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MINERAL OCCURRENCE DATA SYSTEM

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ABSTRACT

The Mineral Occurrence Data System (MODS) is a three-part infobase consisting of a manual Mineral Inventory File, published mineral occurrence maps on geological bases, and a computerized Mineral Inventory Database. It contains approximately 5000 mineral occurrence reports and is designed to offer rapid and easy access to information on the province's mineral resources.

The MODS is currently being redesigned to reflect recent advances in digital database technology. The manual Mineral Inventory File and the computerized Mineral Inventory Database will converge to form one all encompassing infobase. This redesign will eliminate duplication between the two and replace published mineral occurrence maps with computer-generated on-demand ones.

INTRODUCTION

The Mineral Occurrence Data System (MODS) (O'Driscoll *et al.,* 1991), which began in the early 1970s, consists of a manual Mineral Inventory File, published mineral occurrence maps on geological bases and a computerized Mineral Inventory Database (Figure 1). The MODS is designed to provide an efficient information service of all mineral occurrences in Newfoundland and Labrador.

The information is compiled mainly from a systematic search of mineral-exploration company assessment reports. Other sources include publications by the Geological Survey of Newfoundland and Labrador, the Geological Survey of Canada, news items, press releases, geological and mining journals publications, and personal communications with mining company and government personnel.

MANUAL MINERAL INVENTORY FILE

The manual Mineral Inventory File consists of mineral occurrence reports, in Wordperfect format, that summarize all data on known mineral occurrences in the province. It presently contains approximately 5000 reports covering all of insular Newfoundland (Figure 2) and selected areas in Labrador (Figure 3). The file was started in 1978 and is constantly being updated as new geological mapping and exploration continue to result in the discovery of new occurrences.

MINERAL OCCURRENCE MAPS

Mineral occurrence maps on geological bases have been published at 1:250 000 scale. In addition, selected areas have been published at 1:50 000 and 1:100 000 scales. An industrial minerals map for the Island of Newfoundland, at 1:1 000 000 scale, on a coloured geological base is also available. The maps provide the location, minerals present, and status of each occurrence and are available from the Geological Survey's Geoscience Publications and Information Section.

COMPUTERIZED MINERAL INVENTORY DATABASE

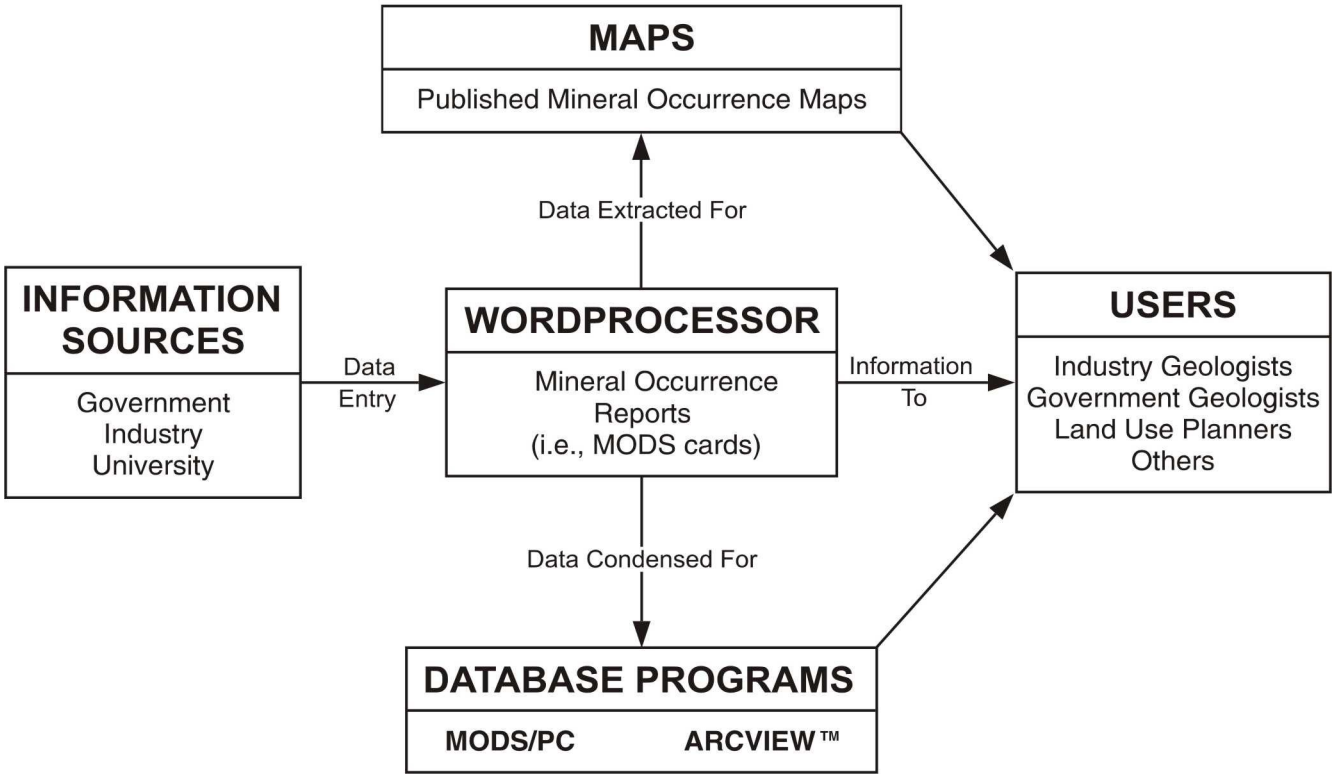
Since 1978, a computerized Mineral Inventory Database, which parallels the manual Mineral Inventory File and contains information selectively extracted from it, has been developed and maintained. Over the years, the computerized database and the database software have changed as a result of technological advances and client demand.

GRASP

The MODS originally used the mainframe-based Geological Retrieval and Synopsis Program (GRASP), which was developed by the United States Geological Survey (Bowen and Botbol, 1975), as its database management software. Although GRASP is a powerful program, it is no longer used by the MODS as it is not user friendly or available for microcomputers.

MODS/PC

Due to the proliferation of PC's and the demand for easier access to the MODS information, a microcomputer-based MODS, called MODS/PC, was developed and released in 1991 (Stapleton and Parsons, 1991). It is written



The three components of the Mineral Occurrence Data System (MODS) are mineral occurrence reports, mineral occurrence maps and the computerized database. These can be used either individually or collectively.

A user may study the mineral occurrence map of an area to identify occurrences of interest and can then peruse the mineral occurrence reports to find detailed information on one or more specific mineral occurrence(s).

Occasionally a user may want less detailed information on all occurrences of a particular type, for example, vein type, located over a large geographic area. Particular information can be selected from the database and saved on disk, displayed on screen or printed out in a report.

Mineral-exploration company personnel or individuals interested in claim staking will first want to assess an area's mineral potential before acquiring a land position. This can be achieved by using a geographic information system to view MODS data in combination with other data sets such as lake sediment geochemistry, aeromagnetics or land tenure.

Figure 1. *Organization and operation of the present Mineral Occurrence Data System.*

in the R:Base database language (V2.11) and uses the R:Base compiler (V1.02). MODS/PC is a menu-driven, user friendly, "turn-key" system that is designed to run on an IBM compatible microcomputer having a 286 or better, processor. Since its release, it has been very well received having approximately 80 companies and individuals on the subscribers list.

MODS FOR GIS

Selected fields from the computerized Mineral Inventory Database (Table 1) are available on CD-ROM with the Geochemical Atlas of Newfoundland (Davenport *et al.,* 1994) and the Geological Map of Labrador (Wardle *et al.,* 1997). Both operate as "turn-key" systems on microcomputers and use ArcExplorer™ or ArcView™ as their viewing system. In addition to geological, geochemical and mineral occurrence data, these publications provide access to other databases and enable users to view mineral occurrence data in a broad geoscientific context. As a result, interest in MODS/PC has declined. Clients prefer an integrated approach that can be better achieved using GIS programs.

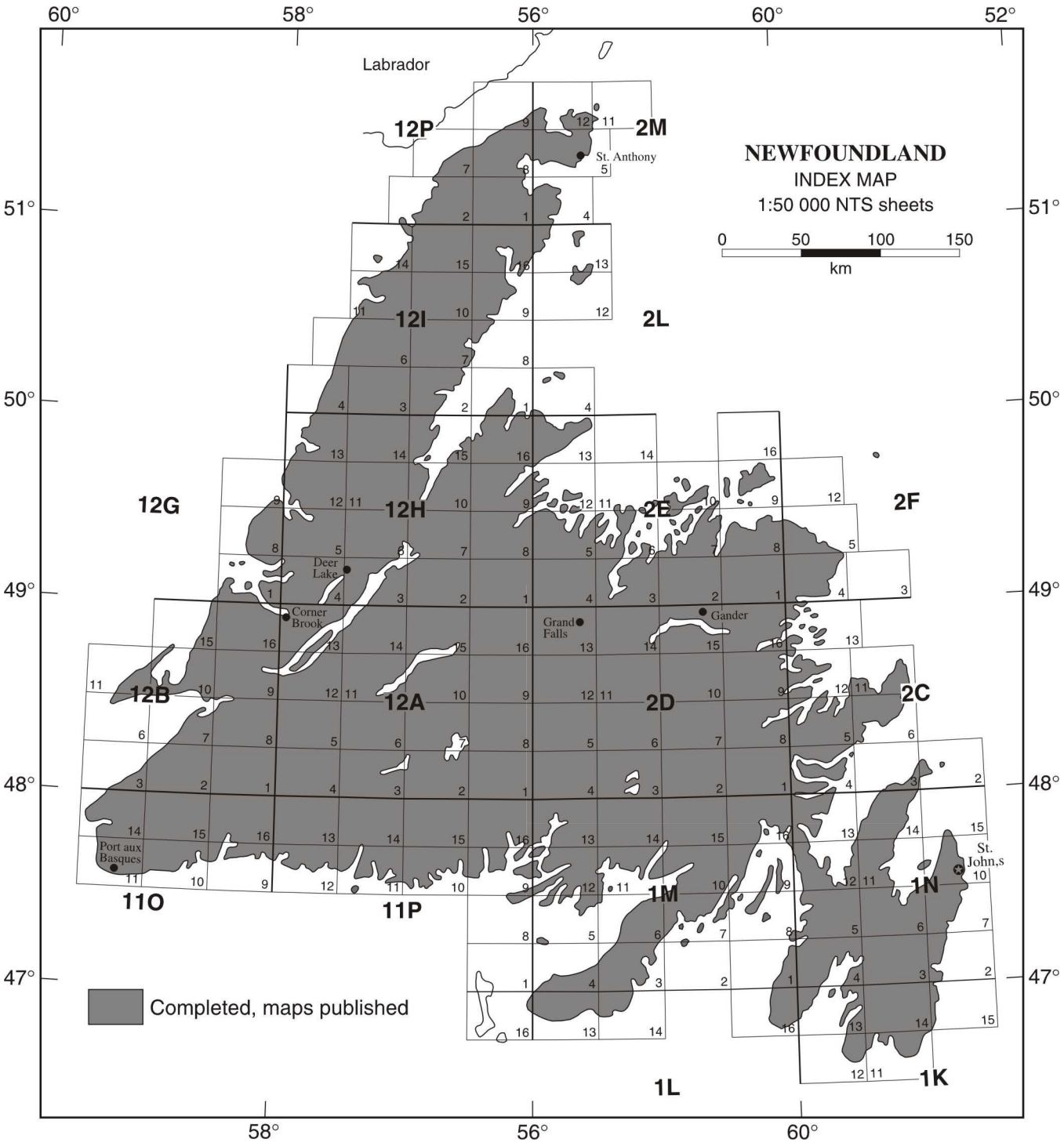


Figure 2. *Index map for the Mineral Occurrence Data System project, insular Newfoundland.*

WORK IN PROGRESS

THE NEW MODS INFOBASE

The current MODS design is limited in that it consists of three separate parts that are not digitally linked. At present, it is difficult to maintain and build this system. As shown in Table 2, there are 24 duplicate and redundant database fields in each mineral occurrence report (Wordperfect format) and corresponding computerized record (Rbase format) and much duplication with respect to the bibliography. The MODS is presently being redesigned to eliminate duplication and redundancy, improve the database structure and update the contained information. The duplicate and redun-

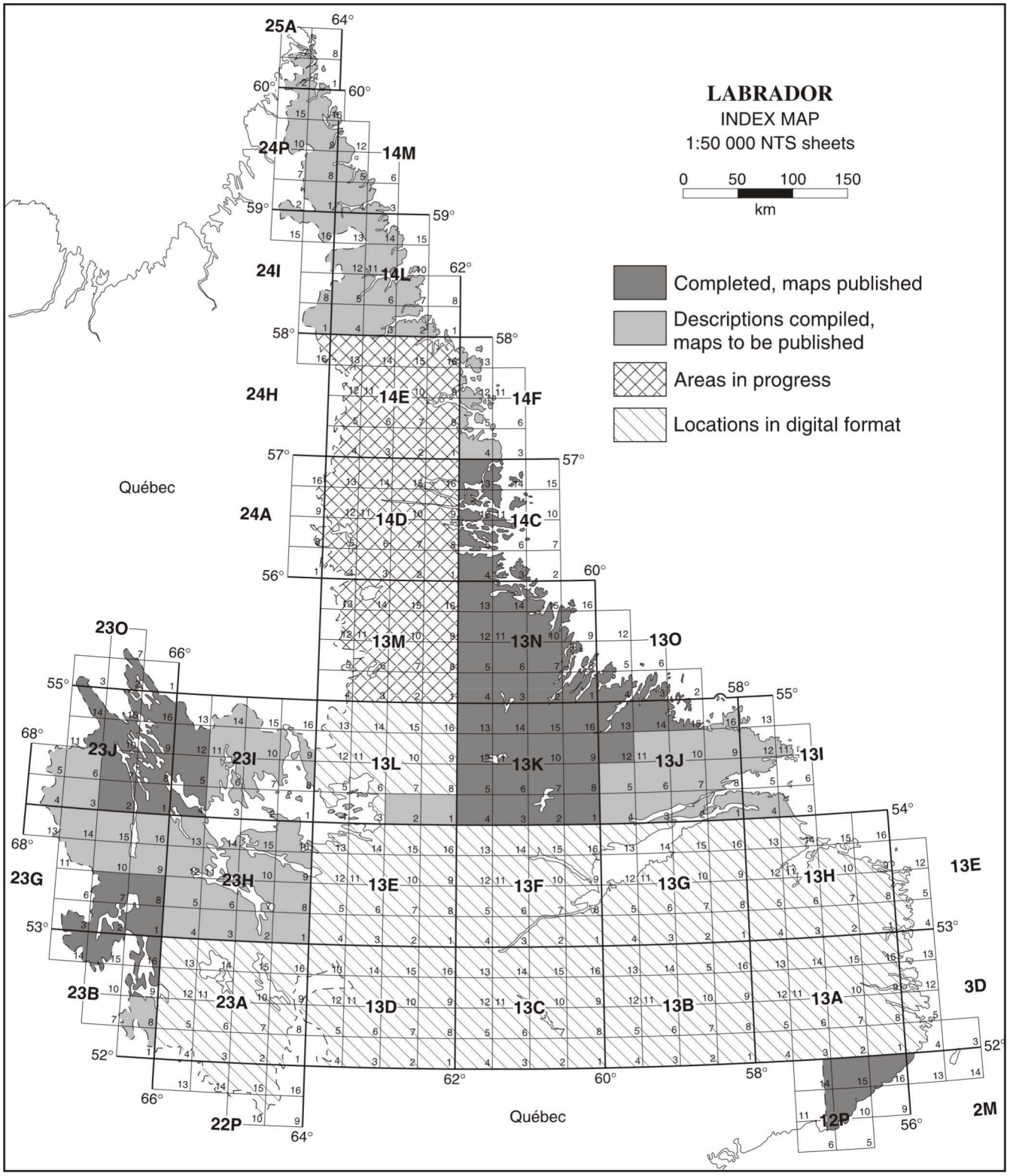


Figure 3. *Index map for the Mineral Occurrence Data System project, Labrador.*

Table 1. Fields and field descriptions from MODS for GIS record

dep name	Usual name for occurrence
alt name	Alternate name for occurrence
nmino	National mineral inventory number
major com	Major commodity present
mod type	Symbol for major commodity present
minor com	Secondary commodities present
dep type	Deposit type; coded genetic classification of deposit
dep char	Deposit description
status	Numeric code indicating amount of work done and hence the amount of information available on a deposit 1. Producer - Commodity is extracted for sale 2. Developed Prospect - Reserves or demonstrated resources of the commodity can be calculated but the commodity has not yet been produced (i.e., three dimensional data plus grade). 3. Past Producer Dormant - The commodity is no longer produced, although there are known reserves or demonstrated resources 4. Past Producer Exhausted - The commodity is no longer produced and there are no longer reserves or demonstrated resources 5. Prospect - Two dimensional data and grade are available but not enough data to calculate reserves 6. Showing - Mineralization exists in outcrop with little information known about its spatial extent. Assay data exists. 7. Indication - An indication of the existance of the commodity, i.e., field observation, grab sample, assay, etc.
status key	Alpha description of numeric status code as described in status above
geology	Code for geological unit in which occurrence lies
tect zone	Tectono-stratigraphic zone in which occurrence lies
host rock	Rock type(s) associated with deposit
str unit	Stratigraphic unit in which occurrence lies
rocks	Rock type(s) associated with deposit
geolwk	Geological work done? y = yes
geophwk	Geophysical work done? y = yes
geochwk	Geochemical work done? y = yes
DDH	Number of drill holes into the deposit
trench	Trenching? y = trenching done
adit	Adit? y = adit present
shaft	Shaft? y = shaft present
working	Type of mine workings. This field would have a value for deposits of status 1, 3 or 4 Underground - u Open Pit or Quarry - o Strip - s Placer - p Solution/Leaching - l Underground and Open Pit - uo Underground and Strip - us Underground and Placer - up Uncertain - un
size	The workings size (size) field gives an indication of the size of the mine and would only have a value for deposits of status 1, 3 or 4. It is a single digit alpha field that has three (3) possible values, s - small, m - medium and l - large. This field is divided into two (2) categories. 1) Underground - Size is based on total lateral advances out from a minimum 18.30 m adit or shaft. s = small, < 1500 m m = medium, 1500 m - 15 000 m l = large, > 15 000 m 2) Open Pit/Strip/Placer - Size is based on amount of rock removed. Minimum 300 cu. m. s = small, <30 000 cu. m m = medium, 30 000 - 150 000 cu. m l = large, >150 000 cu. m
prores	Statement of deposits production and reserve figures
utmzone	UTM Zone in which the occurrence falls
utmeast	Easting coordinate
utmnorth	Northing coordinate
nts	NTS area

Table 2. Convergence Table

Present Database Field	MODS Report Header	Database Fields After Convergence	Field Type	Field Size
Recid		Record ID Number#^	Integer	6
Nmino	Nmi. File Number	National Mineral Inventory Number#^	Text	14
Split			***Text***	***2***
Depname	Name of Property	Deposit Name^	Text	30
Altname		Alternate Name	Text	30
		Modtype#	Text	3
Owner*	***Owner/operator***		***Text***	***30***
Owpind*			***Text***	***1***
Tenure*	***Land Tenure***		***Text***	***2***
Prov	Province or Territory	Province Area(Nfld. or Lab.)+#	Text	2
Dist	***Geographic Subdivision***	***Geographic Subdivision***	***Text***	***50 ?***
	Physiographic Setting	Physiographic Setting#	Memo	Dynamic
		!Location Description	Text	500 ?
	Uncertainty in Metres	Uncertainty in Metres#	Integer	4
	Elevation	Elevation#	Integer	4
Nts		Nts Area#	Text	6
Lat	Latitude	Latitude#	Integer	6
Long	Longitude	Longitude#	Integer	6
Utmzone	UTM Zone	UTM Zone+#	Integer	2
East	Easting	Easting#	Integer	6
North	Northing	Northing#	Integer	7
Entcode		Complexity#	Text	1
Entcom	Object Located	Object Located in the Field	Text	30
Status	Status	Status+#	Integer	1
Statusd*			***Text***	***1***
	Description of Deposit	Description of Deposit#	Memo	Dynamic
Depchar		***Deposit Character***	***Text***	***300***
	Age of Mineralization	Age of Mineralization	Text	50 ?
Mapscal*			***Text***	***1***
Deptype	Type of Deposit	Deposit Type+#	Integer	3
Comname	Product	Major Commodity Name+#	Text	20
Commods		Secondary Commodities		
	Associated Minerals or Products of Value	Associated Minerals or Products of Value+	Text	60
Product		Major Commodity Type+#	Text	1
	Ore Minerals	Ore Minerals	Text	150 ?
	Gangue Minerals	Gangue Minerals	Text	150 ?
	Wall Rock Alteration	Wall Rock Alteration	Text	100 ?
	Nature of Mineralization and Genesis	Nature of Mineralization and Genesis	Memo	Dynamic
	Metal/Mineral Content	Metal/Mineral Content	Memo	Dynamic
	Geophysical Expression	Geophysical Expression	Memo	Dynamic
	Geochemical Expression	Geochemical Expression	Memo	Dynamic
Geoprov		Geological Province+	Text	4
Tecbelt		Tectonic Belt+	Text	2
	Structural Features and Tectonic Setting	Structural Features and Tectonic Setting#	Memo	Dynamic
Strunit	Stratigraphic unit	Stratigraphic Unit+	Text	30
Geolage	Age	Geological Age+	Text	9
Agecode		Age Code+	Integer	3
Rocks	Rock Types	Rock Type Lithology#	Text	78
	Strike	Strike	Text	50
	Dip	Dip	Text	50
	Plunge	Plunge	Text	50
	Size	Size	Text	300
	Length	Length	Text	50
	Width	Width	Text	50
	Thickness	Thickness	Tex	50
	Shape	Shape	Text	300
Geolwk		***Geological Work***	***Yes/No***	***1***
Geophwk		***Geophysical Work***	***Yes/No***	***1***
Geochwk		***Geochemical Work***	***Yes/No***	***1***
Ddh		Diamond Drill Hole	Integer	4
Trench		Trench	Yes/No	1
Adit		Adit	Yes/No	1
Shaft		Shaft	Yes/No	1
Working		Type of Mine Workings+	Text	2

Table 2. *Continued*

Present Database Field	MODS Report Header	Database Fields After Convergence	Field Type	Field Size
Size		***Size of Mine Workings+***	***Text***	***1***
	History of Exploration and Development	History of Exploration and Development#	Memo	Dynamic
Pro&res		***Pro & Res***	***Text***	***147***
	History of Production and/or Reserves	History of Production and/or Reserves#	Memo	Dynamic
Remarks	***Remarks***	***Remarks (from report)***	***Memo***	***Dynamic***
	Comp./Rev./Date	Comp./Rev./Date#	Text	100 ?
Conf		Confidentiality	Yes/No	1
Rewdate		Review Date	Date	5
Mapref*	***Map Reference***		***Text***	***30***
Inref*			***Text***	***1***
Ref1*	***Reference 1#***		***Text***	***240***
Ref2*	***Reference 2#***		***Text***	***240***
Ref3*	***Reference 3#***		***Text***	***240***
Ref4*	***Reference 4#***		***Text***	***240***
Ref5*	***Reference 5#***		***Text***	***240***
Moreref*			***Text***	***1***
Codedby*			***Text***	***3***
Codate*			***Text***	***4***
Updatby*			***Text***	***3***
Update*			***Text***	***4***
Reldate*			***Text***	***6***
Upremks*			***Text***	***90***

**** (denotes redundancy), + (denotes pick list needed for data entry and querying), ^(field has unique value), # (never a null field)***

dant fields (bold, italics in Table 2) will not be included in the new MODS record and instead of the bibliographic reference being hard coded into each record, the unique Geological Survey library number for each reference will be used to link to a lookup table containing a list of unique references.

The fields pertaining to the geology of the mineral occurrence host rocks will eventually be linked with the Geological Survey's geological database, i.e., Geolegend. However, because Geolegend presently contains only thirty percent of the geological information for insular Newfoundland, the MODS will maintain and update its own fields dealing with host rock geology until Geolegend is complete.

A comparison of Figure 1 (before redesign) with Figure 4 (after redesign) illustrates that the redesigned MODS will be more streamlined and easier to update, while continuing to provide clients with detailed information (Table 2).

As discussed, the new MODS infobase will be created from converging the present mineral occurrence reports and the MODS database records to form one new infobase record in Microsoft Access (Table 2). Microsoft Access was chosen because it is widely used both inside and outside of government and because it is used by the Geological Survey's Geolegend and the bibliographic database, to which MODS will eventually link. Microsoft Access links intimately with Map Objects and Visual Basic, which are being used by the Geological Survey to develop a custom data viewer which will be used to view the MODS data. Microsoft Access also links with Autodesk Mapguide which is being considered for an internet data server so that the MODS can be accessed via the World Wide Web.

LABRADOR

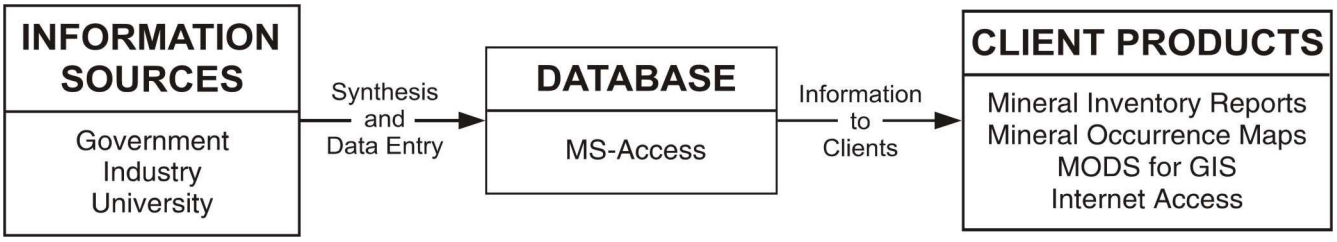
The MODS project continues to document new mineral discoveries in Labrador that resulted from the recent intense exploration activity sparked by the discovery of world-class nickel, copper and cobalt reserves at Voisey's Bay. Efforts were concentrated on NTS map areas 14C, 14D, 14E and 14F as these have been the focus of mineral explorationists in recent years.

INSULAR NEWFOUNDLAND

Work in insular Newfoundland this past year concentrated on documenting gold discoveries on the Baie Verte Peninsula (NTS map areas 12H/09 and 12H/16) and occurrences on the Burin Peninsula (NTS map areas 1L/14, 1M/06, 1M/08, 1M/09, 1M/10, 1M/12 and 1M/13). This data will be intergrated into the MODS during the next few months.

MODS USERS

The MODS is used primarily by mineral exploration company personnel, however, it is also used by mineral exploration consultants, independent prospectors, geotech-



The heart of the redesigned MODS is the infobase that uses Microsoft Access as its database management system. Information will flow into MODS via a Microsoft Access data entry application program and out to clients as four main products, mineral occurrence reports, mineral occurrence maps, MODS for GIS bundled with a custom data viewer and other geoscientific datasets on CD-Rom and internet access to the infobase using an application such as Autodesk Mapguide.

Figure 4. *Organization and operation of the redesigned Mineral Occurrence Data System.*

nical consultants, personnel and students of academic organizations and the general public. It is used daily by government geologists in land-use-planning. Advise is given to various government departments through the Inter-departmental Land Use Committee (ILUC) referral process on establishing wilderness areas, hydro developments, provincial and national parks, cottage developments, water reservoirs, etc., so that where possible, these developments proceed in areas of low mineral potential.

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