonite-chlorite-calcite-quartz-pyrite, which consists of three different assemblages. It is also overprinted by structurally controlled (but not ore-related) zeolitic alteration (albite-natrolite-calcite±stibnite). The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg-Cu-Pb-Te-W. Fluid inclusion data suggest that precious metals were transported under reduced conditions as bisulphide complexes, and that they precipitated as the result of an increase in the fugacity of oxygen and/or a decrease in the activity of sulphur species (Brake and Romberger, 2000). Due to lack of evidence of boiling, Brake and Romberger (2000) concluded that mineralization at the New Savage mine resulted from mixing of precious metal-rich hydrothermal solutions with more oxygenated ground water.

4083 The West and East Archimedes deposits are Cretaceous, intrusion-related sediment-hosted micron gold deposits with a total gold content of 19 metric tons. They are located in the historic Eureka mining district within the Great Basin and Range, North American Cordillera, Nevada, United States. The dominant regional tectonic structure is the Hoosac Thrust, a N-trending thrust fault that stacked Cambrian rocks over Devonian and Mesozoic rocks in a series of imbricated thrusts. Disseminated sulphides at West Archimedes and silicified breccia at East Archimedes are hosted by calcisiltite, calcarenite, micrite and limestone of the Ordovician Pogonip Group. The dominant ore mineral is pyrite with minor cinnabar, but oxides such as limonite and hematite carry gold values in the oxide zone. Gangue minerals are silica, barite, zircon, wolframite and pyrolusite. The deposits are lithologically and structurally controlled. Limy horizons were most favorable for mineralization and alteration, and thus controlled the distribution of the mineralization, particularly at the West Archimedes deposit. NNE-trending, high-angle faults, exhibiting complex sinistral strike-slip and normal movements, are pre-mineral faults that were important in localizing the mineralization. WNW-trending, high-angle faults with normal offsets are common, and also played a significant role in localizing mineralization at the West Archimedes deposit. Minor, E-striking normal faults localized base-metal mineralization at nearby mines within the mining camp. Two major alteration changes occurred; decarbonatization affected the limy units and occurs above, and marginal to, a jasperoid alteration core that hosts the bulk of the high-grade mineralization. Narrow patches of friable silica from silicic alteration within the jasperoid host high-grade gold values. At depth, within the East Archimedes deposit, base metal-rich skarns occur adjacent to sericitized Cretaceous Graveyard Flat porphyry, as well as Zn-rich replacement (manto) zones. The metallic signature of the bulk of the ore is Au-Ag-As-Hg-Sb-Cu-Pb-Zn.

4085 The Tonopah mining district contains Miocene, low-sulphidation epithermal Au-Ag deposits with a total gold content of 58 metric tons. It is located in the San Antonio Mountain Range, Great Basin and Range, North American Cordillera, Nevada, United States. Quartz veins and veinlets, with local disseminated sulphides in the associated wallrocks, are hosted mainly by Miocene andesites of the Mizpah Formation. Intrusive rhyolite breccias and rhyolite tuffs, domes and flows also host some mineralization. The gangue mineralogy consists of quartz, chalcedony, adularia, rhodocrosite, and barite. Ore minerals are pyrite, argentite, pyrargyrite, polybasite, chalcopyrite, galena and sphalerite. Mineralized quartz veins are localized along WNW- to ENE-striking low-angle faults, such as the Tonopah fault system. These faults are cut by NW-striking normal faults related to pre-Basin and Range extension, and along which strata were tilted. Most of those faults are post-ore (like the Belmot and Mizpah faults), but some are also pre-ore (Halifax fault). The presence of mineralized veins within the latter faults constitutes evidence that mineralization and extension were contemporaneous. Hydrothermal alteration is zoned and divided into three broad types, which can be divided into subtypes. Proximal potassic alteration (quartz-sericite-adularia-pyrite) of the volcanic rocks grades outward to a zone of intermediate argillic alteration, subdivided in two subzones; an inner subzone of kaolinite-halloysite-quartz-sericite and an outer subzone of montmorillonite-kaolinite-sericite-pyrite. Distal propylitic alteration is subdivided into three subzones; an inner subzone (most intense and pervasive) of quartz-sericite-calcite-albite-chlorite-rutile-pyrite grades outward to a very similar subzone where there are no sulphides, but Fe-Ti oxides instead. This grades outward to a zeolitic alteration subzone of mordenite-calcite-chlorite-montmorillonite-Fe oxides, and to an external fringe of calcite-magnetite-amorphous clays. The metallic signature of the bulk of the ore is Ag-Au-Mn-Ba-Sb-Pb-Zn-As-Mo-Cu.

4087 The Aurora district and Aurora Au-Ag deposits are Miocene, epithermal low-sulphidation deposits with a total gold content of 63 metric tons. They are located in the Great Basin and Range physiographic province, North American Cordillera, Nevada, United States. A young, less than 3 Ma old, broad regional anticlinal fold is the major regional structure in the area. Vuggy, crustiform and banded quartz vein mineralization is hosted by Miocene andesitic and latitic flows and agglomerates. Gangue mineralogy consists of quartz, adularia, calcite, chlorite and barite. Ore minerals are mainly pyrite, chalcopyrite, electrum, acanthite, tetrahedrite, naumannite and bromargyrite. Two vein systems, the Prospectus-Humboldt and Wide West-Sandlot-Philadelphia-Juniata systems, are structurally controlled by pre- to syn-mineralization, NE- to ENE-striking, steeply-dipping thrust faults (one of which, the Juniata Fault, hosts the Juniata vein). Post-mineralization, steep NS-trending faults, such as the Prospectus Fault, offset the mineralized structures. Alteration of the andesitic hosts around the veins is zoned. Adjacent to the veins is a high-temperature argillic alteration assemblage of quartz-illite-montmorillonite-pyrite, which grades outward to a strong propylitic assemblage of albite-illite-quartz-chlorite-montmorillonite-adularia, and to a weak, distal propylitic alteration assemblage of calcite-albite-chlorite-quartz-illite±montmorillonite. Late, post-ore silicification parallels the veins and mainly affected the argillic-altered andesites. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-Te-Se-Br.

4088 The Goldfield Main district or Goldfield Au-Cu-Ag deposit is a Miocene, high-sulphidation epithermal deposit with a total gold content of 132 metric tons. It is located in the Goldfield mining district, Great Basin and Range, North American Cordillera, Nevada, United States. A caldera is the most important structure in the area. Mineralization is hosted by Miocene porphyritic rhyodacites, latites, trachyandesites, and rhyolitic flows and tuffs overlying Tertiary quartz monzonite. Mineralization occurs within silicified and brecciated "ledges" of quartz replacement zones and in vuggy silica zones. Gangue mineralogy consists of quartz, with minor barite and kaolinite. Ore minerals are pyrite, copper sulphosalts, famatinite, bismuthinite, enargite, goldfieldite, tetrahedrite, tennantite, and various gold tellurides. A fold dome structure and interpreted ring fractures related to caldera emplacement are thought to be the main ore-controlling structures. Vuggy silica represents the most intensely acid-leaching alteration. It is surrounded by a 3-4 metre wide zone of advanced argillic alteration represented by an assemblage of alunite-kaolinite-pyrophyllite-diaspore-quartz, with various sulphide minerals. Advanced argillic alteration grades outward to an argillic alteration assemblage of montmorillonite-illite-kaolinite±quartz, and then to regional propylitic alteration (chlorite-calcite-antigorite). The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Cu-Pb-Bi-Te-Hg.

4094 The Bodie mining district consists of two important, Late Miocene, epithermal hot-spring-type Au-Ag deposits with a total gold content of 45 metric tons. It is located in the Bodie Hills area, Great Basin and Range, North American Cordillera, California, United States. The major regional structure in the area consists of an irregular and faulted N-trending anticline intruded by several plugs. Banded (and in places brecciated by repeated cracking) quartz-feldspar veins and hydrothermal breccias are hosted by altered Late Miocene dacite, trachyte, latite, and quartz latite flows, and by trachytic lithic tuff. Gangue mineralogy is dominated by quartz, adularia and calcite. Ore mineralogy consists of argentite, pyrite, galena, chalcopyrite, sphalerite, tetrahedrite and cerargyrite. Quartz-feldspar veins cut across hydrothermal breccia zones within volcanic flows, which formed during an early, explosive stage and consist of K-silicate altered clasts in a matrix of quartz-adularia-hematite-magnetite. A NNE-striking, steeply-dipping normal fault set controls the distribution of the major veins and breccias. A later WNW-striking set of steeply-dipping strike-slip faults cuts through the mineralized zones. Immediately adjacent to the veins and breccias, the wallrocks are completely altered to an oxidized quartz-adularia-limonite-sericite-kaolinite assemblage near surface and quartz-adularia-illite-pyrite at depth. Silicification is also pervasive in the sinter zones occuring in the dacite and trachyte flows. Pods of quartz-kaolinite±pyrite argillic alteration occur within the silicified and adularized zones and at depth along some mineralized faults and fractures. The alterations grades downward and peripherally to a propylitic assemblage, consisting of various amounts of illite-hematite-calcite-heulandite-quartz-chlorite-kaolinite±pyrite. The metallic signature of the bulk of the ore is Au-Ag-As-Zn-Sb-Tl-Mn-Ba-Be-Cr-Cu-Ni.

4100 Idarado is a Miocene, low-sulphidation epithermal Au-Ag-Zn-Pb-Cu deposit with a total gold content of 131 metric tons. It is located in the Silverton mining district within the western San Juan Mountains, North American Cordillera, Colorado, United States. The 27 Ma Silverton caldera is an important caldera complex in the area. Precious metal and base metal quartz veins and veinlets and associated disseminated sulphides are mainly hosted by rhyodacitic tuff breccias and flows of the Miocene San Juan Formation, and by the conglomerates of the Ecocene Telluride Conglomerate. Replacement ore is hosted by the Eocene Telluride Conglomerate, consisting of calcareous conglomerates with some sandstone lenses and minor siltstones, and by also by Triassic and Permian conglomerates occurring lower in the stratigraphic sequence. The gangue mineralogy of the veins is quartz, calcite, rhodochrosite, rhodonite and fluorite. Ore minerals are sphalerite, galena, chalcopyrite, pyrite, specular hematite, and diverse tellurides and sulphosalts. The replacement ore consists of 20% disseminated sulphides, and its mineralogy is very similar to the veins, with the addition of the following gangue minerals: epidote, chlorite, Mn-bearing epidote and lesser sericite. Quartz veins and veinlets are localized within NW-trending, steeply-dipping radial normal faults related to caldera formation, and also within arcuate NW-trending, dextral and dextral-normal faults. Quartz veins occur either adjacent to or within pre-ore, fault-intruded dykes. Replacement ore occurs immediately adjacent to the base metal-rich veins, in swells extending laterally away from the veins, and within manto-like bodies. The basal horizon at the base of the Telluride Conglomerate, above the unconformity with Cretaceous shales, is the most mineralized. Permeability of the conglomeratic horizon is invoked as the main ore control (Mayor, 1978). Vein-related alteration is zoned, with a proximal silicification and sericitization zone (quartz-sericite-pyrite) extending to 1 metre away. This alteration then grades outward into an argillic alteration zone (sericite-kaolinite-quartz-pyrite) that extends up to 8 metres, and gradually weakens into the regional propylitic alteration (sericite-kaolinite-quartz-pyrite). Replacement orebodies also have their own alteration signature. Proximal alteration consisting of Mn-bearing epidote and carbonates, rhodonite and green epidote grades outward to chlorite and sericite in the matrix of the conglomerates. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb-Cu-As-Te.

4101 The Camp Bird Au-Ag-Zn-Pb-Cu district consists of Miocene, low-sulphidation epithermal and replacement ore deposits with a total gold content of 45 metric tons. It is located in the western San Juan Mountains, North American Cordillera, Colorado, United States. The 27 Ma Silverton Caldera complex is the main regional structural feature of the area, and is closely related to the mineralization event. Cockscomb, brecciated, compound quartz veins and veinlets are hosted by Miocene rhyodacitic tuff breccias and quartz latitic ash-flow tuffs of the San Juan Formation, and by overlying andesites and rhyolites. Gangue minerals of the veins are mainly quartz, rhodonite, calcite, fluorite and adularia. The primary ore minerals are pyrite, specularite, galena, sphalerite, chalcopyrite and tetrahedrite, with lesser manganese oxides, magnetite, scheelite, petzite and hessite. The Camp Bird gold-quartz-base metal vein set occurs within EW-oriented, steeply-dipping dextral strike-slip faults (probably an older reactivated structure), and gold-rich shoots occur particularly inside dilational jogs. NW-trending high-angle normal faults (ring faults related to the Silverton Caldera formation) intersect the older Camp Bird fracture, and hosts silver-base metal-quartz veins of similar mineralogy to the Camp Bird vein but are notably devoid of gold. Intersecting dykes and faults locally controlled the deposition of the ore. A district-wide propylitic alteration of the volcanic rocks produced an epidote-calcite-chlorite-pyrite assemblage. Sericitic alteration (quartz-sericite-pyrite) extends up to one metre away from the veins. This grades into a halo of argillic alteration (kaolinite-quartz-sericite-pyrite) up to 8 metres wide. Base metal replacement deposits are associated with deeper zones of calc-silicates adjacent to veins, and where the host formation is more permeable and calcareous. However, these replacement deposits are minor in the Camp Bird area, and were never mined. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Pb-Zn-Cu-Mn-Te-Mo-W.

4104 Donlin Creek is a Late Cretaceous to Early Paleocene, low-sulphidation epithermal gold deposit with a total gold resource of 793 metric tons. It is located in the Iditarod quadrangle of the Kuskokwim belt, North American Cordillera, Alaska, United States. The Denali fault system and the Iditarod-Nixon Fork Fault are important, regional NE-trending, high-angle dextral strike-slip faults in the area. Hairline quartz-carbonate veinlets to larger, local quartz-carbonate-sulphide veins and associated disseminated sulphides are hosted by Late Cretaceous to Early Paleocene, granitic to monzonitic porphyritic felsic dykes, and by the enclosing Cretaceous graywackes and lithic sandstones of the Kuskokwim Group. Quartz is the dominant gangue mineral, with lesser ankerite, dolomite and calcite. Ore minerals are mainly pyrite, arsenopyrite and stibnite, with lesser cinnabar, orpiment, realgar and other sulphosalts. Quartz veins and dykes are structurally controlled by NNE-trending, steeply-dipping extensional faults such as the Donlin Creek Fault, a subsidiary of the Iditarod-Nixon Fork Fault. Veins are best developed where NNE-trending faults intersect competent lithologies such as felsic intrusions or massive graywacke. Quartz veins also occur locally in NW- and NE-trending faults. Felsic dykes and sills have been altered to varying degrees by argillic (illite-kaolinite) alteration, which is most intense around mineralized zones. Pervasive silicification of the sandstones and graywackes is present along the vein selvages. Argillic alteration has also affected the sediments, but in limited extent. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Hg. Evidence of epithermal textures such as vugs, comb structures, banding and cockades within the ore-bearing veins, and common bladed carbonates (Ebert *et al.*, 2000) are indications of an epithermal environment. Preliminary fluid inclusion data from the main resource area indicate low-temperature fluids, with an estimated depth of emplacement of less than 1 km (Ebert *et al.*, 2000).

4114 New World is a grouping of five Tertiary Au-Cu-Ag skarn deposits within the New World district. The district saw the beginning of its production activity during the late 1800s, and peaked up from 1933 to 1953 with production from the McLaren Gold mine. Total gold content is 2(?) metric tons, with a resource of 53 metric tons. The New World district is located in the Cooke City area in south-central part of the Beartooth Uplift, North American Cordillera, Montana, United States. The New World district is part of a large intrusive center (Fisher Mountains Intrusive Complex) along the Cooke City fault zone, a major regional structure. One of the most extensive faults in the district is the steeply-dipping, reverse Crown Butte Fault. Most of the deposits are hosted by silty to shaly limestone and calcareous to dolomitic shale of the Middle Cambrian Meagher and Wolsey Formations, along the contact with the Fisher Mountains Intrusive Complex or along other structural flow conduits. The mineralization consists of replacement skarns (Como, McLaren and Miller Creek deposits), sulphide-rich veins and veinlets along the Crown Butte Fault (Fisher Mountain deposit) and lesser hydrothermal, diatreme and intrusive breccias near the Homestake intrusive complex (Homestake deposit). Ore mineralogy is complex, and consists of (in decreasing order of abundance): pyrite, chalcopyrite, magnetite, bornite, chalcocite, covellite, hessite, tetradymite, digenite, galena, sphalerite, specularite, pyrrhotite, enargite, petzite, wittichenite, matildite, tellurobismuthite and calaverite. Quartz is the only gangue mineral present in the sulphide-rich veins. Lithological control of the mineralization is evident; orebodies are confined to the contacts of the intrusions, and along fluid conduits within reactive sedimentary lithologies of the Meagher and Wolser Formations. NW-trending, vertical normal faults (parallel to, and probably splays of the Cooke City fault) acted as fluid conduits. Early potassic alteration of the intrusive rocks grades outward to a propylitic alteration halo. These alteration types are related to early skarn alteration, represented by an epidote-garnet-pyroxene-chlorite-amphibole assemblage. Subsequent sericitic alteration in the intrusive rocks is associated with a retrograde pyrite-epidote-magnetite-carbonates-chalcopyrite-quartz mineralized skarn assemblage. The skarns and breccias are overprinted by intense quartz-pyrite alteration, with which the bulk of the mineralization is associated. The metallic signature of the bulk of the ore is Au-Ag-Cu-Te-Pb-Zn-As-Bi-Se.

4174 Ruby Hill/Fad Shaft is a Late Cretaceous to Early Tertiary, intrusion-related carbonate replacement (manto) Au-Ag-Pb-Zn-Cu deposit with a total gold content of 51 metric tons. It is located in the historic Eureka mining district, Great Basin and Range, North American Cordillera, Nevada, United States. The dominant regional tectonic structure is the N-trending Hoosac Thrust, along which Cambrian rocks have been stacked over Devonian and Mesozoic rocks by a series of imbricated thrusts. Massive sulphide mineralization is hosted by a wedge of carbonaceous, commonly brecciated dolomite and limestone of the Middle Cambrian Eldorado Dolomite. Gangue mineralogy is mainly calcite, dolomite and quartz. Ore minerals are limonite, goethite, pyrite, arsenopyrite, galena, cerussite, anglesite, plumbojarosite, sphalerite and argentite. Ore mined before 1940 was mostly oxidized. The Ruby Hill thrust zone is a thrust fault responsible for fluid circulation; it was subsequently folded into a N-plunging antiform. The Ruby Hill fault is a NW-trending, high-angle normal fault with both pre- and post-ore movement which displaced the ore downward. Sulphide ore was discovered along the downdip extension of the Ruby Hill fault after 1940. Numerous faults parallel to the Ruby Hill fault (such as the Richmond and Lizette faults) occur in the area, and displaced the ore as well. The Sharp and Jackson faults are NS-oriented, normal faults which terminate the ore zone. The Eldorado Dolomite is an important lithological control, and acted as a reactive unit, whereas the overlying Secret Canyon Shale capped the system. Carbonate rocks in the vicinity of the ore bodies have been locally bleached and/or marmorized. This alteration (marble front) is inferred to be related to the emplacement of the Mineral Hill and Ruby Hill quartz diorite stocks. Hornfels and minor skarns and silicification occur along the margins of the intrusions. The metallic signature of the bulk of the ore is Ag-Au-Pb-Zn-Cu-As-Sb.

4210 Pogo is a Late Cretaceous, intrusion-related porphyry gold deposit with a total gold content of 113 metric tons. It is located in the Fairbanks gold camp, Goodpaster District of the Tintina Gold Belt, Yukon-Tanana Terrane, North American Cordillera, east-central Alaska, United States of America. The major regional structures of the area are the NE-trending, high-angle dextral strike-slip Tintina and Denali fault systems, respectively bounding the Yukon-Tanana Terrane on its northern and southern borders. Banded, and sheeted quartz veins and replacement mineralization are hosted mainly by upper amphibolite grade, Late Proterozoic to Middle Paleozoic biotite quartz feldspar paragneiss and granitic orthogneiss. Minor quartz stockwork and en echelen tension veinlets are hosted by small sub-alkaline granite of the Early to Late Cretaceous Tombstone intrusive suite. Quartz is the dominant gangue mineral, with lesser muscovite, K-feldspar and plagioclase. Ore mineralogy is dominated by pyrite, with lesser pyrrhotite, loellingite, arsenopyrite, chalcopyrite, bismuthinite, galena, sphalerite, molybdenite, tetradymite, maldonite, Ag-Pb-Bi sulphosalts, and native Bi. Mineralized veins are associated with WSW- to WNW-trending, shallowly-dipping shear zones, but the exact nature of the structural control is yet unknown. A minimum of three phases of post-mineral faulting have thickened or dismembered the ore zones. Hydrothermal alteration consists of an early and deep proximal potassic alteration (biotite-Kspar), overprinted by a later and shallower sericitic alteration (albite-sericite/muscovite-carbonate). A sporadic overprint by carbonate alteration (sericite-calcite) occurs along quartz veins mainly located in the shallower parts. The metallic signature of the bulk of the ore is Au-Bi-Te-W-As-Mo-Zn-Sb. Fluid inclusion and analytical results are consistent with formation of the deposit at high-temperature and pressure (Smith, 1999). The Pogo deposit may represent a deep-seated manifestation of the porphyry gold deposits found elsewhere in the Tintina Gold Belt such as Fort Knox, True North and Dublin Gulch (Smith, 1999; Thompson and Newberry, 2000).

4262 Goldbug/Rodeo is a Late Eocene sediment-hosted, micron gold deposit (Carlin type) with a total gold content of 59 metric tons. It is located in the Carlin district of the Great Basin and Range, American Cordillera, Nevada, United States. The Roberts Mountains Thrust and the Tuscarora Anticline are the two major regional structures affecting the area. Disseminated sulphide and hydrothermal breccia ore are mainly hosted by micritic limestones of the Devonian Popovich Formation and by silty limestones of the Siluro-Devonian Roberts Mountains Formation. Minor (structurally controlled) gold orebodies also occur in the siltstones and siliceous mudstones of the Devonian Rodeo Creek Formation. Mineralogy of this deposit has been inferred from the nearby Meikle-Griffin and Betze-Post deposits. Gangue mineralogy mainly consists of quartz,barite and calcite. Ore mineralogy is dominated by pyrite, with lesser marcasite, arsenopyrite, sphalerite and stibnite, and possibly other Hg and As minerals (cinnabar-orpiment-realgar). Mineralization is structurally controlled by the NNW-trending, high-angle, sinistral-normal (dyke-intruded) Post Fault System. These faults represent the prime feeders for the mineralizing fluids. Structural preparation by the Post Fault System in the core of the NW-trending, asymetrical Post Anticline, a local expression of the regional Tuscarora Anticline, was essential in the development of the orebodies. NE-trending, high-angle faults served as secondary conduits, and their intersections with the NNW-trending fault set also localized zones of gold mineralization. Lithological control was provided by the limestone units, which were susceptible to alteration and mineralization. Hydrothermal alteration consists of early decalcification of the limestone units, which resulted in increased permeability and solution-collapse breccias. These zones were pervasively silificied and pyritized during gold deposition. Fault-filling monzonite and lamprophyre dykes are affected by argillic (kaolinite-illite) alteration. The metallic signature of the bulk of the ore (inferred from the signature of the adjacent deposits) is Au-Ag-As-Sb-Hg-Se-Mo-W-Tl. Tonalite dykes (dated at 39 Ma) of the Betze dacite localized within the Post Fault at the nearby Griffin deposit are locally mineralized and thought to be coeval with the mineralization event (Ressel *et al.*, 2000).

UZBEKISTAN

1775 Muruntau is an Early Permian (or very Late Carboniferous) to Late Triassic, non-carbonate-hosted stockwork-disseminated Au-Ag-W deposit with a total gold content of 3952 metric tons. It is located in the Muruntau ore field, within the Central Kyzyl Kum subzone of the Zerafshan-Turkestan metallogenic zone, Southern Tian Shan, Uzbekistan. The Muruntau ore field is located on the northern limb of the EW-oriented Taskazgan Anticline. It is localized by the left-stepover forced by the intersection between the high-angle, brittle-ductile to brittle, sinistral strike-slip Tamdytau-Sangruntau and Muruntau-Daugyztau D_4 fault zones (or shear zones). Both of these regional fault zones are splays from the Nikolaev lineament, which marks the suture between the Northern and Southern Tien Shan. Quartz veinlet stockworks, ribbonned and banded quartz veins and disseminated sulphides are hosted mainly by greenschist grade carbonaceous siltstones and quartz-mica metapelitic schists (and also by minor sandstones, mudstones and limestones), all part of the Middle Ordovician to Early Silurian Besapan Formation. The dominant gangue minerals are quartz, K-feldspar and biotite, with lesser tourmaline, actinolite, hornblende, muscovite, ankeritic carbonate and apatite. Ore mineralogy is dominated by pyrite and arsenopyrite, with minor scheelite, bismuthinite, pyrrhotite, marcasite, chalcopyrite, molybdenite, galena, sphalerite, tetradymite, tellurides, selenides, wolframite and native bismuth. Structural control on the mineralization is provided by a number of elements: 1) ENE-striking, high-angle reverse-sinistral oblique-slip D_4 shear zones such as the Structural, Tourmaline and Southern faults, 2) NE-striking, high-angle reverse-sinistral oblique-slip D_4 shear zones such as the Kyumyshsai, Biryuzovyi and Northeastern faults, 3) EW-trending extension fractures related to the NE-trending fault system, 4) intraformational D_3 thrust faults and detachments hosting banded quartz veins and related to early ductile deformation, 5) local NE-trending D_4 fold structures affecting the northern limb of the Taskazgan Anticline, and 6) S_2 axial planar cleavage enhanced permeability, resulting in the formation of closely-spaced veins. Early hydrothermal alteration of the schists consists of potassic and sodic (biotite-chlorite-plagioclase) alteration at shallow levels, grading to aluminous (cordierite-sillimanite) alteration at greater depths. Each vein stage has its own alteration signature, which are, from earliest to latest: 1) potassic alteration (quartz-albite-biotite-chlorite-Kspar-carbonates) associated with quartz veins and veinlets, 2) widespread sericitic (muscovite-Mg-chlorite-quartz-phlogopite-Kspar-carbonates) alteration associated with stockworks of phlogopite-pyrite-arsenopyrite, and 3) potassic alteration (quartz-Kspar-muscovite-carbonate-sulphides) associated with the Central veins containing the highest grade ore. A potassic (Kspar-dolomite-tourmaline±pyrite) alteration occurs in EW- to ENE-trending en echelon zones in brittle structures parallel to the Central veins. Late “beresite” (quartz-sericite-carbonate) alteration and intense carbonate alteration occur along brittle faults offseting previous structures, but are devoid of ore. The metallic signature of the bulk of the ore is Au-Ag-W-As-Bi-Sb. Deeper levels (lower ore and sub-ore) are characterized by a halo of W-Co-Mo, while the upper ore and supraore levels are characterized by As-Cu-Zn-Pb-Ag-Sb-Ni.

4015 Daughyztau is an Early Permian to Late Triassic, turbidite-hosted quartz-carbonate vein (Bendigo-type) Au-Ag deposit with a total gold content of 5 metric tons. It is located in the Amantaitau-Daughyztau ore field within the Central Kyzyl Kum subzone of the Zerafshan-Turkestan metallogenic zone, Southern Tian Shan, Uzbekistan. The deposit is located on the southern limb, and in the axial zone, of the NW-oriented Daugyztau Anticline. It is localized by the left-stepover developed at the intersection between the high-angle, brittle-ductile to brittle, sinistral strike-slip Tamdytau-Sangruntau and Muruntau-Daugyztau D_4 fault zones (or shear zones). Both of these regional fault zones are splays from the Nikolaev lineament, which marks the suture between the Northern and Southern Tien Shan. Quartz vein stockworks and disseminated sulphides are hosted by greenschist grade siltstones, schists, sandstones, mudstones and minor limestones of the Middle Ordovician to Early Silurian Besapan Formation. Quartz and dolomite are the dominant gangue minerals. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser stibnite, sphalerite and tetrahedrite-tennantite, and minor to rare boulangerite, clausthalite, chalcopyrite, galena, chalcostibite, polybasite, zinkenite, pyrargyrite, coloradoite and cinnabar. En echelon orebodies are structurally controlled and localized by the NNE-trending, steeply-dipping Daugyztau fault, thought to be a splay of the Daugyztau-Muruntau regional fault zone. Other secondary ENE- , NE- and WNW-trending, steeply-dipping D_4 faults related to transpression also carry ore-grade mineralization. Early, pre-mineral and pre-metamorphic sodic hydrothermal alteration consists of albite-quartz-chlorite alteration. Ore-related alteration consists of an inner phyllic alteration zone of sericite-carbonate-pyrite, grading into an outer phyllic zone of quartz-sericite. Silicification is widespread and occurs along ore-bearing structures. Late argillic alteration, related to the final vein stages, occurs locally and is represented by a quartz-muscovite-kaolinite-dickite-breunnerite-pistomesite assemblage. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Zn-Pb-Cu-Hg-Te.

4016 Amantaitau is an Early Permian to Late Triassic, turbidite-hosted quartz-carbonate vein (Bendigo-type) Au-Ag deposit with a total gold content of 89 metric tons. It is located in the Amantaitau-Daughyztau ore field within the Central Kyzyl Kum subzone of the Zerafshan-Turkestan metallogenic zone, Southern Tian Shan, Uzbekistan. The deposit is located on the southern limb, and in the axial zone, of the NW-oriented Beltau-Daugyztau Anticline. It is localized by the left-stepover developed at the intersection between the high-angle, brittle-ductile to brittle, sinistral strike-slip Tamdytau-Sangruntau and Muruntau-Daugyztau D_4 fault zones (or shear zones). Both of these regional fault zones are splays from the Nikolaev lineament, which marks the suture between the Northern and Southern Tien Shan. Mylonitized, ribboned and brecciated quartz veins, veinlets and disseminated sulphides are hosted by greenschist grade carbonaceous siltstones, sandstones and mudstones of the Middle Ordovician to Early Silurian Besapan Formation. Quartz is the dominant gangue mineral, with minor carbonates. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser argentite, stibnite, proustite, pyrargyrite, tetrahedrite, silver sulphosalts, galena and sphalerite. Mineralization is structurally controlled by NE-trending, steeply-dipping faults such as the Geophysical and Asaukak faults, which respectively bound the deposits to the north and south. ENE-trending, steeply-dipping dextral strike-slip Central and Median faults link the Geophysical and Asauka faults. En echelon, subparallel and conformable orebodies follow lesser NW-trending faults, the latter are bounded by the ENE-trending Central and Median faults and splays. EW- to ENE-trending faults dislocated the mineralization. Early, pre-mineral and pre-metamorphic hydrothermal alteration consists of a sodic assemblage (albite-quartz-chlorite). Ore-related alteration consists of phyllic (quartz-sericite) alteration at shallow levels, associated with pockets and lenses of disseminated ore. This grades into phyllic alteration at depth typically associated with the vein mineralization and characterized by a quartz-carbonate-chlorite-albite-sericite assemblage. Silicification is widespread and occurs along ore-bearing structures. Late argillic alteration is represented by kaolinite veinlets with carbonaceous matter. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Pb-Te-Co.

4017 Zarmitan is a syn- to post-Late Carboniferous, quartz-carbonate shear-zone-related Au-Ag deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 168 metric tons. It is located in the Samarqand area, Southern Tien Shan, Uzbekistan. The Nikolaev lineament, a Carboniferous suture zone defining the boundary between the Northern and Southern Tien Shan, is the dominant regional structure in the area. Gold-bearing quartz veins and stockworks are hosted by the Late Carboniferous Koshrabad massif (batholith) of syenite, gabbrosyenite and granosyenite intruding Silurian sediments. Gangue mineralogy consists of quartz, scheelite, feldspar and carbonate. Ore mineralogy is mainly pyrite, arsenopyrite, sphalerite and gold. Mineralization is structurally controlled by the Karaulkhana-Charmitan crush zone. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Zn-W.

4251 Kokpatas is an Early Silurian (?) gold deposit of probable quartz-carbonate shear-zone-related affinity (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 234 metric tons. It is located in the Muruntau ore field, within the Central Kyzyl Kum district of the Kyzylkum-Nuratau metallogenic zone, South Tian Shan fold system, Uzbekistan. The NW- to EW-trending Nikolaev Lineament, a suture zone of Carboniferous collision marking the boundary between the northern and southern Tien Shan, and a (broadly) NW-trending anticline are the dominant regional tectonic structures. Massive to disseminated sulphides and stockwork zones are hosted by Silurian mafic and intermediate, schistose volcanic and volcaniclastic rocks. Pyrite and arsenopyrite are the main ore minerals. The deposit is confined to a thrusted slice or thrust and fold belt about 20 km long and 5 km wide. Hydrothermal alteration consists of sericitic and carbonate alteration, characterized by an assemblage of quartz-sericite-fuchsite-chlorite-carbonate. The partial metallic signature of the bulk of the ore is Au-Ag-As.

4252 Almalyk is a Late Carboniferous to Early Permian porphyry Au-Cu-Mo-Ag-Te-Se-Bi-ln deposit with a total gold content of (approximately) 2015 metric tons. It is located in the Chatkal Kurama district of the Valerianov-Beltau-Kurama magmatic arc, South Tien Shan fold system, Uzbekistan. The deposit is exploited by two mines: the Kalmakyr mine is a Au-Cu-Mo porphyry, whereas the Dalnee mine is essentially a Cu porphyry deposit. NW-trending and EW-oriented structures that controlled intrusion emplacement are the dominant regional tectonic structures. Stockwork mineralization is hosted by granodiorite stocks intruding syenite and diorite. Skarns occur in syenite and diorite on the borders of the granodiorite plutons, along with gold-bearing low-sulphidation epithermal-style veins (higher grade but never exploited due to irregular distribution) peripheral to the porphyry deposit. Gangue mineralogy of the stockwork consists of dominant quartz, with lesser K-feldspar and carbonate. Ore mineralogy consists of pyrite, chalcopyrite, bornite, magnetite, molybdenite, sphalerite and galena, with minor tennantite, calaverite, crenoirite, matildite, hessite, acanthite, aikinite, and native gold and silver. Mineralization is structurally controlled by the E- to NE-trending, steeply-dipping Kalmakyr and Karabulak fault zones. Epithermal veins are especially associated to the NE-trending faulting. Hydrothermal alteration consists of concentric zones centered on the granodiorite porphyry host. The most central alterations are potassic alteration and silicification (quartz-K-feldspar, grading to biotite-K-feldspar), which grades away to, and is superposed by, an intense and pervasive phyllic alteration stage consisting of 3 distinct zones (chlorite-muscovite-sericite, quartz-chlorite-sericite, and chlorite-sericite). This in turn grades outward to a propylitic alteration zone of albite-chlorite-actinolite, and a most distal albite-epidote-carbonate-chlorite. Strong silificiation and sericitization (represented by a quartz-sericite-pyrite assemblage) occur along the NE-trending faults; "crush zones" (breccias) are associated with peripheral epithermal-style gold-bearing veins. Supergene argillic alteration with kaolinite occurs alongside oxide ore at the top of the deposit. The metallic signature of the bulk of the ore is Au-Ag-Cu-Pb-Zn-As-Mo-Bi-Te. Zvedov *et al.* (1993) have estimated the temperature during early ore deposition at 450-500^{o}C, decreasing to 250-200^{o}C for the main chalcopyrite-rich, gold-bearing stage. Depth of ore deposition has been estimated between 700 and 1700 meters below surface (Zvedov *et al.*, 1993).

4255 Angren is a Late Carboniferous low-sulphidation epithermal Au-Ag deposit in production since 1974 (figures unavailable), with a total gold content of 270 metric tons. It is located in the Chatkal-Kurama (or Kuraminsk) district of the Valerianov-Beltau-Kurama magmatic arc, South Tien Shan fold system, Uzbekistan. The Kuramin anticlinorium is the dominant tectonic strucutre in the area. Banded and crustiform quartz-carbonate veins and stockworks, and pipe-like hydrothermal breccias are hosted by Middle to Late Carboniferous calc-alkaline andesite, dacite, and associated volcaniclastic rocks (tuff, ash tuff, agglomerate) of the Nadak Formation, Atcha Group. Gangue mineralogy of the quartz veins consists of dominant quartz, with lesser sericite, calcite and barite. Ore mineralogy is dominated by pyrite, tetrahedrite, chalcopyrite, sphalerite, galena and tellurides (calaverite, petzite, sylvanite, hessite, altaite), with minor to trace amounts of stutzite, empessite, luzonite, arsenopyrite, bismuthinite, jamesonite, marcasite, tetradymite, argentite, tellurobismuthinite, weissite, huebnerite, bournonite, tennantite, joseite, plagionite, volynskite, native Bi, famatinite, chalcostibite. Quartz vein and stockwork mineralization is structurally controlled by S-trending, steeply-dipping faults, as well as by WSW-trending, steeply-dipping faults which control the distribution of conformable orebodies hosted in ashy tuffs. Fault intersections and bends along structures are particularly favorable loci of ore shoots. Hydrothermal alteration consists of proximal sericitic alteration characterized by a quartz-sericite-chlorite-carbonate assemblage, grading outward to propylitic alteration represented by quartz-pyrite-carbonate-orthoclase-albite, and to a distal chloritic alteration halo of calcite-sericite-albite-quarz-chlorite-pyrite. Argillic alteration with kaolinite-pyrophyllite-carbonaceous matter also occurs in the deposit. Pre-ore syenite and diorite plutons have been affected by silicification. The metallic signature of the bulk of the ore is Au-Ag-As-Bi-Se-Pb-Cu-Zn-Te. Kovalenker and Rusinov (1999) recognized dual, low-sulphidation and high-sulphidation features at Kochbulak based on the varying mineralogical assemblages and alteration signatures. In particular, breccia pipe orebodies containing goldfieldite, famatinite, luzonite, enargite, diaspore and pyrophyllite, have a strong high-sulphidation signature.

VENEZUELA

308 Las Cristinas is an Early Proterozoic, intrusion-related, non-carbonate-hosted stockwork-disseminated Au-Cu deposit with a total gold content of 298 metric tons. It is located in the Kilometre 88 district of the Pastora-Amapa, Guyana Shield, Venezuela. A regional, shallow-plunging syncline is the dominant regional tectonic structure in the area. There are three types of mineralization at Las Cristinas; sulphide-rich veinlets and disseminated sulphide mineralization, hydrothermal breccias, and massive sulphide lenses. They are hosted by Early Proterozoic, lower greenschist grade andesites, and by andesitic crystal and lapilli tuffs. Ore mineralogy is dominated by pyrite and chalcopyrite, with minor electrum. Gangue mineralogy of the veins and breccias consists of quartz, carbonate, sericite, chlorite, tourmaline and K-feldspar. A SSW-striking, heterogeneous shear zone (the Quebrada Amarilla fault?) and associated parallel foliation was superimposed on the alteration and mineralization. Hydrothermal alteration associated with the veinlet-disseminated ore style consists of proximal biotite-sericite alteration, grading outward to a peripheral epidote (propylitic?) alteration characterized by an epidote-carbonate-quartz-chlorite-pyrite assemblage. The hydrothermal breccias are silicified and tourmalinized, whereas the massive sulphide lenses are affected by sericitic (quartz-sericite-pyrite) alteration and chloritization. The metallic signature of the bulk of the ore is Au-Ag-Cu-Mo-Mn-Zn.

580 The El Callao district consists of Proterozoic(?), quartz-carbonate shear-zone-related gold deposits (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998), with a total gold content of 166 metric tons. It is located in the Pastora-Amapa area of the Guayana Shield, state of Bolivar, Venezuela. The dominant tectonic structure in the area is the NE-oriented, regional Nacupay Anticline. Crack-seal quartz-carbonate veins and associated disseminated sulphides are hosted by greenschist grade, pillowed basalt and andesite flows, and calcareous andesitic tuffs of the Early Proterozoic El Callao Formation. Gangue mineralogy is dominated by quartz, with lesser calcite, ankerite, sericite and tourmaline. Pyrite is the dominant ore mineral, with rare amounts of chalcopyrite. Quartz vein orebodies are controlled by NE-striking, moderately-dipping reverse faults and shear zones parallel to the regional anticline, and by the faulted, NE-trending contact between the greenstones and the prominent Laguna diabase dyke. Mineralized veins also occur within extensional fractures between the faults. Hydrothermal alteration associated with the mineralization consists of sericitization (sericite-kaolinite), chloritization, silicification and pyritization. The last two in particular are associated with the disseminated sulphide mineralization. The metallic signature of the bulk of the ore is Au-Ag-As-Hg-Pb-Zn-B-Ba.

VIET NAM

4037 Pac Lang is a Late Jurassic, probable turbidite-hosted quartz-carbonate vein (Bendigo type) Au-Ag deposit with a total gold resource of 137 metric tons. It is located in the Ngan Son township, in the Song Hiem continental rift zone, North Indochina gold metallogenic province, Viet Nam. NS-trending faults are the dominant regional tectonic structure in the area. Quartz vein mineralization is hosted by shale, coaly shale and sandstone of the Middle Triassic Song Hiem Suite. Quartz is the dominant gangue mineral, together with common calcite and barite. Ore mineralogy is dominated by pyrite, with lesser sphalerite, galena, chalcopyrite and arsenopyrite, and minor argentite and gersdorffite. Mineralization is structurally controlled by NW-SE-oriented faults, and their intersections with the regional NS-trending faults. No hydrothermal alteration is reported for the Pac Lang mine area, although volcanic rocks at the Na Pai mine are affected by propylitic alteration and silicification. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb-Cu-As-Ni.

4038 Bong Mieu is a Late Triassic to Early Jurassic, intrusion-related, batholith-associated quartz vein (Korean type) Au-Ag-Pb deposit with a total gold content of 4 metric tons. It is located in the Tam Ky district, on the northern margin of the uplifted Kontum Massif, South Indochina gold metallogenic region, Viet Nam. Regional structure is dominated by two parallel WNW-ESE-trending anticlinal structures. Quartz vein mineralization is hosted by Lower Proterozoic quartz schists, gneisses and quartzites. Quartz is the dominant gangue mineral, with minor calcite, muscovite and graphite. Ore mineralogy is dominated by pyrite and arsenopyrite, with lesser galena, hematite, magnetite, chalcopyrite, pyrrhotite, sphalerite, molybdenite and cassiterite. Mineralization is structurally controlled by six fault and shear systems. The two main fault systems are: 1) a SW-trending, shallowly-dipping fault system that is heavily mineralized, and 2) a NW-SE-oriented, moderately- to steeply-dipping fault system. Hydrothermal alteration consists of chloritization and sericitization. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Pb-Cu-Zn-Mo-Sn.

ZAIRE (DEMOCRATIC REPUBLIC OF CONGO)

296 Kilo-Moto is an Archean(?), quartz-carbonate shear-zone-related Au-Ag-Cu deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 20 metric tons. It is located in the Mongbwalu district of the Bomu-Kibalian Craton, Congo Craton, Democratic Republic of Congo (former Zaïre). The dominant regional tectonic structures in the area are NE- and NW-trending lineaments, possibly representing faults. Massive to laminated quartz veins and replacement semi-massive sulphides at Moto are hosted by mafic metavolcanics, iron formation, and surrounding schists and mylonites of Middle Archean age, whereas quartz veins at Kilo are hosted by Archean quartz diorite, tonalite, and mafic volcanics. Gangue mineralogy is dominated by quartz and albite with lesser chlorite, ankerite, apatite and magnetite. Ore mineralogy consists of arsenopyrite, pyrite, chalcopyrite and pyrrhotite. Ore distribution is structurally controlled by gently- to moderately-dipping shear zones with dominantly dip-slip movement, by NE-trending, moderately- to steeply-dipping fractures, and by intersections between the two. The intrusive contacts between the quartz diorite and tonalite intrusions with the mafic volcanics also localized quartz vein mineralization. Axial zones of folds are also an ore-controlling structure. Hydrothermal alteration consists mainly of carbonate and chlorite alteration. Carbonatization of the mafic rocks and the schists is extensive. Chloritization occurs in mafic rocks and schists, as well as in the diorite and tonalite. Albitization, biotitization and local tourmalinization occur along schist-hosted quartz vein selvages. Iron formation that hosts replacement semi-massive sulphide ore is affected by argillic (kaolinite) alteration. Silicification is also present. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-As-B.

Appendix 2

ZIMBABWE

329 Arcturus is a Late Archean(?), non-carbonate-hosted stockwork-disseminated gold deposit with a total gold content of 61 metric tons. It is located in the Goromondzi district, within the Shamva-Harare greenstone belt of the Zimbabwe craton, Zimbabwe. A broad, W-plunging syncline in the center of the greenstone belt is the main regional tectonic structure. Disseminated sulphide mineralization is hosted by altered and sheared, upper greenschist to lower amphibolite grade metabasalts and andesites of the Arcturus Formation, part of the Late Archean Bulawayan Supergroup. Ore mineralogy consists of arsenopyrite, pyrite, pyrrhotite, stibnite, chalcopyrite, molybdenite, Bi-sulphides and tellurides. The lodes are localized by a set of six sub-parallel, W-trending, moderately- to steeply-dipping, brittle-ductile, oblique-reverse (sinistral) shear zones. Hydrothermal alteration is extensive along the sheared mafic-felsic volcanic rocks, and consists of carbonatization, silicification and K-metasomatism. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Cu-Mo-Bi-Te.

336 Cam and Motor is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 155 metric tons. It is located in the Kamoda district of the Midlands greenstone belt, Zimbabwe craton, Zimbabwe. The main regional structures are major sinistral shears bounding the volcano-sedimentary succession to the east and west of the deposit. Quartz veins and stockworks are hosted by Late Archean tholeiitic basalts, andesites, magnesian basalts, dolerite intrusions and minor sedimentary rocks. Quartz and carbonate are the main gangue minerals. Ore mineralogy is dominated by pyrite, with lesser arsenopyrite, stibnite, sphalerite and scheelite. A NNE-trending, vertically-dipping shear at the volcanic-sediment contact controls the Motor group of orebodies. Another EW-trending, moderately- to steeply-dipping shear control the Cam group of veins. Both shears are thought to represent Riedel splays of the more regional sinistral shears (Foster *et al.*, 1991). Hydrothermal alteration consists of carbonate alteration occurring along veins and shear zones. The intensity of the alteration gradually decrease away from the shears. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As-Sb-Zn-W.

340 Dalny is a Late Archean(?), quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 69 metric tons. It is located in the Chegutu area of the Midlands greenstone belt, Zimbabwe craton, central Zimbabwe. The major regional structure in the area is the NS-oriented, crustal scale Lily Shear Zone, interpreted as a Late Archean terrane boundary with dextral strike-slip movement. Quartz-carbonate veins are mainly hosted by Late Archean, lower to middle greenschist grade, pillowed tholeiitic basalt flows and by minor beds of black shales. Gangue mineralogy is dominated by quartz and carbonates, with lesser chlorite, tourmaline and scheelite. Pyrite and arsenopyrite are the dominant ore minerals, with lesser stibnite, galena, chalcopyrite, tetrahedrite, pyrrhotite, sphalerite and bornite. The deposit is located along the Dalny Shear Zone, a NE-SW-oriented, dextral strike-slip shear interpreted as a Riedel structure of the Lily Shear Zone. This D_1 shear zone was reactivated as a reverse-sinistral shear during the D_2 deformation event, associated with fluid circulation and mineralization emplacement. Late, WNW-trending and NS-striking, sinistral strike-slip faults (such as the Turquoise Gap Fault) dislocated the orebodies and are associated with dyke intrusion. However, Dirks and Van Der Merwe (1997) suggested that those faults do not exist, and that the dislocation is related to tectonic stacking and duplex-forming processes during earlier deformation. Zoned hydrothermal alteration consists of a proximal sericitic-pyritic (muscovite-pyrite-quartz) alteration zone, grading outward to a carbonate (muscovite-ankerite-quartz) alteration zone and a distal propylitic (chlorite-calcite-quartz) alteration zone. The metallic signature of the bulk of the ore is Au-Ag-As-Sb-Pb-Zn-Cu-W-Ba.

346 Freda-Rebecca is a Late Archean, intrusion-related gold deposit of probable porphyry style, with a total gold content of 49 metric tons. It is located in the Bindura goldfield of the Shamva-Harrare greenstone belt, Zimbabwe craton, northern Zimbabwe. A broad, W-plunging syncline in the center of the greenstone belt is the main regional tectonic structure in the area. Disseminated sulphide mineralization is hosted exclusively by the Late Archean Bindura monzodiorite and granodiorite. Ore mineralogy consists mainly of pyrite, chalcopyrite and arsenopyrite, with lesser pyrrhotite, molybdenite and galena, and trace amounts of scheelite, stibnite, bismuthinite, native bismuth and tellurides. The mineralization occurs within the Freda and Rebecca shear zones. The Freda Shear Zone is a NE-striking, moderately- to steeply-dipping, brittle-ductile, dextral-reverse shear zone within the monzodiorite pluton. The Rebecca Shear Zone is a SE-trending, moderately- to steeply-dipping, brittle-ductile, dextral-reverse shear zone at the monzodiorite-granodiorite contact. Hydrothermal alteration of the monzodiorite along the Freda Shear Zone is intense, with potassic-chloritic alteration represented by a chlorite-actinolite-biotite-microcline-quartz-carbonate assemblage. No alteration zoning has been reported. Alteration along the Rebecca Shear Zone is inconspicuous, but for minor quartz lenses and sulphide stringers along the shear. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Cu-As-Mo-Pb-W-Sb-Bi-Te. Vinyu *et al.* (1996) proposed a model whereby mineralization is broadly synchronous with the emplacement of the host plutons. Pb isotopic data strongly suggests a magmatic rather than metamorphic source for the gold (Vinyu *et al.*, 1996). However, a Proterozoic age for mineralization at the nearby RAN-Kimberley deposit was demonstrated by Frei and Pettke (1996), which would favor a quartz-carbonate shear-zone-related orogenic gold deposit model.

350 Globe and Phoenix is a Late Archean, quartz-carbonate shear-zone-related gold eposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 124 metric tons. It is located in the Kwe Kwe area of the Midlands greenstone belt, Zimbabwe craton, Zimbabwe. A WNW-trending, moderately- to steeply-dipping reverse-dextral shear is the main regional tectonic structure in the area. It is located at the contact between the granite/gneiss domain of the Rhodesdale Batholith and the greenstones of the Kwe Kwe Ultramafic Complex. Quartz veins and stockworks are hosted by altered Archean orthogneiss of the Rhodesdale Batholith, and by mafic volcanics and talc schists of the Kwe Kwe Ultramafic Complex. Quartz is the dominant gangue mineral. Ore mineralogy is dominated by stibnite, with lesser pyrite, arsenopyrite, galena, sphalerite, tetrahedrite, jamesonite and boulangerite. The NNW-striking, moderately-dipping, ductile reverse Sherwood Shear Zone follows in places the gneiss/volcanic contact, and is the dominant control on fluid flow. Quartz veins and stockworks are associated with local transpression zones induced by the bending of the shear zone. NNE-striking shears transecting the gneiss-volcanic contact are the major host structures for gold mineralization in the mine. Earlier, EW-trending, steeply-dipping shears also host some mineralized quartz veins. Early carbonate alteration of the mafic and ultramafic volcanics produced a more competent assemblage of magnesite-talc-fuchsite susceptible to brittle failure and vein emplacement. Silicification also occurs in the volcanic and gneissic rocks, and is especially intense near the mineralized areas. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Sb-As-Pb-Zn.

351 Golden Valley is a Late Archean(?), quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 49 metric tons. It is located in the Kadoma area of the Chegutu-Kadoma greenstone belt, Zimbabwe craton, Zimbabwe. NNE-trending regional folds are the dominant tectonic structure in the area. Quartz-carbonate veins and disseminated sulphides are hosted by Fe-tholeiitic basalts of the Late Archean Bulawayan Upper Greenstones, and at the contact with fault-controlled felsite and quartz-porphyry dykes. Gangue mineralogy is dominated by quartz, with lesser calcite and minor chlorite and tourmaline (schorlite). Pyrite is the dominant ore mineral, with minor galena, scheelite, sphalerite, chalcopyrite, pyrrhotite, arsenopyrite and gersdorffite. The mineralization is structurally controlled by a series of parallel, thin, SSW-trending, shallowly-dipping, brittle-ductile reverse dip-slip shear zones such as the Jubilee and Pioneer faults. The shears were reactivated in a mainly strike-slip movement, with development of conjugate, broad ENE-trending shears locally carrying lower grade ore. Late EW-trending normal faults displaced the orebodies. Extensive carbonate alteration affected the mafic volcanics, whereas the intrusive rocks are sericitized. Sulphidation affected both rock types. The metallic signature of the bulk of the ore is Au-Ag-As-Pb-Cu-Zn-W-Rb.

359 Lonely is a Late Archean(?), quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 35 metric tons. It is located in the Bubi area of the Midlands greenstone belt, Zimbabwe craton, Zimbabwe. Mineralized quartz veins are hosted by mafic volcanic rocks and serpentinite of the Late Archean Bulawayan Lower Greenstones. Gangue mineralogy is dominated by quartz, with minor calcite. Pyrite is the dominant ore mineral, with minor sphalerite, galena and chalcopyrite. Mineralization is structurally controlled by shear zones (inferred to be brittle-duction, reverse dip-slip shears), and potentially by the compentency contrast between the serpentinite and the mafic volcanic rocks. Hydrothermal alteration consists of intense carbonatization in the serpentinite wallrocks, with an assemblage of talc-carbonate-chlorite. Mafic volcanics host rocks are also affected by carbonatization (ankerite), and by sericitization near the lodes. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-Zn-Pb-Cu.

361 Mazowe is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 46 metric tons. It is located in the Mazowe gold field of the Harare-Bindura-Shamva greenstone belt, Zimbabwe craton, Zimbabwe. A broad, W-plunging syncline in the center of the greenstone belt is the main regional tectonic structure in the area. Other important D_1 structures (but unrelated to the mineralization) are the NNE-trending Tateguru-Mazowe Shear Zone, at the contact between the Arcturus and Iron Mask formations, and the NNW-trending, dextral Mazowe fault. Quartz veins with typical crack and seal textures are hosted mainly by the Late Archean porphyritic Jumbo Granodiorite and cogenetic Jumbo quartz-feldspar porphyry dykes. The surrounding metadacites and metasediments of the Late Archean Passaford Formation (Bulawayan Group) are hosts to minor mineralization as well. Quartz is the dominant gangue mineral, with lesser calcite and minor chlorite and rutile. Ore mineralogy is dominated by pyrite, with minor amounts of pyrrhotite, sphalerite, chalcopyrite, galena, arsenopyrite and cobaltite. Scheelite is common as thin veinlets or along the vein selvages. Late Bi-minerals such as native Bi, bismuthinite, tetradymite, cosalite, joseite and ingodite occur within the orebodies. Mineralization is structurally controlled by two contemporaneous sets of shear zones: 1) a W-trending, subparallel and anastomosing set of gently- to moderately-dipping reverse oblique (sinistral) $D_{2/3}$ (syn- to post-Chilimanzi structures) shear zones controlling the major reefs, and 2) an E-trending, gently-dipping set of reverse $D_{2/3}$ shear zones. Hydrothermal alteration consists of a thin selvage of sericite along the mineralized veins. The metallic signature of the bulk of the ore is Au-Ag-Bi-Te-W. Fluid inclusion and isotopic studies by Oberthür *et al.* (2000) indicate that mineralization formed from relatively reduced fluids with a “metamorphic” signature during a single gold mineralizing event. The lack of a major regional, first-order shear zone in the vicinity of the Mazowe gold field led Blenkinsop *et al.* (2000) to suggest that significant gold deposits can form in relatively minor deformation events, unrelated to major shear zones or granitoid intrusions.

370 Shamva is a Late Archean, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 75 metric tons. It is located in the Shamva area of the Shamva-Harrare greenstone belt, Zimbabwe craton, Zimbabwe. A broad, W-plunging syncline in the center of the greenstone belt is the main regional tectonic structure in the area. Disseminated sulphides, quartz-carbonate veins and sulphide stringers are hosted by upper greenschist grade felsic volcanic breccias, rhyodacitic tuffs and epiclastic sediments of turbiditic affinity such as greywacke. All of these rocks are part of the Late Archean Lower Shamvaian Unit. Porphyritic intrusive rocks of a granodiorite-tonalite-diorite suite also host some mineralization. Most of the disseminated and stringer ore consists of pyrite, with minor sphalerite, galena, chalcopyrite, pyrrhotite, arsenopyrite and molybdenite. Gangue minerals of the veins are quartz and carbonate, with minor biotite and chlorite. The deposit is structurally controlled by two sets of shear zones. The Shamva shear zone set (which includes the Shamva shear zone) is a series of WSW-trending, steeply-dipping, brittle-ductile reverse-oblique (sinistral) shear zones. Pyrite stringers and quartz veins parallel the shear-related schistosity. The Cymric shear zone set is a series of SSW-trending, steeply-dipping, brittle-ductile oblique (reverse-sinistral) shear zones, subsidiaries (Riedel) or conjugates to the Shamva shear zone set. Late, EW-trending listric reverse faults dislocated the previous shears and orebodies. Proximal hydrothermal alteration consists of extensive potassic alteration and silicification (biotite-microcline-quartz) of the sediments, grading into a distal propylitic (chlorite-epidote-pyrite) alteration. Carbonatization (with calcite-dolomite-ankerite) is ubiquitous in all rock types. The metallic signature of the bulk of the ore is Au-Ag-As-Mo-Pb-Zn-Cu-Ba. Foster *et al*. (1986) proposed a complex history of hydrothermal events beginning with synsedimentary sulphide deposition, followed by introduction of As, Ba and Mo and potassic alteration in response to high-level porphyry stock emplacement, an exhalative contribution with local enrichment of As-Pb-Zn-Cu, and final shear-related CO_2 metasomatism related to peak metamorphism. However, Jelsma *et al*. (1998) argued that shearing is the main fluid infiltration and mineralizing process at the Shamva mine.

381 Wanderer is an iron-formation-hosted (Homestake type) vein and disseminated gold deposit with a total gold content of 37 metric tons. It is located in the Shurugwi area of the Shurugwi (formerly Selukwe) greenstone belt, Zimbabwe craton, Zimbabwe. Disseminated to semi-massive sulphides and quartz veins and veinlets are hosted by greenschist grade, oxide-silicate facies iron formation of the Early Archean Sebakwian Group. Pyrite is the main ore mineral. Zones of gold concentration occur where the quartz veins intersected the oxide-silicate iron formation layers. Hydrothermal alteration consists of sulphidation and carbonate alteration (pyrite-ankerite-quartz) of the iron formation. The metallic signature of the bulk of the ore is unknown.

2105 Blanket is a Late Archean or Early Proterozoic, quartz-carbonate shear-zone-related gold deposit (also known as "greenstone-hosted quartz-carbonate vein" in Poulsen *et al.*, 2000, or "orogenic gold" in Groves *et al.*, 1998) with a total gold content of 42 metric tons. It is located in the North Western mining camp of the Gwanda area, Gwanda greenstone belt, Zimbabwe craton, Zimbabwe. A NNW-trending, moderately- to steeply-plunging, large F_2 synform is the dominant regional tectonic structure in the area. Gold deposits of the mining camp are aligned along the North West Shear Zone, a NNW-trending, low angle anastomosing deformation zone. Disseminated sulphides and quartz-carbonate veins are hosted by greenschist grade, Late Archean schistose basalts. Disseminated sulphides occur in zones of siliceous replacements with other gangue minerals such as albite, calcite, actinolite, diopside and sphene. Ore mineralogy of the veins and disseminated sulphides lodes is the same, with dominant arsenopyrite, pyrite and pyrrhotite, and minor galena and chalcopyrite. Mineralization is structurally controlled by NNW- and N-trending, steeply-dipping shears (subsidiaries of the North West Shear Zone) and their intersections. The Wenlock Fault is a late, NS-striking, vertical fault with undetermined displacements which offset the orebodies. Hydrothermal alteration consists of a proximal, high-grade envelope of silicification (quartz and brown carbonates) around the lodes, grading outward to a carbonate (calcite-biotite-quartz-plagioclase-actinolite) alteration zone, to a biotite (biotite-quartz-plagioclase-actinolite) alteration zone, to a distal propylitic assemblage of chlorite-epidote-calcite. The metallic signature of the bulk of the ore (inferred from its mineralogy) is Au-Ag-As.