PINCOCK perspectives

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Basic Drill Hole Database Setup: simple but.........

Introduction

In modern exploration, feasibility studies, and mine site evaluations, drilling is paramount in gathering and assessing the vital information needed for a project. Large amounts of information are generated before, during and after a drilling program is finalized. To complicate matters there is hardly ever a single drilling program; most of the time several campaigns are needed at different stages of discovery and evaluation. Furthermore, in older mining districts or older existing mines, historical data is also available that has an impact on future plans, interpretations and models. The drill hole database serves as the foundation on which all subsequent engineering rests.

With the current vast utilization of computers and databases one would expect that exploration drilling data would be properly gathered and stored by companies and mine operators. This is the case most of the time; however, traveling around the world conducting inspections or receiving data for review or modeling we occasionally run into fairly inadequate database setups. This makes it very difficult to perform even the most basic checks or input data for modeling purposes. Consequently, extensive data checks, validations, manipulations or even manual re-entering of original data are necessary to turn the available data into adequate and usable formats.

Setting Up a Basic Drill Hole Database

PAH is sometimes asked by clients the question… How to set up a simple and proper drill hole database that will work in most circumstances and that can be sufficiently robust for geologic and mine models, yet simple enough for just about anybody to properly input useful data? This question is even more relevant where computerization is less prevalent such as projects in Russia and the former Soviet Union Republics where drill hole data is, for the most part, still on paper!

A drill hole database needs to be simple, consistent and flexible. Formats and parameters need to be defined as far in advance as possible. However, flexibility is of primary importance as additions, subtractions and modifications will occur as the drilling program advances or new programs are put in place.

PAH NEWS PIX

- *ENERGY BILL PASSES HOUSE AND SENATE*
- *EU'S REACH COULD INCREASE MINERAL EXPORT COSTS*
- *RIO NEGRO BANS CYANIDE USE*

CALENDAR

- ***Gold & Precious Metals Investment Conference***
  September 7–8, 2005
  The Mirage
  Las Vegas, Nevada
  e-mail: iiconf@iiconf.com

- ***XXVII Convencion Minera - EXTEMIN 2005***
  September 12–16, 2005
  Arequipa (TECSUP)
  Lima, Peru
  e-mail: msovero@iimp.org.pe

- ***Exposibram XI Brazilian Mining Exhibit***
  September 20–23, 2005
  Exhibition Pavillion of Expominas
  Minas Gerais, Brazil
  e-mail: singular@aul.com.br

- ***XXVI International Mining Congress (Expominex 2005)***
  October 12–15, 2005
  World Trade Centre
  Boca del Rio, Veracruz, Mexico
  e-mail: coordinacion@expominex2005.com.mx

■ ***ENERGY BILL PASSES HOUSE AND SENATE***

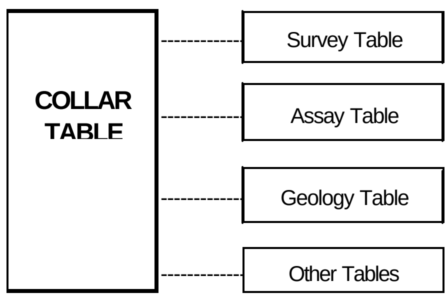
The Energy Policy Act of 2005 has passed the House and Senate and is headed to the White House for President Bush's signature. Bush stated that the energy bill will give America a comprehensive national energy strategy for the first time in more than a decade and is critically important to our long-term national and economic security. The National Mining Association supports the bill saying that it will lessen the county's dependence on foreign energy by spurring the use of coal. The bill promises a cleaner environment by enabling power companies to generate the electricity with advanced clean coal technologies. The bill contains nearly $2 billion for the Clean Coal Power Initiative for developing coal-based gasification technology and loan guarantees for petroleum coke gasification projects. It also contains a proposal for a coalbed methane study and provisions for developing clean coal-fired plants across the county, including one for Alaska and the Upper Prairie Region of North Dakota, South Dakota, Nebraska, Kansas and Oklahoma.

■ ***EU'S REACH COULD INCREASE MINERAL EXPORT COSTS***

The European Union's (EU) proposed chemical legislation REACH (Registration, Evaluation and Authorization of Chemicals) could result in higher costs to import mineral products into the trade bloc according to Chile's state copper commission Cochilco. Under REACH, companies that manufacture or export more than 1 t/y of a chemical substance to the EU would be required to register it in a central database which would require chemical analysis of mining products in EU laboratories. The higher volume imported, the greater the costs, which would likely be shared by consumers and producers. Cochilco believes the legislation could severely limit access to the European market of Chilean mineral products. The legislation is due for initial reading in October 2005 and would start being implemented in 2007, with full compliance scheduled for 2012.

Drill hole databases are hierarchical by design. The header or collar table controls the database and allows the maintenance of down hole information in an organized way. Typically, the hole-ID (or hole "name") is the main element to link the down hole information for a drill hole. Other typical information is the down hole surveys, assays, geochemistry, geological and geotechnical data. A basic drill hole database organization is depicted in Figure 1.

Figure 1
Basic Drill Hole Database Setup
Drill Hole Database Hierarchical Structure



The header or collar table must contain hole-id, x, y, z collar coordinates and length of the hole. Other optional fields to have are project, area, year, hole-type, etc. The hole-ID should be alphanumeric or numeric with no blank spaces or special characters. Coordinate fields should be numeric with no commas. Some countries utilize commas as decimal place dividers which programs confuse with comma-delimited fields causing problems in data loading; this should be avoided. An example of a typical Header table field set up is shown in Table 1.

The down hole survey data allows software programs to graphically depict deviation both of dip and azimuth to show a realistic hole trace location in 2D and 3D. The down hole deviation is commonly input as a distance down hole or as

Table 1
Basic Drill Hole Database Setup
Collar (Header) Table

Hole-ID	Easting (x)	Northing (y)	Elevation (z)	Length	Area	Year Drilled	Other
DDH012	350343.45	768675.73	1544.38	203.1	North	1998	
DDH051	349550.14	766345.29	1934.72	315.5	South	2002	
RCH103	349280.53	766150.85	1775.47	275.8	South	2004	

Table 2
Basic Drill Hole Database Setup
Survey Table

Hole-ID	Distance	Azimuth	Dip
DDH012	0	0	-90
DDH012	50	75.4	-89.4
DDH012	100	127.0	-87.3
DDH012	150	136.5	-88.1
DDH012	200	153.7	-86.8
DDH051	0	80.0	-60.0
DDH051	50	75.0	-58.7
DDH051	100	74.5	-58.1
DDH051	150	73.0	-57.6
DDH051	200	79.8	-57.6
DDH051	250	83.0	-56.3
DDH051	300	84.2	-55.8
RCH103	0	0	-90

a “from and to” interval. Some programs also allow for an x-y-z location of down hole points. Some down hole measurement devices provide very detailed measurements (down to tiny fractions of meters or feet) at very short spacing. It is important to simplify these measurements to more manageable intervals (several meters or feet) to avoid overloading the database and graphics memory.

Down hole survey table fields also include, azimuth and dip. Both azimuth and dip should be numeric in degrees: azimuth with values 0 to 360 and dip with values -90 to 90. Down inclined holes are normally negative; up-inclined holes are positive numbers although this may vary depending on the modeling software in use. Relative orientations such as N30E or S67W must be avoided. A typical Survey table fields example is shown in table 2.

Assay data requirements can vary significantly depending on the project. For metal mines it will include the metals of interest and other elements that impact the project. In coal mining the quality analyses are stored in the quality or assay table. Other variables include geochemistry data relevant to acid generation and neutralizing potential that can be stored in the assay table or in a separate table. Geologic data such as lithology is often included in a separate table because the intervals may not be the same as the assay intervals. For ease of data manipulation a lithology code (text and/or numeric), which is a short version of the lithology description, is generally developed. Tables for other data such as geotechnical data can

Table 3
Basic Drill Hole Database Setup
Assay (Quality) Table

Hole-ID	From	To	Interval	Lithology	Lith Code	Metal 1	Metal 2	Other
DDH012	95.1	96.0	0.9	quartz vein	QV	3.420	59.40	
DDH012	96.0	96.5	0.5	granite	G	0.150	12.34	
DDH012	96.5	97.5	1.0	quartz vein	QV	38.530	207.20	
DDH012	97.5	98.3	0.8	quartz vein	QV	12.780	135.60	
RCH103	0.0	1.5	1.5	granite	G	0.001	0.01	
RCH103	1.5	3.0	1.5	granite	G	0.001	0.01	
RCH103	3.0	4.5	1.5	granite	G	0.001	0.01	
RCH103	4.5	6.0	1.5	granite	G	0.001	0.01	
RCH103	6.0	7.5	1.5	granite	G	0.035	0.16	

Table 4
Basic Drill Hole Database Setup
Geology Table

Hole-ID	From	To	Interval	Lithology	Lith Code	Other
DDH012	0.0	5.3	5.3	overburden	OB	
DDH012	5.3	95.1	89.8	granite	G	
DDH012	95.1	96.0	0.9	quartz vein	QV	
DDH012	96.0	96.5	0.5	granite	G	
DDH012	96.5	98.3	1.8	quartz vein	QV	
DDH012	97.5	98.3	0.8	quartz vein	QV	
DDH012	98.3	184.3	86.0	gneiss	GN	
DDH012	184.3	190.1	5.8	quartz vein	QV	
DDH012	190.1	203.1	13.0	gneiss	GN	
RCH103	0.0	3.2	3.2	overburden	OB	
RCH103	3.2	25.8	22.6	granite	G	

■ ***RIO NEGRO BANS CYANIDE USE***

Argentina’s southern province of Rio Negro has passed a bill banning cyanide and mercury use in metallic minerals mining, production and industrialization. According to the new law, companies or individuals who own first category mineral deposit concessions or those who industrialize the minerals must adapt their processes to the new regulation. The law was approved despite efforts by a group of opposition lawmakers who proposed that international quality certification ISO 14001 be required for mining activities using cyanide. Caem, Argentina’s mining investors chamber, believes gold mining cannot be carried out in Rio Negro due to the ban as miners need to use cyanide to make gold mining profitable.

PAH HAS MOVED:

Our office is now located at:
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Tel: 303-986-6950
Fax: 303-987-8907

Minerals Corner—

Jamesonite
$PB_4FeSb_6S_{14}$, Lead Iron Antimony Sulfide

Jamesonite is a metallic fibrous gray mineral formed generally from hydrothermal fluids. Jamesonite is named for Robert Jameson, a Scottish mineralogist. It is one the few sulfide minerals that form fine acicular crystals that appear as hair-like fibers. The fibers can very in thickness. Jamesonite also forms larger prismatic crystals that can be confused with stibnite. Jamesonite forms in low temperature hydrothermal veins. It is commonly associated with other lead sulfosalts. Because of it forming hair like needles (acicular) it is often confused with millerite. It can be separated by taking a closer look at its color, Jameonite is gray-black and millerite is golden.

be created as needed for the project. Table 3 shows an example of an Assay table fields, and Table 4 shows an example of a Geology table fields.

The time that can wasted fixing a bad drill hole database set up is enormous. In addition, the potential for errors both during data entry and during the performance of modifications to "fix" a database is quite large. A good set up from the beginning saves time, money, and later headaches as the database grows.

Basic Things to Avoid (or follow) When Setting Up a Drill Hole Database

Very common problems include the lack of consistency in data entry (e.g. different code spelling for same items; upper case and/or lower case codes for same data; use of relative orientations instead of actual azimuth and dip data; etc.), the failure to record interval data (i.e. from's and to's) together with the Hole-id identification, or the mixing of down hole deviation survey data with some holes recorded as down hole distances and others as intervals. Also, duplicate intervals must be avoided; for example when maintaining assay checks or assay duplicates the repetition of the same interval (i.e. duplicates "from" and "to") can be avoided just by creating more columns for the extra data. Other examples are:

- Set up procedures and flexible coding schemes early on in the program
- Use only standard alpha numeric values in fields; avoid the use of special characters such as ?, !, etc.
- Maintain consistency throughout the program
- Hole-IDs must be consistent throughout the database
- Set up data entry procedures, accepted numeric value ranges and accepted codes
- Implement data validation procedures
- Never use relative azimuth or dip angles (e.g. N50E; -55NW)
- Allow database access to key people only
- Hole interval From's and To's must be in separate columns
- Have all down hole geological intervals represented without leaving gaps.
- Never have characters on coordinate data (e.g. 125354N), or any other numeric data (e.g. hole length 215m)
- Be consistent in the use of upper and lower case as these are interpreted differently
- Do not use commas in numeric fields
- Make sure assay units are consistent and do not vary between measurements such as ppm, opt and percent

Following these basic guidelines can avoid the possibility of ending up with a troubled and possibly unreliable resource estimate. In fact, few very basic steps can lead to good (yet simple) drill hole data bases. Accuracy and consistency in data entry from the beginning of drill programs and avoidance of multiple data handlings and manipulations later tend to maintain database integrity and reliability which eventually helps in project modeling.

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