British Columbia Geological Survey
Geological Fieldwork 1986

MINFILE-REDESIGN AND PROGRESS REPORT*

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INTRODUCTION

Important progress has been made in the redesign of MINFILE during the past year. An "ideal" database model (Figure 7-2-1) was drafted for database navigation, several new coding forms (Figures 7-2-2 and 7-2-3) and a new coding manual were completed, and all existing data that resided on the IBM mainframe were downloaded into the VAX in the new format. In addition, under the Canada/British Columbia Mineral Development Agreement (MDA), recoding of all mineral occurrences in MINFILE began. Two open file publications were also prepared, one on platinum and one on magnesite occurrences (in press) in the province.

DATABASE DESIGN

"A 'mineral deposit' includes naturally occurring deposits of both metallic and industrial minerals and of the fossil fuels and is defined as a volume of mineral-bearing material of economic or scientific interest sufficiently homogeneous in the opinion of the file-builder to be considered an entity" (Geological Survey of Canada, Paper 78-26).

This definition is used to form the basis of MINFILE occurrences. When the redesign of *MINFILE* commenced it was decided to use a relational database model and techniques for the database design.

The ideal design of the database, in terms of an "entity-relationship" model, is illustrated in Figure 7-2-1. The square boxes represent entities, diamond-shaped boxes show the relationship of the entity to mineral deposits and circles represent attributes of the entity. The way the "entity-relationship" model works is illustrated by the following example; a deposit type may contain many mineral deposits and a mineral deposit may be characterized as more than one deposit type, for example, "vein" and "stockwork".

Attributes can be generally thought of as deposit type codes and descriptions of all the tables that make up the relational database.

COMPUTER SOFTWARE

CINCOM Systems is the vendor of our computer software. The main product, called ULTRA, is a directory driven database and information management system designed for the VAX minicomputer using the VMS operating system.

The ULTRA directory is the central point of control for the system. Its integration with Logical User Views (LUV) insulates all users from the physical structure of the database. A subsequent change to a logical view usually does not require programs to be changed or recompiled.

ULTRA allows standard application programs written in COBOL, FORTRAN, or BASIC to access the database management system (DBMS) without including logic to physically navigate the DBMS. The programmer simply accesses the logical view of the data needed. MANTIS, another CINCOM product, is a fourth generation language that is able to interact directly with the LUV and DBMS.

The new MINFILE programs were written in MANTIS with the exception of a routine to convert latitude/longitude to UTM which is written in FORTRAN. After initial testing of the report outputs it was found that MANTIS could not easily produce the type of output reports required. It was decided that COBOL was the most logical alternative.

DATA COLLECTION

CODING FORMS

During the past 18 months the coding form has undergone five revisions, with the latest version illustrated in Figure 7-2-2. Production and reserve information is input from separate coding forms (*see* detail on reserves following). The information indicated by the dashed lines on the main coding form represents information that is collected for the geologists (coders) use only and is not stored in the computer.

NEW FIELDS

The reader is referred to the MINFILE coding manual (in press) for detailed decriptions of fields, codes and tables. Below is a brief summary of the significant changes.

STATUS

When a property has reached the development stage and beyond, extensive work has usually been performed, often including bulk sampling or production. It is now possible to record whether this work has been conducted on surface or underground.

MINERALIZATION

We are now gathering information on gangue and alteration minerals as well as information on the economic mineralization. The age of the mineralization and isotopic dating of the deposit are also recorded.

GEOMETRY

Information is now being gathered on the geometry of the mineral deposit. This information includes shape of the deposit (for example, tabular), modifiers to the shape (for example, faulted), the dimensions of the deposit and the attitude.

HOST ROCK

The host rock section of the coding form is divided into three sections: dominant rock type; stratigraphy; and igneous/metamorphic/other relationships. Data are also gathered on the age of the host rock.

GEOLOGICAL SETTING

Information on the geological setting of the mineral occurrence is now gathered and stored. This includes the tectonic belt that the mineral occurrence resides in, the terrane associated with the occurrence, the physiographic region and any available data on metamorphic relationships and grades.

TEXT

One of the strong features of the system is the ability to input an unlimited amount of textual information.

* This project is a contribution to the Canada/British Columbia Mineral Development Agreement.
British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1986, Paper 1987-1.

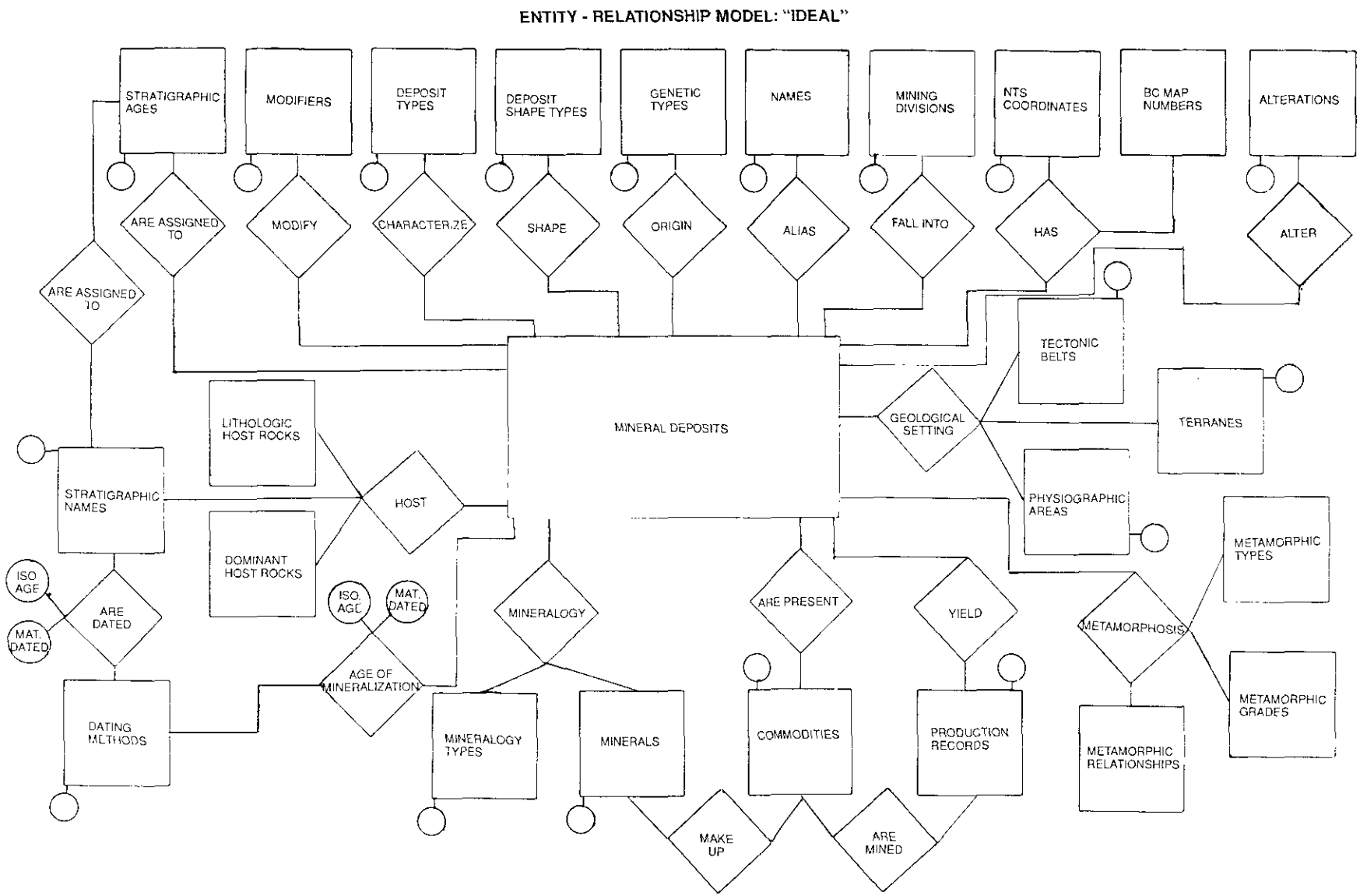

Figure 7-2-1. Entity-Relationship Model: "Ideal".

Province of British Columbia — Ministry of Energy Mines and Petroleum Resources

GEOLOGICAL SURVEY BRANCH

MINFILE

IDENTIFICATION

MINFILE NO. _____ NATIONAL MINERAL INVENTORY NO. _____

NAMES _____

CLAIMS _____

OWNER _____

OPERATOR _____

STATUS SHOWing PROSpect DEveloped PRospect O U PRODucer O U PAst PRoducer

LOCATION

NTS _____ MINING DIVISION _____

LATITUDE ____ ° ____ ' ____ " LONGITUDE ____ ° ____ ' ____ " ELEVATION _____ metres

UTM ZONE _____ NORTHING _____ EASTING _____

LOCATION CERTAINTY 1 WITHIN 500 m 2 WITHIN 1 km 3 WITHIN 5 km

COMMENT ON IDENTITY _____

MINERAL OCCURRENCE

COMMODITIES _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

listed according to economic importance

RESERVES TYPE ___ TONNES _____ GRADES _____

OR BEST ASSAY DATA _____

COMMENTS _____

PRODUCTION YEARS _____ TONNES MINED _____

METALS RECOVERED _____

MINERALOGY ECONOMIC MINERALS _____ _____ _____ _____ _____

COMMENTS _____

GANGUE MINERALS _____ _____ _____ _____ _____

COMMENTS _____

ALTERATION MINERALS _____ _____ _____ _____ _____

COMMENTS _____

ALTERATION TYPE _____ _____

AGE OF MINERALIZATION _____ ISOTOPIC AGE _____

DATING METHOD ___ _____ MATERIAL DATED _____

DEPOSIT TYPE
- 01 VEIN
- 02 STOCKWORK
- 03 PORPHYRY
- 04 PIPE
- 05 IGNEOUS
- 06 SKARN
- 07 PEGMATITE
- 08 STRATABOUND
- 09 STRATIFORM
- 10 CONCORDANT
- 11 PLACER
- 12 PRECIPITATE
- 13 DISSEMINATED
- 14 MASSIVE
- 15 UNKNOWN
- 16 UNCLASSIFIED

GENETIC TYPE
- 1 REPLACEMENT
- 2 MAGMATIC
- 3 VOLCANOGENIC
- 4 SEDIMENTARY
- 5 SYNGENETIC
- 6 EPIGENETIC
- 7 HYDROTHERMAL
- 8 RESIDUAL
- 9 UNKNOWN (UNCLASSIFIED)

SHAPE OF DEPOSIT 1 REGULAR 2 TABULAR 3 CYLINDRICAL 4 BLADED 5 IRREGULAR

MODIFIER 1 FOLDED 2 FAULTED 3 FRACTURED 4 SHEARED 5 OTHER _____

DIMENSION _____ _____ _____

ATTITUDE _____ _____ 1 STRIKE/DIP 2 TREND/PLUNGE

COMMENT ON STRUCTURE _____

HOST ROCKS

A. DOMINANT ROCK TYPE 1 SEDIMENTARY 2 PLUTONIC 3 VOLCANIC 4 METASEDIMENTARY 5 METAPLUTONIC 6 METAVOLCANIC 7 METAMORPHIC

B. SUPERGROUP _____ GROUP _____

FORMATION _____ MEMBER _____

AGE _____ ISOTOPIC AGE _____ _____

DATING METHOD ___ _____ MATERIAL DATED _____

ROCK TYPE _____ _____ _____ _____ _____

LITHOLOGY _____ _____

C. IGNEOUS/METAMORPHIC/OTHER _____

AGE _____ ISOTOPIC AGE _____

DATING METHOD ___ _____ MATERIAL DATED _____

ROCK TYPE _____ _____ _____ _____ _____

LITHOLOGY _____ _____

COMMENT ON HOST ROCK ___ _____ ___ _____

GEOLOGICAL SETTING

TECTONIC BELT INsular OMineca TERRANE _____

Coast Crystalline EAstern _____

InterMontane

PHYSIOGRAPHIC AREA _____ _____

METAMORPHISM: TYPE 1 CONTACT 2 REGIONAL RELATIONSHIP 1 PRE-MINERALIZATION 2 SYN-MINERALIZATION 3 POST-MINERALIZATION

GRADE Hornfels BlueSchist AMphibolite EClogite SubBituminous

Zeolite GreenSchist Granulite Lignite Low Vol. bituminous

Mod. Vol. bituminous Hi Vol. bituminous SemiAnthracite ANthracite

COMMENT ON GEOLOGICAL SETTING _____

CAPSULE GEOLOGY _____

BIBLIOGRAPHY (place 'best' or most recent source first)

CODED BY _____ initials FIELD CHECKED: YES ☐ NO ☐ DATE CODED _____ yr ____ mo ____ day

REVISED BY _____ initials FIELD CHECKED: YES ☐ NO ☐ DATE CODED _____ yr ____ mo ____ day

Figure 7-2-2. Coding form.

RESERVES

A new reserves coding form has been designed (*see* Figure 7-2-3) and has seen limited distribution. In the previous versions of MINFILE all reserve calculations for a property were saved no matter how many or what the status of the reserves were. Under the new design only two reserve figures for a given year per ore zone may be entered for any single reserve category. Only the most recent year in each category will be saved. A new category called "Best Assay" has been added with its associated sampling method being noted. The best assay category is for significant properties which have not had enough development work completed on them for formal reserve figures to be calculated. After formal reserve figures for the property have been released the best assay category will be deleted from core storage for that mineral occurrence. Another new feature which has just been introduced is a confidence factor. This is meant to give the end-users of MINFILE an indication of the reliability of the reserve measurements. No reflection is intended on who calculated the reserve figures, but is strictly a judgment value assigned by the coder, based on reliability of information. For example, data from a feasibility study are assigned a higher reliability than information from a press release.

DATA RETRIEVAL

Two methods exist for data retrieval. SPECTRA, a CINCOM product which can be used for conducting *ad hoc* enquries on any field in the database, and through the use of preprogrammed searches. Only the preprogrammed searches will be dealt with here. The enquiry system is based on the use of Boolean logic to search and reduce the resultant deposit file. This involves the use of "and", "or" and "not" conditions to reduce a file. For example, if a list is requested for deposits containing gold "and" silver, then all deposits that contain both commodities will be shown. If a list is requested for deposits containing gold 'or' silver, then all deposits containing one or the other commodity will be returned.

The enquiry process begins when the area selection screen is returned. The user initially has the option of narrowing the search by choosing an area either by latitude/longitude; UTM; or NTS designations. This can be further used in conjunction with either mining divisions, physiographic regions, tectonic belts or terranes. The default is the whole province. When a result is obtained a new menu appears listing the twelve preprogrammed searches (Table 7-2-1). At any stage of the search the user has the option of browsing any

Ministry of Energy, Mines and Petroleum Resources

GEOLOGICAL SURVEY BRANCH

MINFILE RESERVES

MINFILE NUMBER ..... NAME .....

ORE ZONE NAME ..... CATEGORY: MR MG IN IF UN BA

If BA, sample type = ...

	CONFID. FACTOR	YEAR	QUANTITY (TONNES)	COMMODITY/GRADE (PRECIOUS METALS IN GRAMS, ALL OTHERS PER CENT)		
A	1 2 3					
	COMMENTS					
	REFERENCE					
B	1 2 3					
	COMMENTS					
	REFERENCE					

CODED BY ..... (initials) DATE CODED ..... yr ..... mo ..... day

CONFIDENCE FACTOR:
1 Probably reliable
2 Possibly reliable
3 Unknown

SAMPLE TYPES:

GRAB	Grab
CHIP	Chip
CHNL	Channel
BULK	Bulk Sample
ROCK	Rock Geochemistry
DRAD	Drill

NOTE For any given reserve category only two figures for any given year per ore zone may exist

Figure 7-2-3. MINFILE reserves.

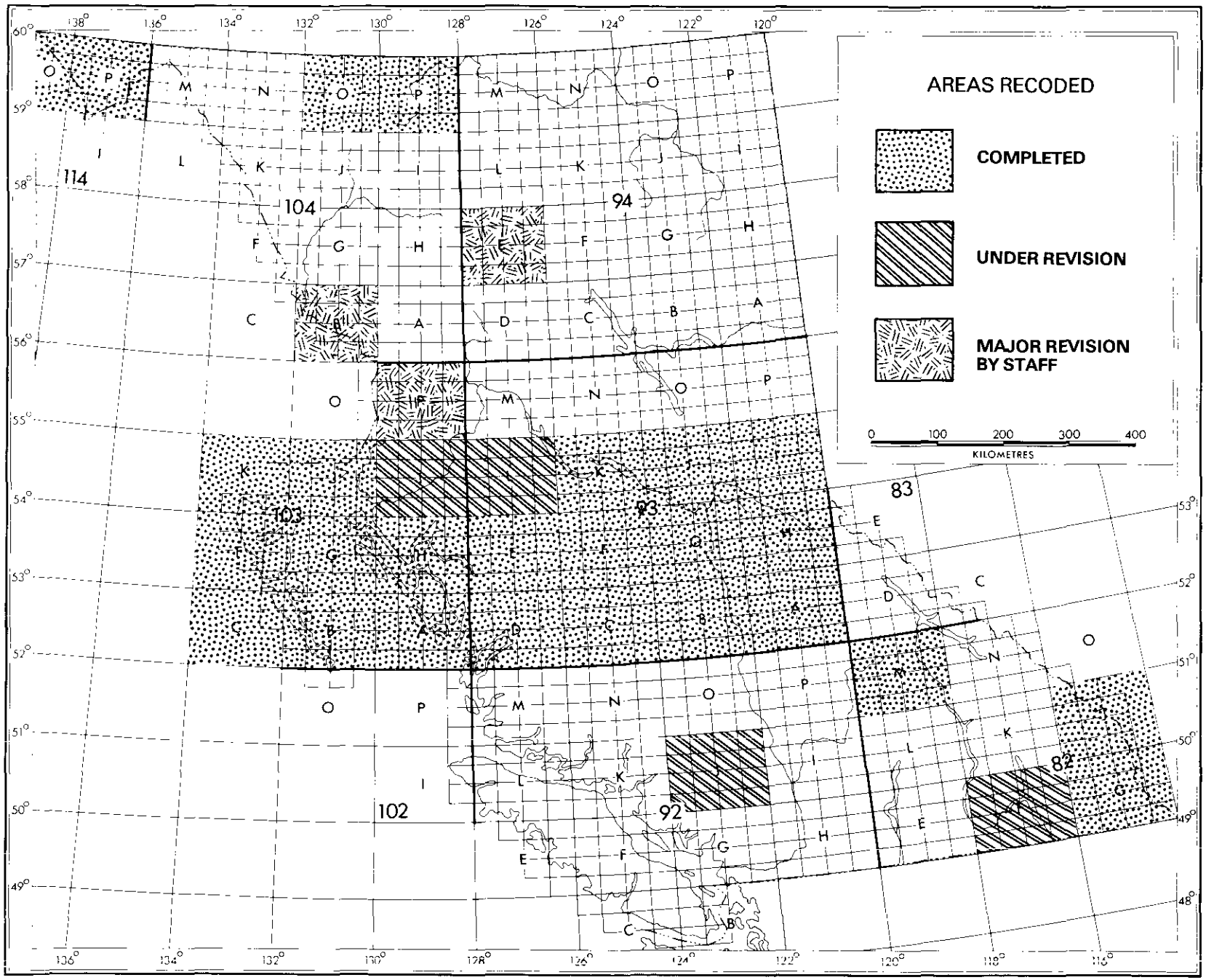

Figure 7-2-4. Areas coded.

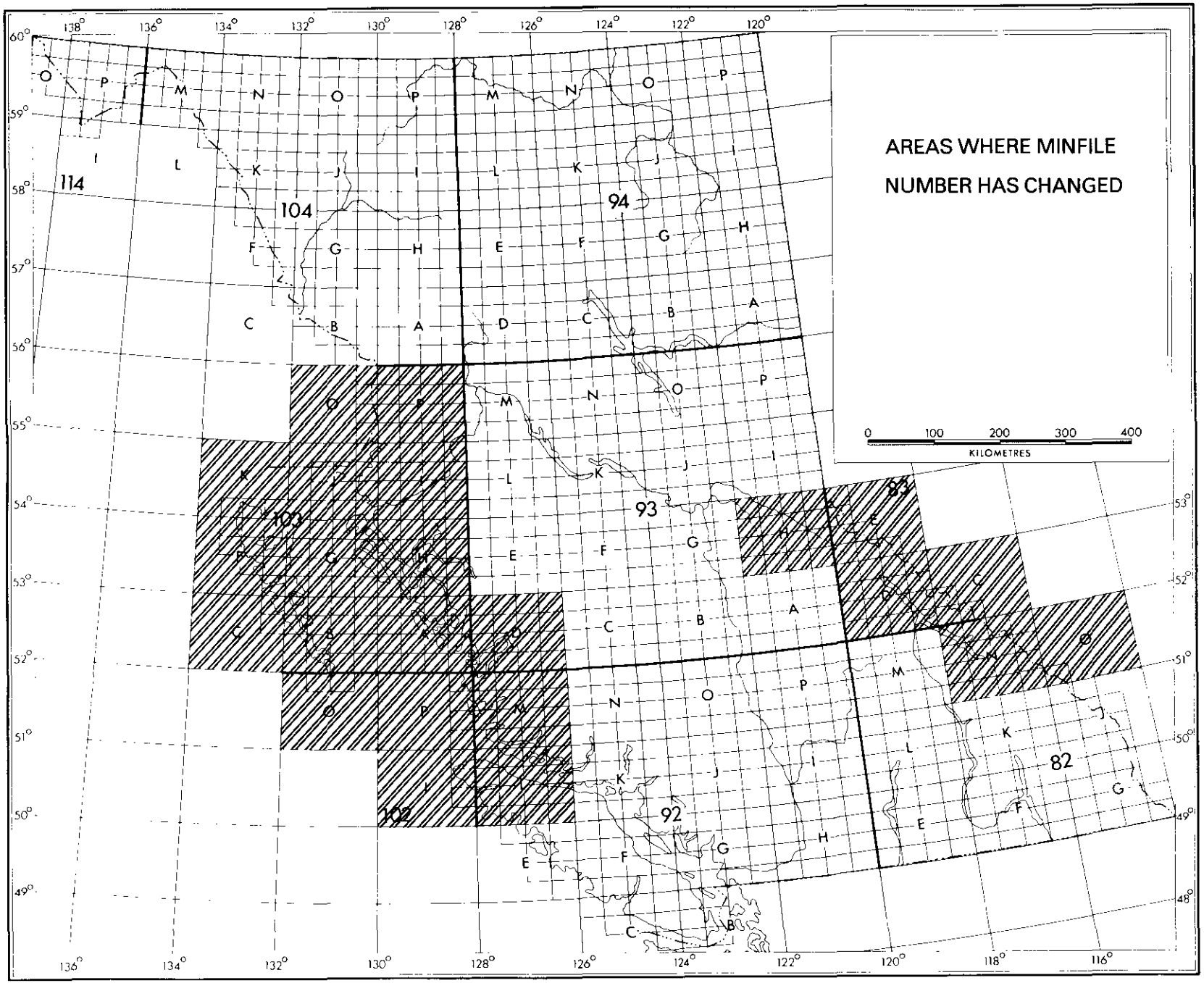

Figure 7-2-5. Change in MINFILE numbers.

one of the data maintenance screens that exist for any given occurrence. The user may combine any of these preprogrammed searches together, thus further refining the search.

TABLE 7-2-1. PREPROGRAMMED SEARCHES

1. DEPOSIT NAME
2. STATUS
3. COMMODITY
4. MINERALOGY
5. AGE OF MINERALIZATION
6. DEPOSIT TYPE
7. GENETIC TYPE
8. HOST ROCK NAME
9. ROCK TYPE (LITHOLOGY)
10. STRATIGRAPHIC AGE
11. DEPOSITS WITH RESERVES
12. DEPOSITS WITH PRODUCTION

RECODING DEPOSITS

A team of contract geologists, aided by a research assistant, have been hired under the Canada/British Columbia Mineral Development Agreement to recode all the mineral occurrences in the province and to establish a hard-copy backup of all references associated with each occurrence. Coders receive technical guidance from staff and district geologists who have first-hand knowledge of the areas being recoded. Geological Survey Branch staff have also assisted in the collection of data and submitted revised descriptions of mineral occurrences that they have visited in the field.

As of the end of October 1986, over 2400 occurrences have been rewritten. This represents approximately 25 per cent of the existing occurrences in MINFILE. Of these 2400 occurrences approximately 25 per cent represent new mineral showings. Figure 7-2-4 shows the area of the province which has been reviewed by coders and staff. All the coal properties have been coded and are included in the totals.

In the old version of MINFILE, the deposit number was a sequential number based on the NTS system. Since one of the key elements in the redesign of MINFILE is for graphical representation, it was decided to change this key on certain map sheets. Figure 7-2-5 represents the areas effected by this change. For the most part they are the coastal regions around the Queen Charlotte Islands and the Rocky Mountain Foothills near the Alberta border.

Two open file publications have also been prepared in conjunction with the recoding. The first was released as Open File 1986-7 entitled "Occurrence and Distribution of Platinum-Group Elements in British Columbia", compiled by Jacqui Rublee. The other publication "Magnesite, Brucite and Hydromagnesite Occurrences in British Columbia", compiled by Brian Grant, is currently in preparation.

INFORMATION AVAILABLE

Upon the completion of redesigned MINFILE the following output reports will be available:

1. Paper (complete listings and descriptions of all occurrences).
2. Microfiche.
3. Computer tape (ASCII or EBCDIC).
4. MS-DOS diskettes (by map sheet area).

A number of conventional reports and indices will also be available. These include:

1. Alphabetic listing of deposits.
2. Commodity index.
3. Numeric index of MINFILE numbers.

Other selective searches and reports will be produced on a user-pay basis. SPECTRA, another CINCOM product, will be used to perform these *ad hoc* enquiries and to produce the reports.

Further information is available by telephone or mail from the authors at the address below:

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REFERENCES

B.C. Geological Survey Branch (1986): *MINFILE Coding Manual, B.C. Ministry of Energy, Mines and Petroleum Resources*, Open File (*in preparation*).

B.C. Geological Survey Branch (1986): MINFILE Users Manual, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Open File (*in preparation*).

Longe, R.V., Burke, C.F. Jr., Dugas, J., Ewing, K.A., Ferguson, S.A., Gunn, K.L., Jackson, E.V., Kelly, A.M., Oliver, A.D, Sutterlin, P.G., Williams, G.D. (1978): Computer-based Files on Mineral Deposits: Guidelines and Recommended Standards for Data Content, *Geological Survey of Canada*, Paper 78-26.

Lowe, G. (1986): MINFILE Audit Report, Internal Report, *SHL-Systemhouse*.

Wilcox, A.F. and Borsholm, C. (1986): MINFILE, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Geological Fieldwork, 1985, Paper 1986-1, pages 231-233.

Wilcox, A.F. and Guilbault, A. (1986): MINFILE — A Case History in Database Redesign, Paper Presented at the Mineral Exploration Computer Conference (MECA), Vancouver, November 17, 1986.

Wilcox, A. and Ritchie, C. (1985): MINFILE — Past, Present and Future, *B.C. Ministry Energy, Mines and Petroleum Resources*, Geological Fieldwork, 1984, pages 405-409.

Wilcox, A.F. (1985): MINFILE — The British Columbia Mineral Inventory System, Paper Presented at the Workshop on Mineral Inventory Data Files, In Conjunction With the *Prospectors and Developers Association*, Toronto, March 14, 1985.

REPORT ON THE ESTABLISHMENT OF A COMPUTER FILE OF RADIOMETRIC DATES*

By A. Bentzen

INTRODUCTION

During the early part of 1986, a computer file was established consisting of the radiometric dates and ancillary data recorded in a manual file maintained by Dr. R.L. Armstrong of the Department of Geological Sciences, at The University of British Columbia. The great majority of dates are potassium-argon dates, with the remainder being rubidium-strontium, uranium-lead, and a few fission track dates. The number of dates is estimated to be approximately 3000.

DESCRIPTION OF MANUAL FILE

The manual file maintained by Dr. Armstrong comprises a set of forms in ring binders organized by 1:250 000-scale NTS designations. Three types of form make up the file, one for each of the three major classes of radiometric dates. The design of the forms was influenced by what is included in the United States Geological Survey Radiogenic Age Data Bank and the Geological Survey of Canada geochron file forms. The information recorded includes sample identification and geographic information, source material and analytical data, and the resultant dates and their interpretation. Also included are revised figures for dates to reflect, for example, revised decay constants. In order to obtain all the information available for one locale, it may be necessary to consult several forms since a single form only covers one dating method and dates may have been obtained on different occasions. As a consequence of having information spread over several forms a certain amount of information is duplicated, a fact which was taken into account in the design of the computer file.

LOGICAL STRUCTURE OF COMPUTER FILE

The computer file consists of a single ("flat") file comprising a number of logical records. Each record is based on the radiometric age dating effort of a particular researcher, at a unique location and on a single rock type. Each logical record consists of a collection of forms, and each form is a collection of data items. The file is line-oriented with each data item occuping a line; a field name occupies the left side of the line with a data field following on the right. Thus, at a lower level, the structure of the file is quite similar to that used in the NAMELIST concept in FORTRAN or the structure used on the distribution tapes of MINFILE.

In order to reduce redundancy, data items common to the three types of form have been "factored out". These items include identity of collector, rock type, latitude and longitude and description of location. The items that remain within each form are then specific to the kind of analysis involved.

ACCESS TO AND MODIFICATION OF COMPUTER FILE

Since the file might be put to different uses in different computing environments, it was felt that allowance for flexible access should be part of the design. The present design allows for accessing by a simple text editor, in fact that is in part how the file was created. A simple retrieval should not require a complicated program and with some modification, the file, may be used as an input file to some database management systems.

Modification of the file, such as alteration or the addition of new data, is not difficult. Addition of new data fields and forms is also possible, though such additions may affect how current programs access the file.

ACKNOWLEDGMENTS

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British Columbia Ministry of Energy, Mines and Petroleum Resources, Geological Fieldwork, 1986, Paper 1987-1.