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**GEOLOGICAL SURVEY OF CANADA
OPEN FILE 7766**

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FOREWORD: About this database by L.B. Chorlton

History and database contents

This publication contains a world scale database of mineral deposits that are sources or potential sources of nickel (Ni), copper (Cu), platinum group elements (PGE), and chrome (Cr), along with shallow data extractions for plotting and deposit reports. There are several distinct types of deposit included in this database, most fundamentally hosted by mafic and/or ultramafic magmatic rocks, or derived from the breakdown of such sources. Types of mineralization targeted for the compilation are (1) Ni+/-Cu+/- (PGE) and Cu-PGE rich sulphides; (2) PGE associated with minimal sulphide; and (3) Cr in high concentrations such as in chromitite, which may or may not contain economic PGE.

This database was initiated at the Geological Survey of Canada (GSC) in 1997 for the industry-sponsored World Map Project (WMP: 1997-1998). The purpose of the project was to upgrade the content of a world geological map and to compile three key world mineral deposit databases: world porphyry and related deposits (Kirkham and Dunne, 2000a; 2000b), world volcanogenic and sedimentary exhalative deposits (Jenkins and Lydon, 2002), and world nickel deposits (Eckstrand and Good, 2000a; 2000b).

The WMP was followed by the World Minerals Geoscience Database Project (WMGDP: 1998-2004), another project sponsored jointly by industry and government¹. The selection of deposit types was broadened at the request of sponsors to include Sedex, MVT, lode gold, and IOCG deposits, and the scope of the nickel database was broadened to include platinum group elements and chrome. All databases were transferred into a new, generic mineral deposit database schema (Chorlton et al., 2007) so that they could be managed using a common set of interfaces and tools. The schema and tools, described below and in the documentation, are known collectively as GlobalDBSystem. David Good continued the Ni-PGE-Cr compilation, and subsequently, contracts were issued to Alexander Yakubchuk to add data for countries of the former Soviet Union, and to Quentin Gall to augment the database for American, particularly northern Canadian, deposits. All databases were delivered to project sponsors periodically.

After the WMGDP, the mineral deposit databases were inherited by the GSC and updated as needed for the Canada-based Consolidating Canada's Geoscience Knowledge, Northern Resource Development, Northern Mineral Resource Development, and Geomapping for Energy and Minerals programs. The evolving databases were made available to the public On-Line through the NRCan Canadian and World Mineral Deposits web map portal from 2007 to 2014. NRCan now limits access to Canadian and World Mineral Deposits to Web Map Services (WMS), which can be used by external web map portals in geospatial data mashups. The aim of this Open File is to make the full database and its supporting database management utilities available to those that can use them, and to provide simple attributed derivative ESRI® Shape and Google Earth™ files, and folders of deposit and deposit group reports in html format with index.html files serving as Tables of Contents.

This database of Ni, Cu, PGE, and Cr deposits has not been updated since the end of the WMGDP for most parts of the world. The level of attribution and locational accuracy reflect the data sources from which they were compiled. There has been a dramatic increase in scientific knowledge about these deposits since the time compilation began in the mid-1990's (circa Eckstrand, 1996; Duke, 1996a, 1996b). Consequently, the way the deposits would be classified and characterized today may have evolved. Following the thinking at the beginning of the project, most deposits were classified at the highest level as being magmatic (787), laterite (262: weathering and residual enrichment of magmatic sources), sedimentary (193: mainly placer deposits), and hydrothermal (49: about half vein deposits). Deposits hosted by mafic or ultramafic rocks for which there was not enough information to classify as magmatic or hydrothermal were identified simply as having a "mafic/ultramafic association".

About one quarter of the deposits in the database fall into common groupings related to tectonic setting, magma-type, or events that have been established for some time. For those deposits, new tags reflecting these general groupings have been added to the deposit subtype detail table so that these deposits can be quickly selected by group. The new tags are: komatiitic association; rift and continental flood basalt association; meteorite impact association; and ophiolitic association, the first three following Eckstrand (1996) and Eckstrand and Hulbert (2007). The last group term was generalized from the podiform (ophiolitic) chromite category of Duke (1996b) in recognition that ophiolitic assemblages may have more than one type of chromite mineralization (e.g., Bedard et al., 2007), and may host massive sulphide. Deposits that are

associated with the Sudbury meteorite impact event (meteorite impact association) have been further sub-classified into Sudbury contact, Sudbury offset, and Sudbury footwall types; some are now recognized as being the products of equally important impact-related magmatic and hydrothermal processes and are re-classified at the top level as magmatic-hydrothermal. Pre-existing classifiers in the deposit subtype table have been retained, so that points compilers' intended to emphasize are not lost.

Compilation and the ease of linking of data source references to individual deposits, resource and production figures has been a strength of the GlobalDBSystem. The references themselves can be used to enlarge on information for individual deposit entries. In addition, Ni-Cu, PGE and Cr mineralization review papers such as Barnes and Lightfoot (2005), Cawthorn et al. (2005), Eckstrand and Hulbert (2007); Ames and Farrow (2007), Bedard et al. (2007); Layton-Matthews et al. (2007), and Leshar (2007), and other related scientific literature are valuable complements to the database.

Finally, it is emphasized that resource estimates² captured in this database are historical and do not conform to the Securities Commission National Instrument 43-101 standards, regardless of how they have been classified. In addition, there has been no dedicated effort to compile accurate production data, which would have required more human resources than were available.

GlobalDBSystem

The database schema used for this database (Chorlton et al, 2007) was developed for the WMGDP, but has been in use since the project for other deposit and occurrence databases. The web-style **Documentation** folder, modified from Laramée (2004), contains a thorough description of the WMGDP schema and supporting data management interfaces included with it in the folder **GlobalDBSystem321**, and can be read using an Internet browser by clicking on the file **default.htm**. During the WMGDP, compilers (deposit specialists) and company sponsors suggested extra topics, and thus extra detail tables, to be included in the schema. They also provided helpful feedback for the functionality of the data management interfaces. This resulted in incremental updates to both tools and schema between releases to company sponsors. World and Canadian lode gold databases (Gosselin and Dubé, 2005a, b) were released in schema 3.19, the version used for the final release 3.6 to company sponsors in 2004. The schema, now at version 3.21, release 3.7, is a major update of version 3.19, with the addition of extra tables required for the Northern Resource Development and Northern Mineral Resource Development programs.

The GlobalDBSystem schema (diagram last page of this document) includes sets of tables that can be used to describe six entities (things): deposits/occurrences, deposit groups, mines, production figures, resource figures, and references. The deposits and deposit groups modules describe locations, deposit type and subtype, names, country and province, commodities, geological ages, host rocks, related igneous rocks, mineralization styles, coincident features, radiometric dates, tectonic settings, shape and dimensions, NTS areas, qualified comments, links to other databases, geophysical /geochemical signature, sample geochemistry, and compilation stage and progress. The service tables: entities, tabledoc, links, columndoc, tabpages, and lookup explicitly define the entities, tables, links between tables, fields, interface tab pages, and the lookup tables, to completely define the schema. Two additional service tables: dbversion and unitcvsn, provide the title, version and authors of the current database, and conversion factors (to metric) for the production and resource figures, respectively. The service tables, described above, should be consulted before transferring this data across database management programs and platforms, or rebuilding the data management applications when the application interfaces supplied with this Open File can no longer be used because of changes to the Windows® operating system.

Standalone custom Windows® application interfaces, developed by Robert M. Laramée³, enable a user with a 32 bit computer equipped with the Windows operating system to browse, filter, and obtain output from this database. They are included in this Open File in the folder **GlobalDBSystem321**. All applications require an ADO connection file, or Microsoft® data link, to each database for which they are to be used, created in the folder under the same folder that houses the application interfaces⁴. By convention, WMGDP compilers installed a folder GlobalDBSystem under Program Files on the local C: drive, but the GlobalDBSystem321 folder and files can be saved anywhere and no installation is required. Instructions for creating the mandatory Microsoft data link file are included under "**Defining database aliases**" in the **Documentation\default.htm** and in the standalone file **HowtoADO.rtf**.

GShellBrowser allows a user to browse the database record by record, and offers the same tab page view of the data offered by the original data entry interface, GShellADO, known in short form as **GShell**. The latter only works under the Windows® XP and earlier Windows operating systems, and has been included in this package for users that still have a Windows XP computer (disconnected from the Internet because Microsoft no longer supports it by supplying Security updates), or have an XP emulator installed. GQueryADO, known as **GQuery** for short, provides a user the means to filter the occurrences based on attribute values, to build a template for a custom spreadsheet and export this spreadsheet or a

default summary spreadsheet, and to create folders of occurrence reports for the full set or subsets of the deposits in the database. Both GShellBrowser and GQuery work under Windows 7 once the pre-requisite ADO connection file has been created.

There are three additional programs in GlobalDBSystem321: **GQ_ADO_XtraTables**, **Documenter**, and **GDBSTools**. The program GQ_ADO_XtraTables builds or rebuilds summary tables for the use of GQuery, which improved performance over an older method of creating these summary tables on the fly. The program Documenter allows users to examine each table and field of each category of table (Data, Junction, Lookup, and Service depending on their roles), which complements the more general web page style documentation. Finally, GDBSTools provides a database manager with utilities that can check the internal integrity of the database, time stamp a new release and export SQL data scripts of the contents of the connected database. These SQL scripts can be used to populate a new database created with GlobalDBSchema321.sql in one of many SQL-enabled relational database management systems available today⁵.

FOOTNOTES

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²DISCLAIMER – RESOURCE/RESERVES DATA

Her Majesty the Queen in Right of Canada, represented by the Minister of Natural Resources (NRCan), does not warrant or guarantee the accuracy, completeness or fitness for any purpose of Reserve and Resource information (Data) contained in this database, including whether the Data is compliant with any securities regulations or standards, and NRCan does not assume any liability with respect to any damage or loss incurred as a result of the use made of the Data.

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.

³DISCLAIMER – APPLICATIONS AND DATABASE

The Geological Survey of Canada (GSC) has endeavored to develop and produce this product with a minimum of errors. GSC does not, however, warrant that the product is error free nor will GSC or its Minister and officials accept liability for any loss of profits or revenue, or any other form of loss or damage relating to the use of this product.

⁴ CAUTION: UTILITIES MAY NOT WORK ON SOME WINDOWS COMPUTERS

While the WMGDP and successive projects have been successfully using Global DBSystem since the year 2000, there are now limitations due to the evolution of the Windows operating system and the introduction of 64 bit computers. In order to use GShellBrowser.exe, GQueryADO.exe, GQ_ADO_XtraTables.exe, Documenter.exe, and GDBSTools.exe, you must first create a data link file to allow connection between the program and the database (see “Defining database aliases” under Documentation). It is known that these instructions will not work on Windows 64 bit computers, and the interfaces will not work on computers with operating systems other than Windows®. At present, the data entry and browsing program GShellADO (GShell) will not work under Windows Operating Systems greater than XP, but is included here for anyone who might have an older operating system on a computer disconnected from the Internet or who has an XP emulator.

⁵ LOADING A WMGDP DATABASE USING SQL SCRIPTS

SQL scripts are provided here for anyone with an SQL-enabled database management system (DBMS) and the technical skill to modify the scripts according to the requirements of their software. We have loaded the data onto InterBase and PostgreSQL for the use of applications that emulate GQuery for the Internet and the contents of folders for loading the schema reflect our own processes. There are subtle differences in the scripts for loading the database schema among DBMSs, and some tweaks applied to the schemas supplied in this publication were specific to the Query applications. The scripts for inserting the data into the empty database schema are standard for all databases, and each thematic database has its own INSERT_DATA script that can be used once the empty database has been created.

A note of caution: it would be tempting to try to import the SQL contents of all of the mineral deposit databases in this Open File series (e.g. 7686, 7688, 7708, 7764, 7773, 7775 and so on) into one big database. This will not work because the entities of each separate database are indexed independently from each other, having been compiled on disconnected personal computers at many different localities. In addition, the metadata file dbversion records different compilers and titles for each deposit database. Thus, without substantial and careful re-indexing primary keys will clash between the different databases.

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