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LAURENTIAN'S MINING ENVIRONMENT DATABASE: THE PROCESS OF BUILDING A RESEARCH LITERATURE DATABASE AND AN INVITATION TO ENRICH THE EXISTING COLLECTION.

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ABSTRACT:

Laurentian University Library, with financial support from the Ontario Ministry of Northern Development and Mines, through the Environmental Youth Corps, and the Mine Environment Neutral Drainage (MEND) programs has developed an on-line Mining Environment Database. The database provides references and abstracts to journal articles, books and government reports dealing with land reclamation and abandoned mines. The database, created in 1988, now contains over 4,000 citations on reclamation planning, design and costs; tailings; heavy metals; disposal of hazardous wastes, including acid mine drainage, sulphide-based tailings and asbestos particles; leaching; radioactive hazards of uranium tailings; soil and water contamination; soil stabilization; liming; fertilizers; seeding techniques; mine closure techniques and other related topics. Subject coverage is international in scope, focusing on areas of hard rock mining. Laurentian has purchased or obtained copies of all the materials cited in the database. Access to the on-line database is free of charge, with the exception of long distance costs and copy, delivery or fax charges for requested material. Suggestions for materials not found in the database and donations of pertinent research information from individuals, corporations, institutions, and government departments are welcomed. Private consulting reports (with the appropriate client approval) are especially welcomed, because this category of research literature cannot be purchased or obtained using normal methods. The process of building a comprehensive research database requires a continuing partnership of information specialists and research users to develop a world class research literature database on mining environment and reclamation.

BACKGROUND

In 1981, over 200 square kilometres of the total land surface of Ontario were directly affected by mining operations. These statistics are contained in Ontario's Mines and Minerals: Policy and Legislation, a green paper prepared in 1988 by the Ministry of Northern Development and Mines. The Green Paper outlined a blueprint for policy direction and priorities to be addressed in a revision of the Mining Act. Bill 71 which received Royal Assent in December 1989 significantly altered the Mining Act in particular Part IX which focuses on mining operations. All new and existing operations are now required to submit a closure plan to the Ontario Ministry of Mines for review and acceptance. Additional provisions related to claim staking, fees and assessment requirements are contained in regulations accompanying Bill 71. Public safety issues associated with mine site hazards such as surface cave-ins, mine tailings sites, and open mine shafts, *as* a result of the legislation have created a demand for more information by government, the mining and research communities, and the general public. The regulations include specific requirements for mine managers to follow to stabilize tailings areas and to revegetate and restore mine and mine tailings sites before and after closure. (Rev. Statutes of Ontario, 1980 1)

In December 1988 all levels of government and the Mining Industry recognized the need to undertake new research initiatives for the management of waste rock and mine tailings sites. Public concern for the environment and demands to restore mine sites and tailings areas provided an additional incentive for industry and government to fund research projects on acid mine drainage and land reclamation. The Mine Environment Neutral Drainage Program (MEND) was established as a cooperative research organisation funded and administered jointly by representatives of 1) the Mining Industry, 2) the Federal, and 3) the provinces of British Columbia, Manitoba, Ontario, Quebec and New Brunswick.

The MEND program has initiated a significant number of research projects on acid generating tailings, waste rock disposal areas, and techniques of reclaiming these areas for recreational and other land uses. To date prediction, prevention and control, treatment, monitoring and technology transfer projects including international conferences on acid mine drainage have been supported. MEND project reports are deposited with CANMET are abstracted and are entered into the Mineral Processing (MINPROC) database. On-line database searches are available from QL systems or CANMET for a nominal search fee and MEND project reports can be ordered from CANMET (copy and document delivery charges may apply). (MEND Annual Report, 1990 2)

The public awareness and concern for the environment, the requirements of new legislation, and the significant increase in research in the areas of abandoned mines, acidic mine drainage, tailings and mine spoils, and land reclamation techniques established a need for a more comprehensive research literature database available to the mining research community. In May 1988, the Ontario Ministry of Northern Development and Mines and the Ministry of the Environment began funding a series of Environmental Youth Corps projects at Laurentian University, mandated to develop a specialized Mining Environment Database on Abandoned Mines and Land Reclamation. In 1990 and 1991 MEND provided additional database development funding to focus on the global research literature pertaining to acid mine drainage topics.

FORMAT, SCOPE AND CONTENTS OF THE DATABASE

An on-line catalog format was chosen for the database. A print based format was considered, but the cost of publishing the catalog, and the delays in obtaining current information between updates, were the primary reasons for not producing a printed bibliography. As the database grew, that decision proved to be even more cost effective, in allowing funding to be used for the purchase of more materials, abstracting and data entry purposes. In 1991, a single printed copy of all the entries in the database was produced for auditing purposes. The author catalog was 247 double-sided printed pages in length, the title catalog 445, and the subject catalog 2312. Estimates to bind and print 100 copies of the 3004 page catalog ranged from $150.00 to $200.00 per copy. In future, if there is sufficient demand, the database could be mastered on a CD-ROM disc and sold to clients at a lower cost than printing the catalog.

During the past four years, the Mining Environment Database has increased to over 4,000 references or citations to materials that have been added by purchase and by donation to Laurentian's collection on abandoned mines, acid mine drainage, and land reclamation. The largest category of material consists of journal articles followed by government publications and reports, and finally conference proceedings and books. The government publications, conference proceedings and books are integrated into Laurentian's existing circulation and reference collections. The journal articles are housed in the library's periodical collection or, in the case of off-prints, in vertical filing cabinets located behind the Circulation/Reserve counter near the main entrance of the library.

The range of topics include reclamation planning, design and costs; tailings; heavy metals; disposal of hazardous wastes, including acid mine drainage, sulphide-based tailings, and asbestos particles; leaching; radioactive hazards or uranium tailings; soil and water contamination; soil stabilization; liming; fertilizers; seeding techniques; mine closure techniques; and other related topics. Subject coverage is international in scope.

METHODOLOGY EMPLOYED IN BUILDING THE DATABASE

Literature reviews are often time-consuming, even when searching commercial on-line databases, because the results normally produce only a list of citations. The researcher must then attempt to obtain the articles, reports, or books from a local library or an unknown source through interlibrary loan. This process can take weeks or months. In contrast the Mining Environment Database was developed to include citations reflecting a growing Laurentian University Library collection of books, reports, conference proceedings and journal articles intended to save valuable research time in locating and obtaining information.

Commercial on-line databases and printed indexes were searched by professional librarians and library technicians to locate materials pertinent to the database and focusing on topics of interest to hard-rock mining and land reclamation specialists. The lists were then verified against Laurentian's existing collection of books, government publications, conference proceedings and journals. Pertinent materials not located in Laurentian's collection were ordered from the publishers or from other library collections.

To improve access to conference proceedings, a decision was made to provide full analytic coverage. This involved providing complete individual citations and subject analysis to all individual papers contained in the proceedings of a conference. The current practice of

most libraries is to provide a single citation and general subject analysis for the proceedings of a conference, but not to the individual papers presented.

The Abstracting Procedure

After consulting with a number of local researchers, it was decided to enter a short four to five line abstract for each citation in the database, providing the user with a brief glimpse of the contents in each book, article, or report added to the database. Students were chosen to write the abstracts, based on their subject knowledge of the mining environment and their abstracting skills. The student abstractors were employed during the summer, and were required to read each article.and prepare a brief abstract and assign subject terms. The resulting citations were then entered by other students hired to enter the data into Laurentian's on-line catalog. To date, 38 students have been employed over four summers in abstracting and data-entry positions. Salary, equipment rental, supplies, commercial database searches, purchasing, and overhead costs amount to slightly over $185,000 since the project's inception in 1988.

ACCESS TO THE DATABASE

Any researcher having access to the TELNET network, available at most universities and colleges, can access the database by entering: **telnet laurlibr.laurentian.ca** at the $ prompt and: **NETLIB** at the Username prompt. Other users will require dial-in or INET accounts, which can be obtained free of charge by contacting the Circulation Section, J. N. Desmarais Library, Sudbury, Ontario, P3E2C6; telephone (705)675-1151, ext. 3336; or fax (705)673-6524. Database searching is free, with the exception of your long distance or INET costs, and copy, delivery, printing, or fax charges for requested material.

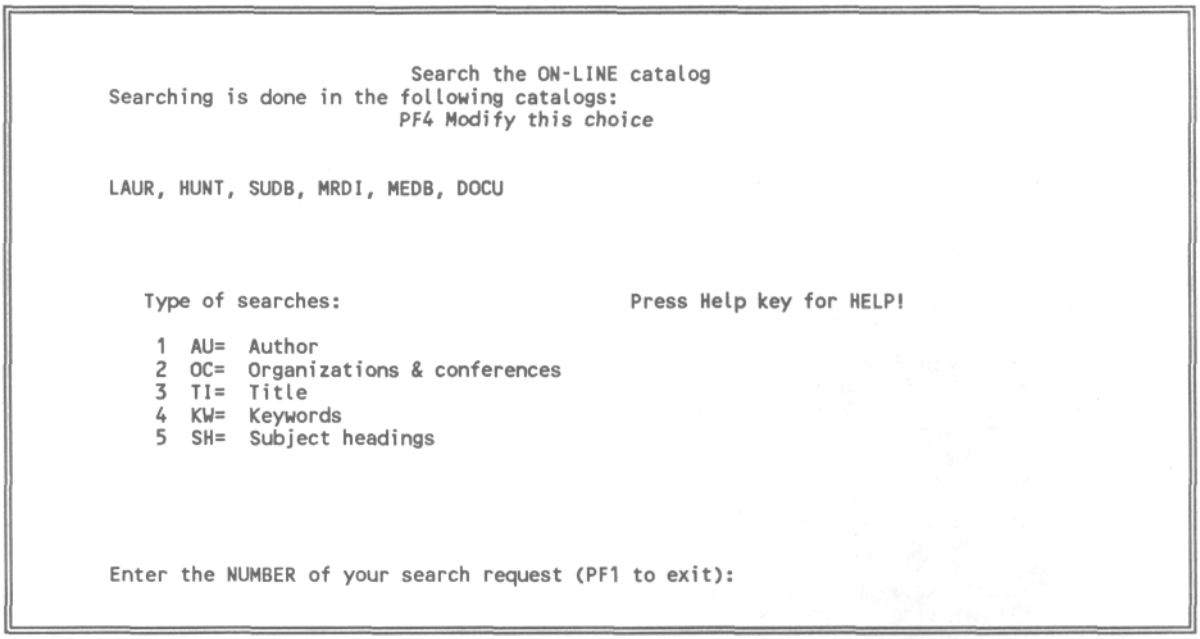
Users will require an I.B.M. compatible personal computer, a modem (1200 or 2400 baud rate), and appropriate communications software. Kermit communications software is available free of charge, by sending a formatted diskette to the Circulation Section at the address shown above. Copies of articles and fax document delivery are available for the cost of reproduction and delivery by contacting the Interlibrary loan Section at (705)675-1151, ext. 3318; or by fax at (705)673-6524. Photocopying is limited to Canadian copyright provisions related to fair dealing for the purposes of research and study, and may entail special fees to be forwarded to a Canadian copyright collective when it is established.

HOW TO SEARCH THE DATABASE

Figure 1 illustrates the main On-line Catalog Search Screen, after a user has signed on to the system and selected the preferred working language. A researcher then chooses the appropriate search option: **Author, Title, or Subject Heading.** The option **Keywords** is currently used for materials on reserve; only the Subject Heading search option will provide access to the **Subject Heading Catalog.** Title and Subject Headings can be searched by using one word or term from the title or subject heading. Spelling does count, and if in doubt the **asterisk (*)** can be used to truncate the ending of a word or search term.

The first page of search results are illustrated in Figure 2. Please follow the instructions at the bottom of the screen to page through the subsequent screens, or to return to the main menu to conduct another search. Remember that some topics may be contained in the title of the book, article, or document, but may **not** be used as a subject heading term

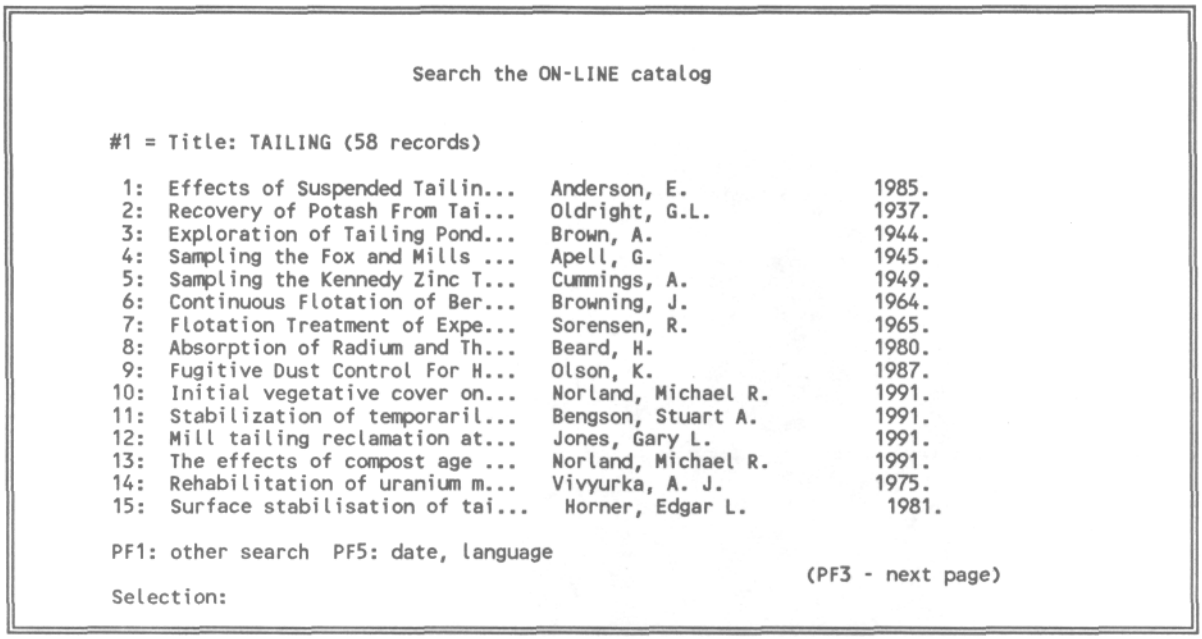
Figure 1: On-line Catalog Search Screen



using the same spelling. Figure 2 illustrates a title search locating 58 records using the term **tailing,** while Figure 3 illustrates a subject heading search using the same term resulting in no records retrieved. Figure 4 illustrates a search using the correct spelling of the term **tailings,** with the s that is used in the **Subject Heading Catalog.** Using the correct term **tailings** resulted in 88 direct and related subject terms being located, representing 320 citations or records in the database.

Searching an on-line catalog requires practice, and a useful technique is to search subject terms in the title catalog before searching in the **Subject Heading Catalog.** Entering a subject term in the **Title Catalog** will often produce a list of citations, and it is then possible to verify the correct subject heading used in the **Subject Heading Catalog** by checking the assigned subject term used at the bottom of each record. Repeating a search using the correct subject heading will often result in a significant increase in citations, more than using only a **Title Catalog** search, as the subject term of interest may not have been used in the title of the book, article, or report.

Figure 2: A Title Catalog Search



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                        Search the ON-LINE catalog

#1 = Title: TAILING (58 records)

 1:  Effects of Suspended Tailin...   Anderson, E.              1985.
 2:  Recovery of Potash From Tai...   Oldright, G.L.           1937.
 3:  Exploration of Tailing Pond...   Brown, A.                1944.
 4:  Sampling the Fox and Mills ...   Apell, G.                1945.
 5:  Sampling the Kennedy Zinc T...   Cummings, A.             1949.
 6:  Continuous Flotation of Ber...   Browning, J.             1964.
 7:  Flotation Treatment of Expe...   Sorensen, R.             1965.
 8:  Absorption of Radium and Th...   Beard, H.                1980.
 9:  Fugitive Dust Control For H...   Olson, K.                1987.
10:  Initial vegetative cover on...   Norland, Michael R.      1991.
11:  Stabilization of temporaril...   Bengson, Stuart A.       1991.
12:  Mill tailing reclamation at...   Jones, Gary L.           1991.
13:  The effects of compost age ...   Norland, Michael R.      1991.
14:  Rehabilitation of uranium m...   Vivyurka, A. J.          1975.
15:  Surface stabilisation of tai...   Horner, Edgar L.         1981.

PF1: other search  PF5: date, language
                                                    (PF3 - next page)
Selection:
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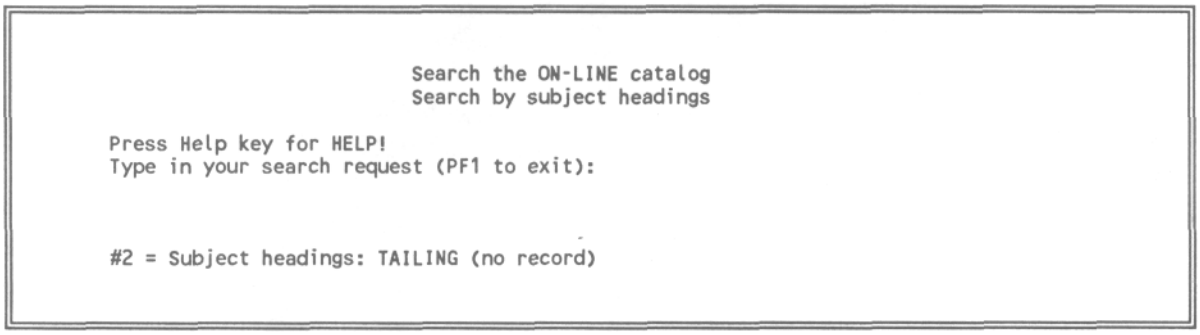
Figure 3: An Unsuccessful Subject Heading Search



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                        Search the ON-LINE catalog
                        Search by subject headings

Press Help key for HELP!
Type in your search request (PF1 to exit):


#2 = Subject headings: TAILING (no record)
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Figure 4: A Subject Heading Search Using the Correct Term

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                        Search the ON-LINE catalog

#3 = Subject headings: TAILINGS (320 records)

 1:  Mineral Waste Resources of ...   Collings, R.K.              1976.
 2:  Canmet's Environmental and ...   Moffett, D.                1977.
 3:  Mineral Waste Resources of ...   Collings, R.K.             1977.
 4:  Mineral Waste Resources of ...   Collings, R.               1979.
 5:  Mineral Waste Resources of ...   Collings, R.               1980.
 6:  Mineral Waste Resources of ...   Collings, R.               1981.
 7:  Reclamation Research For th...   Syncrude Canada Ltd.       1979.
 8:  Restoration of Surface Vege...   Froisland, L.              1982.
 9:  Tolerances of the native gr...   Northern Affairs Program   1985.
10:  Reclamations of acid-formin...   Colbert, Thomas A.         1991.
11:  Preliminary comparison of p...   Henson, James F.           1991.
12:  Initial vegetative cover on...   Norland, Michael R.        1991.
13:  Stabilization of temporaril...   Bengson, Stuart A.         1991.
14:  Mill tailing reclamation at...   Jones, Gary L.             1991.
15:  A history of mineral concen...   Richmond, Timothy C.       1991.

PF1: other search  PF5: date, language
                                                    (PF3 - next page)
Selection:
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Figure 5: An Abstracted Citation on Mine Tailings Reclamation

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                        Search the ON-LINE catalog              --- 8 ---

16-0000746
Peters, T. H. (Thomas H.).
      The approach of the International Nickel Company to tailings reclamation
   : a paper presented at the International Conference on Heavy Metals in the
   Environment at Toronto, Canada, October 29, 1975. -- 1975.
      9 p. -- (Inco Paper File ; 985)

      ABSTRACT:  A paper presented at the International Conference on Heavy
      Metals in the Environment by T.H. Peters, Agriculturist for Inco.  The
      paper outlined the approach taken by Inco to reclaim tailings in the
      Sudbury area.

      1. Reclamation of land--Ontario--Sudbury.  2. Tailings (Metallurgy).
   I. International Nickel Company of Canada.  II. International Conference on
   Heavy Metals in the Environment (1975 : Toronto, Canada).  III. Title.
   IV. Title: A Paper presented at the International Conference on Heavy Metals
   in the Environment
      Document type: pamphlet, Abandoned Mines/Land Reclamation Database.


                                  To be cont'd ... RETURN displays next page
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CATALOG ENTRIES

Figure 5 illustrates an abstracted citation for a document contained in the collection. There are four categories of documents, each of which is assigned *a* specific location code, located at the bottom of each bibliographic record in upper case.

1) VERTICAL FILES / DOCUMENTATION EPHEMERE is the location code referring to off-prints of journal articles, chapters in monographs, or papers of conference proceedings, obtained through interlibrary loan. They are stored in vertical file folders, arranged alphabetically by title, behind the 2d floor circulation desk.

2) CIRCULATION / PRET. This code designates chapters in books, or individual conference papers, where the complete book or published conference proceeding is in the Library's circulating collection. The location is followed by a Library of Congress classification number, which directs users to where the publication can be found on the shelf. All items with this code are available for loan. The circulating collection is located on the 3rd floor.

3) PERIODICALS / PERIODIQUES. Records with this location code are available in journals which the Library has in its collection. Journals are located on the 2nd floor, and are arranged alphabetically by title. Journals must be consulted in the library or by ordering copies using the interlibrary loan procedures previously outlined.

4) DOCUMENTS. This code is assigned to publications of governments or public agencies. The Government Publications Collection is located on the 3rd floor. The location is followed by a shelving number used for the arrangement of official publications. Government documents must be consulted in the Library and do not circulate. Older records using the CODOC system do not have assigned subject headings and can only be searched by author and title.

The following status codes are used after the location codes: **AVAILABLE** (Indicates the material is available for loan), **ON LOAN UNTIL** (Indicates the material is loaned until a specific date). **FOR REFERENCE ONLY** (Indicates the material can only be used in the library), **IN PROCESSING** (Indicates the material has been ordered but has not been abstracted or catalogued) and **ON ORDER** (Indicates the material has been ordered but has not been received).

Subject analysis is based primarily on terms found in Library of Congress Subject Headings (LCSH), the subject list used in most academic and research libraries in the United States and Canada. Because LCSH is designed for general research collections, it does not contain many specific terms used in specialized disciplines. Where appropriate, new terms and subdivisions have been created, based on terms provided by researchers and specialists using the database. Database maintenance and quality control is an on-going exercise and the project editors welcome any suggestions from researchers or users for improvements or modifications to subject analysis, the method of presentation, or individual citations.

THE IMPORTANCE OF OBTAINING PRIVATE CONSULTING REPORTS AND OTHER RESEARCH MATERIALS FROM THE MINING RESEARCH COMMUNITY

Private consulting reports often contain essential scientific and factual evidence on particular mine properties, and are prepared by individual researchers and consulting firms for individuals, corporations, institutions, and government departments. Private consulting reports, with the appropriate client approval, would be especially welcomed for inclusion in Laurentian's Mining Environment Database, because this category of research literature cannot be purchased or obtained using normal methods. Estimates from members of the mining research community indicate that this category of literature is substantial, and the number of such reports could easily be double the literature available through regular commercial sources.

At present, even a simple list of the consulting reports on a particular mine property is not available through any public research database. Unfortunately, as mining properties close, many consulting reports are often discarded, on the mistaken belief that no one in the future will ever be interested in reading a report prepared on a mining property that has been closed. The cost and the lack of storage facilities are also given as reasons for disposing of old reports. At a recent conference, I asked one of the principals in a mine that had been closed what he was going to do with the consulting reports that his firm had commissioned for the mine closure. His answer was that he was about to dispose of the material, because he no longer had space in his office for the six linear feet the reports occupied, and he had no idea that anyone would be interested in keeping them for future research. When I asked him if he was concerned about corporate secrets being made available if the reports were in a public research database like ours, he stated that he might be concerned about geophysical exploration studies that were done by the consulting firms, but he certainly was not concerned about releasing the engineering, operational, and land reclamation reports that were prepared either in house or by outside consultants for his firm.

Out of print materials is another category of the research literature that is difficult to obtain, and is usually obtained through donations from individuals or companies.

INVITATION TO CONTRIBUTE

The process of building a research literature database and collection is an on-going process involving concentrated and patient efforts by information specialists and research users. Suggestions for materials not found in the database, and for more appropriate subject terms, are welcome. A number of researchers who have already used the database have provided materials from their private and corporate collections, and have offered to assist in providing a more comprehensive list of subject terms that are more meaningful to those working in the field. Suggestions for a more consistent and hierarchical subject catalog and the addition of the Latin names of organisms for plant and species references, will be incorporated with the assistance of specialists who have volunteered to check and modify the subject heading terms that have already been assigned.

Laurentian encourages suggestions for improving the database, and donations of pertinent research information from individuals, corporations, institutions, and government departments. Income tax receipts may be issued for appropriate donations of materials upon request. If you have suggestions for materials that you feel should be in the database, or donations that you would like to contribute to enrich the collection, please contact the Gifts

and Exchange representative at (705)675-1151, ext 3322; fax (705)673-6524.

If the materials you wish to donate require special archival conditions, Laurentian has a modern archival facility that has restricted access and special humidity and temperature control. The library can accommodate a donor's request for archival storage of records, for example, if a donor requests that a particular document or report can only be released to researchers after a specified number of years. Laurentian can also accommodate requests for release forms signed by researchers, allowing the report to be read but not photocopied or used without the author's, or in the case of private consulting reports, the client's written approval. Laurentian maintains the right to refuse donations of materials that we consider will have little or no benefit to the collection, and that may contain use restrictions or other conditions with which we are unable to comply.

If it is not possible to provide Laurentian with an actual copy of a document, a simple citation listing with information on how a researcher could obtain access to the report would be welcome. As one consultant mentioned, even providing an author, title, date, and mine property list of the private consulting reports would be helpful to future owners of mine properties, consultants, and researchers.

CONCLUSION

Consulting reports, as well as a mechanism for gaining access to and preserving this category of literature for future research are critical to developing a more comprehensive information network on mining and reclamation. Donating materials that are about to be discarded to Laurentian, or to other local research or public libraries, will assist the library and archival communities in providing the mining community with the materials needed in future research efforts. The process of building a comprehensive database on the mining environment will require a continuing partnership of information specialists and users, in jointly developing a world class research literature database and collection of materials on abandoned mines, acid mine drainage, land reclamation and related topics of concern to the mining industry across Canada.

REFERENCES

1. Revised Statutes of Ontario. 1980. Chapter 268, pp.35-46. Section 161 1) states: "The mine manager shall plant and maintain vegetation or otherwise stabilize the tailings areas which will not be required for "future" impoundment of tailings to the satisfaction of the district engineer of mines".

2. Mine Environment Neutral Drainage (MEND) Program / Programme de Neutralisation des eaux de drainage dans l'Environnement Minier (NEDEM). Annual report. Submitted to the MEND board March 5th 1990, Toronto, Ontario. This unpaged report outlines many of the research initiatives and the project funding provided by the participants.