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WORLD SEDIMENTARY EXHALATIVE (SEDEX) DEPOSIT DATABASE

D.F. Sangster

FOREWORD: About this database by L.B. Chorlton

Sedimentary exhalative (Sedex) deposits are a major global source of lead and zinc, and some deposits contain significant amounts of silver. The compilation of the Sedex deposit database was commissioned in November 1998 for the World Mineral Geoscience Database Project (WMGDP: 1998–2004)[1], and the majority of the compilation occurred from March, 1999 through March, 2000. The names and locations of the first 83 deposits were derived from Jenkins and Lydon (2002), compiled under the precursor World Map Project (1996-1997), many undoubtedly from prior compilations at the Minerals Resources Division, Geological Survey of Canada. Data extracts from this database as compiled up to 2000 were used as a foundation for Sangster and Hillary (2000), and were used to initially populate the appendix of Leach et al. (2005). Twenty-one additional Sedex deposits from this appendix were recently imported back into this database. Significant reviews of Sedex deposit types by Sangster (1990), Lydon (1996), Leach et al. (2005), Goodfellow and Lydon (2007) complement this database and should be referred to for geoscientific context.

Sedex deposits can be broadly defined as sulphide deposits formed in sedimentary basins due to the submarine venting of hydrothermal fluids, and whose principal ore minerals are sphalerite and galena (Lydon, 1996). The consensus is that Sedex deposits are found in two broad tectonic settings, either intracratonic rifts or rifted passive continental margins, generally in the upper rift-cover sequences, and in both cases in areas affected by syn-sedimentary faults. The most common hosts are a wide range of siliciclastic rocks such as shale, siltstone, mudstone and sandstone, but carbonate units within siliciclastics are also hosts in some deposits. Mineralization is either stratiform, due either to deposition from metalliferous brine or syn-sedimentary sub-seafloor replacement, or discordant in the less commonly observed vent facies. Opinions vary on the bases for sub-classification of Sedex deposits (Leach et al., 2005), but Sangster and Hillary (2000) noticed a natural subdivision based on ore minerals during the compilation process and these subtypes are retained in this database. Finally, the timing of the mineralization coincides with the sedimentation of the hosts, in contrast to that of MVT deposits which is largely epigenetic. However, the timing and classification may be contentious in some cases, especially in Ireland. In this Open File database series, sediment-hosted lead-zinc deposits in Ireland are included in the World Mississippi Valley-type deposit database (Sangster, 2015), wherein some are sub-classified as Irish-type. The presence of local magmatic horizons in some Sedex environments, and mineralization assemblages which include copper minerals, lead to qualification of several Sedex deposits as having a volcanic influence (source: Leach et al., 2005). Definitive classification, even between Sedex and MVT, may be especially difficult in deposits having a strong structural and metamorphic overprint.

At the time the majority of this database was compiled, it was difficult to obtain exact locations for every deposit, or to establish exactly what mineralization zone or piece of infrastructure was located by the data source. Many geographic coordinates were rounded to the nearest minute, and the coordinates for additions from Leach et al. (2005) have been rounded to two decimal places. Locations are therefore approximate. It must also be emphasized that resource figures in this database are not current and do not comply with current standards for resource reporting [2]. They should be classified as historical resources and the original data source cited if they are re-reported. None fit the current definition of economic reserve.

These databases are never complete nor are they up-to-date unless resources are available for ongoing maintenance. Mineral exploration, geological mapping and academic study will continue to reveal new facts, and resource and production figures will require periodic revision. However, a compilation of nearly two thirds of all known deposits constitutes the majority of the effort necessary to make a useful global scale database, and it is hoped that this database becomes a useful framework on which to build. The relational nature of the database makes it easy to attach, classify, record and reference many types of ages, ore mineralogy, or stratigraphic and structural details for a given deposit, for example.

The first version of this database appeared on Natural Resources Canada's Geoscience Data Repository web portal: World and Canadian Minerals Deposits in 2007, and was updated in 2008. Geospatial excerpts from the database were made downloadable, and both these files and Sedex points when added to the map portal window were hot-linked to full database reports on an NRCan server. The only access NRCan is now planning to provide for World and Canadian deposit databases is through Web Map Services (WMS). The WMS have been used by external web map portals which display points with no attribute data as components of geospatial "mashups". The aim of this Open File is to make the full database and its supporting database management utilities available, and to provide simple attributed derivative ESRI®

Shape and Google Earth™ files, as well as folders of deposit and deposit group reports accompanied by index.html files that serve as Tables of Contents.

The database schema (Chorlton et al, 2007) used for this database was developed for the WMGDP, and used to bring pre-existing but diversely structured mineral deposit and occurrence databases into a uniform structure for which the same database management tools could be used. The web-style **Documentation** folder, modified from Laramée (2004), contains a thorough description of the WMGDP schema and supporting data management interfaces 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 topics to be included in the schema. They also provided helpful feedback for the functionality of the data management interfaces. This resulted in incremental updates 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 compilations under the Northern Resource Development and Northern Mineral Resource Development programs.

The GlobalDB System schema (diagram page 5) 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 data, 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 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. Laramée[3], enable a user with a 32 bit computer equipped with the Windows operating system to browse, filter, and obtain output from this database. These interfaces 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, and should for convenience be created in the folder that houses the application interfaces[4]. 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 who 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 on a 32 bit computer once the pre-requisite ADO connection file has been created.

There are three additional programs in GlobalDBSystem321: **GQ_ADO_XtraTables**, **Documenter**, and **GBDSTools**. 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 today[5].

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FOOTNOTES

[1]ACKNOWLEDGEMENTS

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[2]DISCLAIMER – 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.

[3] DISCLAIMER – 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.

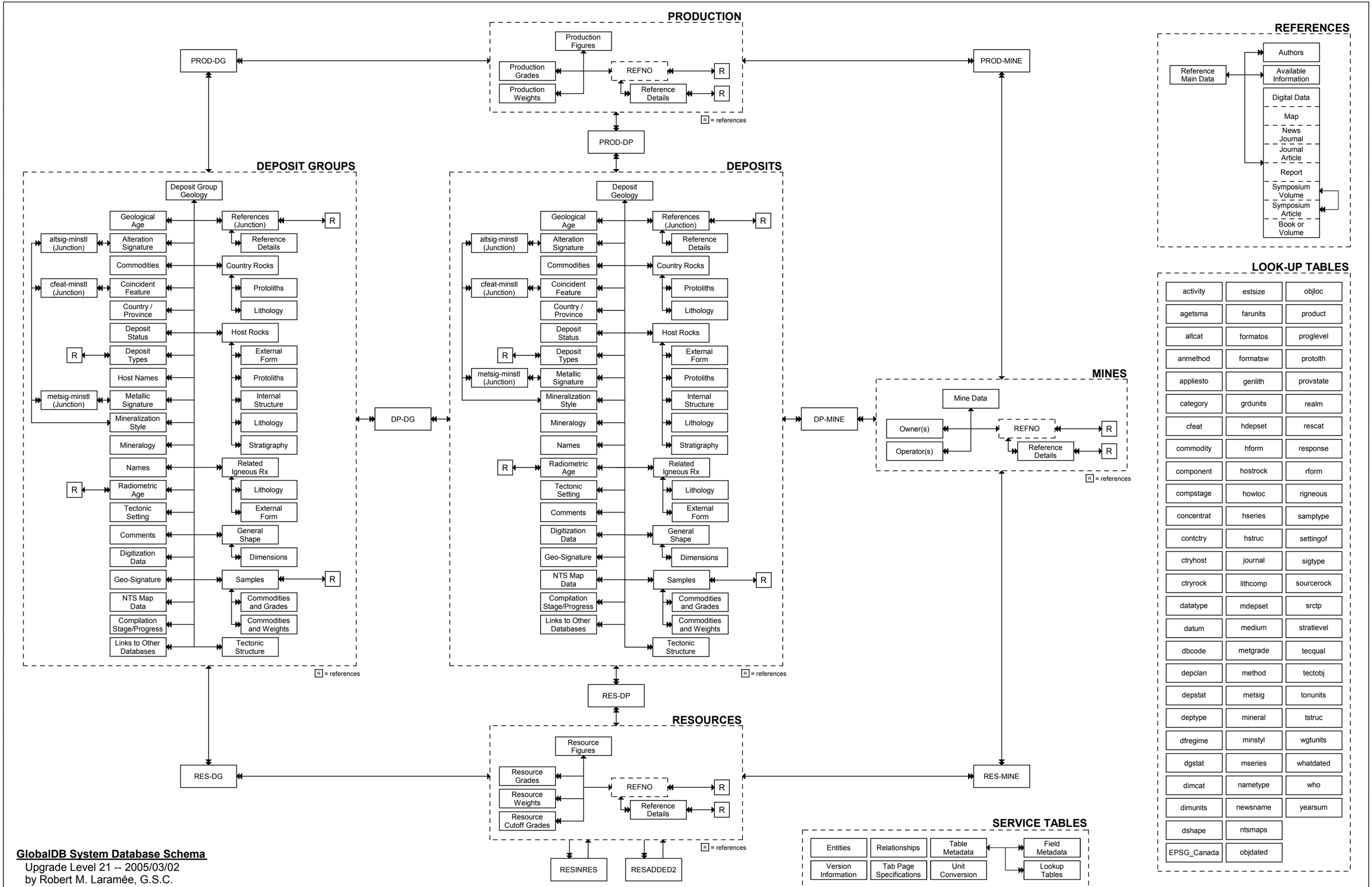
[4] CAUTION: UTILITIES MAY NOT WORK ON SOME WINDOWS COMPUTERS

While the WMGDP and successive projects have been successfully using Global DBSystem since the year 2000, there are now imitations 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, and only one insert script is supplied per database.

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, and were compiled on disconnected computers by compilers in many different places. In addition, the metadata file dbversion records different compilers and titles for each database. Thus, without substantial and careful re-indexing primary keys will clash between the different databases.



GlobalDB System Database Schema

Upgrade Level 21 -- 2005/03/02

by Robert M. Laramée, G.S.C.