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DRILL-CORE REDUCTION–A PILOT STUDY

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INTRODUCTION

The Department of Mines initiated a drill-core collection and storage program in 1979. The stated objective of this program is to provide well maintained and representative collections of drill core from as many drilling programs as possible for the future use of the mineral exploration industry and other sections of the geoscientific community. Three core storage libraries were established with a combined maximum capacity of 260,000 m of core samples. The Pasadena core library is filled and approximately 9,000 m of core are being stored outside the building. The St. John's core library will be filled to capacity within the next several years. The Goose Bay core library will not have a space problem in the immediate future. The continued high level of mineral exploration in insular Newfoundland means a large increase in the amount of drill-core samples that will become available in the next several years.

The department has taken a two-pronged approach to the space problem by 1) pursuing expansion to existing facilities and acquiring or renting new core-storage facilities, and 2) adopting a policy of selective core collection and reduction. The department is in the process of acquiring a core-storage facility in Buchans, complete with all the core from the Buchans mine area, and presently is renting a facility in Springdale, which is 90 percent full.

Drill-core collection and reduction guidelines have been drafted and applied to some of the department's core collection from the Deer Lake Basin this year. This application forms a pilot study to assess the practicality of the core-reduction process and to further develop the guidelines. Results of the pilot study are presented here; the guidelines are contained in Appendix I.

PILOT-STUDY AREA

Core collection from the Deer Lake Basin (12H/6) (Figure 1) totals 10,826 m of core from 146 different drillholes. Practically all of these holes were drilled through rocks of the Deer Lake Group by Westfield Minerals Limited and Northgate Exploration Company Limited, while engaged in exploration for sandstone-hosted uranium deposits.

The primary reasons for choosing the Deer Lake Basin as the pilot-study area are the large size of the core collection from a single group of similar rocks, and the high density

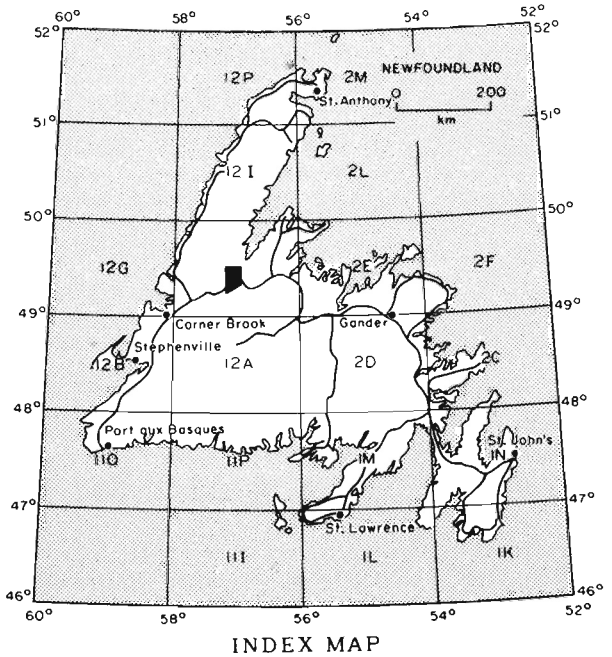


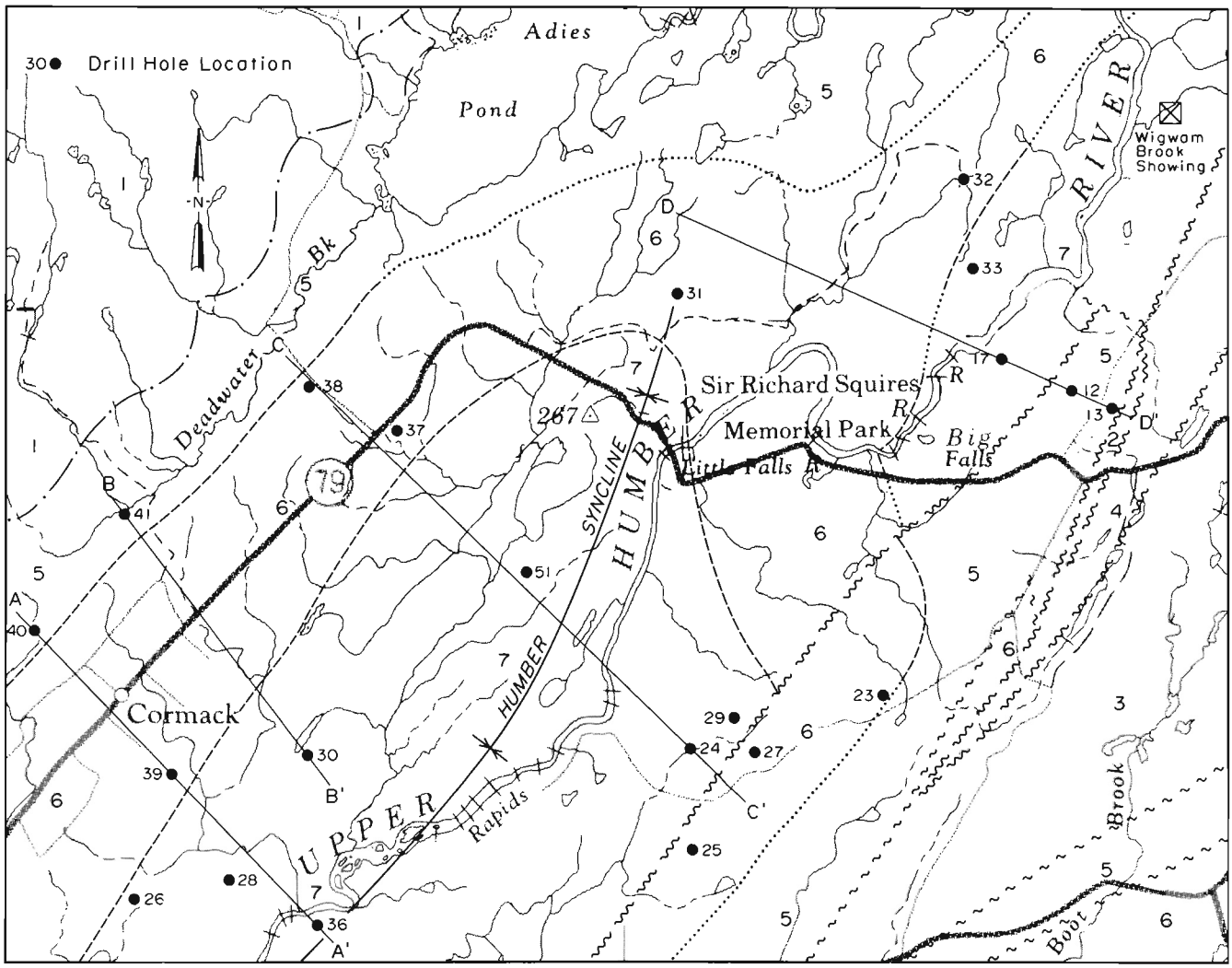
Figure 1. *Location of Upper Humber River area, Deer Lake Basin.*

of drillholes in a number of small areas. In addition, the local and regional geology are well documented by numerous geological studies and mineral exploration reports.

General Geology (from Hyde, 1979, 1982)

The Carboniferous Deer Lake Group includes, in ascending order, the North Brook, Rocky Brook and Humber Falls formations in the Upper Humber River area (12H/6) (Figure 2). The Deer Lake Group is interpreted to unconformably overlie the early Carboniferous Anguille Group in this area.

The North Brook Formation consists of grey and red, pebble to boulder conglomerate, grey, orange and red sandstone, red siltstone, thin limestone beds and an amygdaloidal basalt flow. The North Brook Formation is interpreted as representing alluvial-fan deposition at basin margins, and braided- and meandering-river deposition on the alluvial-fan deposits. The North Brook Formation thickens southward where it has a maximum thickness of 1,300 m.



LEGEND

CARBONIFEROUS

Visean

DEER LAKE GROUP (Units 5 to 7)

7 Humber Falls Formation: *grey, orange and red sandstone, pink to grey conglomerate, red and grey siltstone*

6 Rocky Brook Formation: *grey to green siltstone, mudstone, sandstone, limestone, brown oil shale*

5 North Brook Formation: *Red and grey pebble to boulder conglomerate, red to grey sandstone and siltstone, limestone*

Tournaisian

4 Wigwam Brook Formation: *red, brown and grey sandstone, conglomerate, limestone*

ANGUILLE GROUP

3 Saltwater Cove Formation: *dark-grey sandstone and siltstone, shale, mudstone, conglomerate, rare limestone and dolostone*

SILURIAN

SOPS ARM GROUP

2 *Felsic to intermediate volcanic rocks*

PRECAMBRIAN

1 *Granitic gneiss and undivided granitic plutons*

Figure 2. *Generalized geology of the Upper Humber River area, Deer Lake Basin (after Hyde, 1982; Map 82-7).*

The Rocky Brook Formation gradationally overlies the North Brook Formation and consists of the following rock types: red and grey siltstone and mudstone, dominantly fine grained red sandstone, grey calcilutite and calcarenite, and dark-brown oil shale. The Rocky Brook Formation was deposited in a fluvial environment at its base; shallow-lacustrine deposition dominates the rest of the formation. The Rocky Brook Formation thickens southward where it has a maximum thickness of 1,500 m.

The Humber Falls Formation, which consists of grey, pink and red arkose, arkosic pebble conglomerate and thin red siltstone beds, overlies the Rocky Brook Formation. The Humber Falls Formation has been assigned to the fluvial facies; deposition was by alluvial-fan sedimentation and by braided rivers. The maximum thickness of this formation is probably no more than several hundred metres.

Guidelines Application

Two different sets of drill-core samples from the Deer Lake Basin were chosen for this pilot study. One set is from closely spaced drillholes on the Wigwam Brook uranium prospect (Figure 3), and the other set is from widely spaced holes across the width of the basin in the Cormack area.

In order to assess the usefullness of drill-core samples from the Deer Lake Basin in understanding and recording the geology and mineral potential of the basin, the following studies were carried out:

1) a study of geological reports and company assessment reports;

2) a study of drillhole logs, drillhole sections and cross-sections through the basin, and individual mineral prospects; drafting of drillhole sections and cross-sections where necessary;

3) visual inspection of core samples to check condition of core and accurracy and consistency of drillhole logs.

The department's geofiles contain numerous geological papers and company assessment reports on the Deer Lake Basin (see Byrne, 1979a,b; Saucier, 1979; Patterson, 1981). These assessment reports by Westfield Minerals Limited contain lithological logs, drillhole sections, radiometric logs, assay results, geological cross-sections, reports on sedimentological studies, and other information that documents their exploration in the area. All of this material was used in assessing core from the basin. A section of drillhole WB-79-12 (Figure 4; Hiscott, 1979a) shows the type of detailed information available for reference in the core-reduction process.

After these steps were taken, the core-reduction guidelines were applied. Actual reduction of core samples will not take place until the department gives final approval to the core-reduction process.

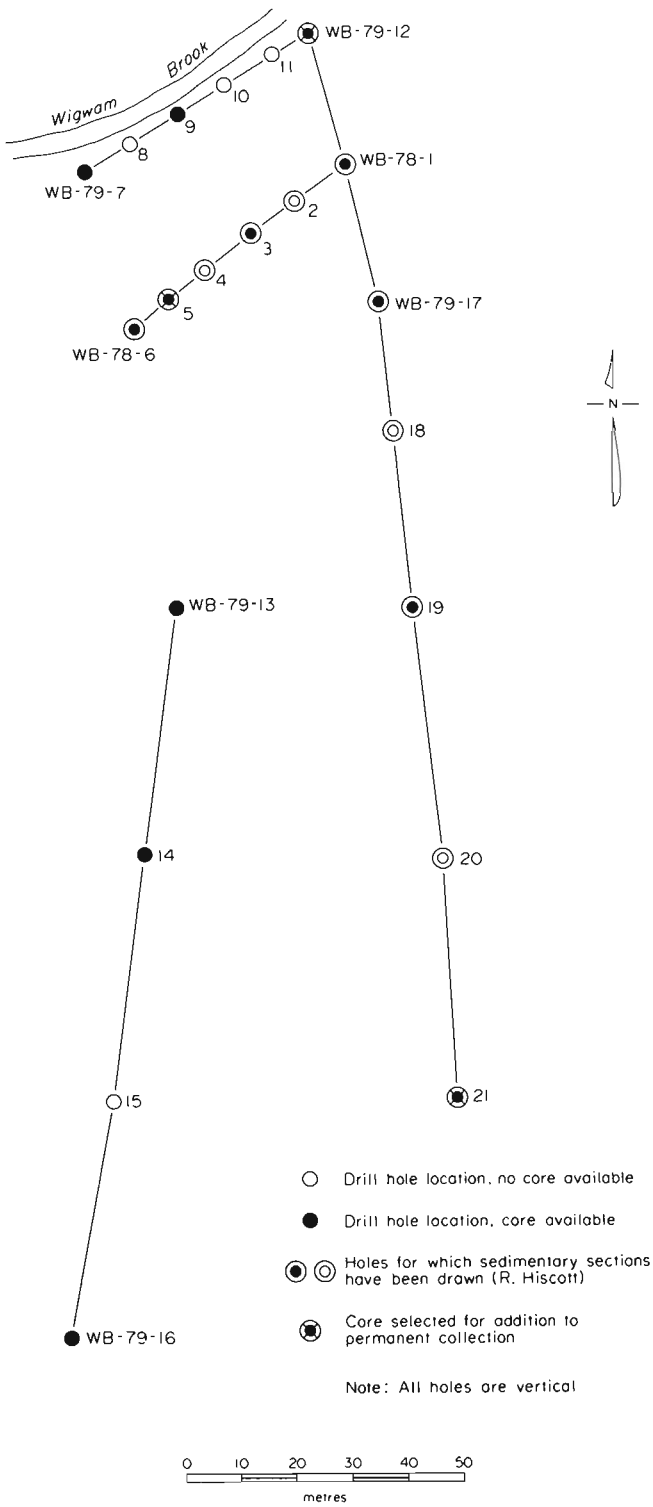


Figure 3. *Wigwam Brook drillhole-location map.*

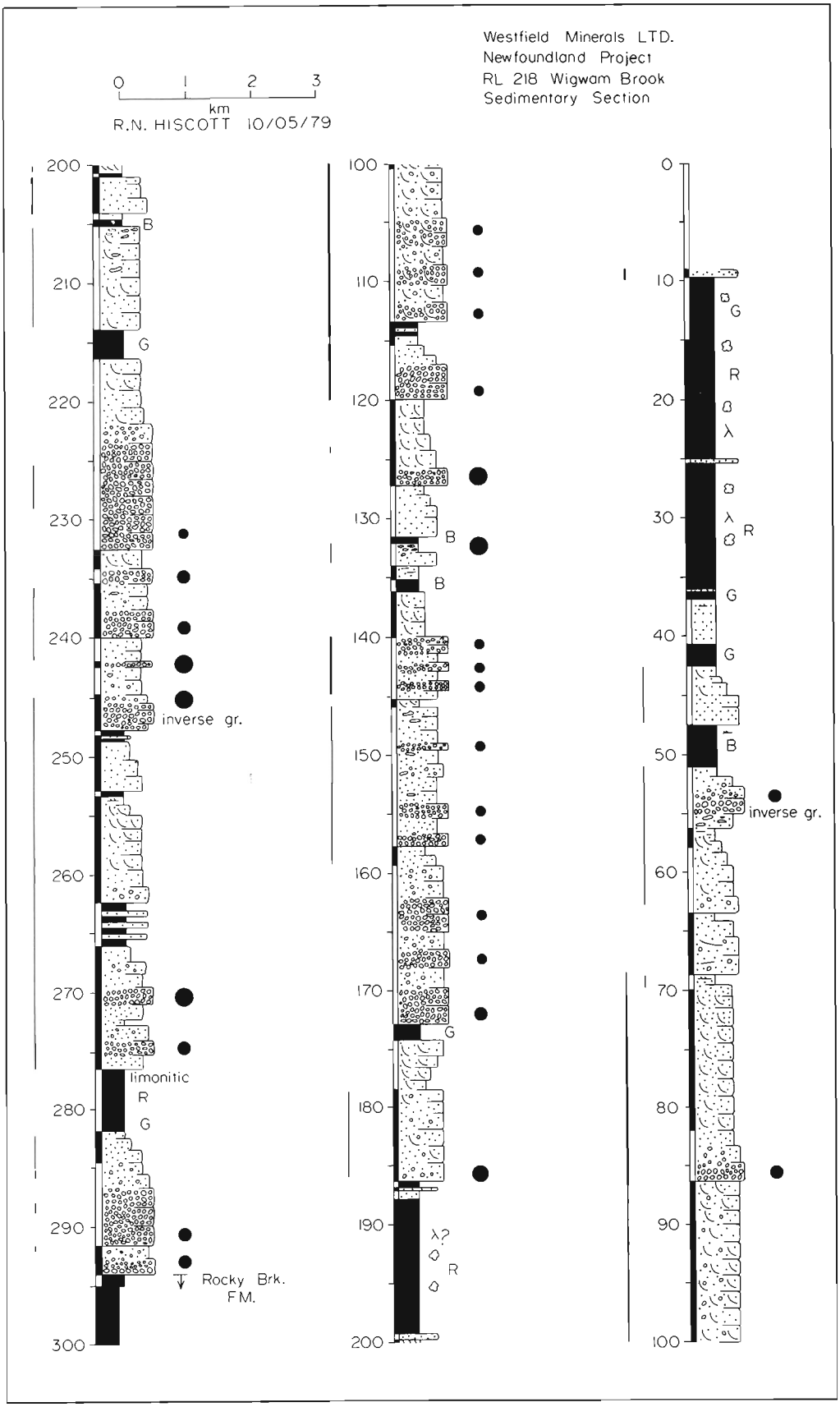
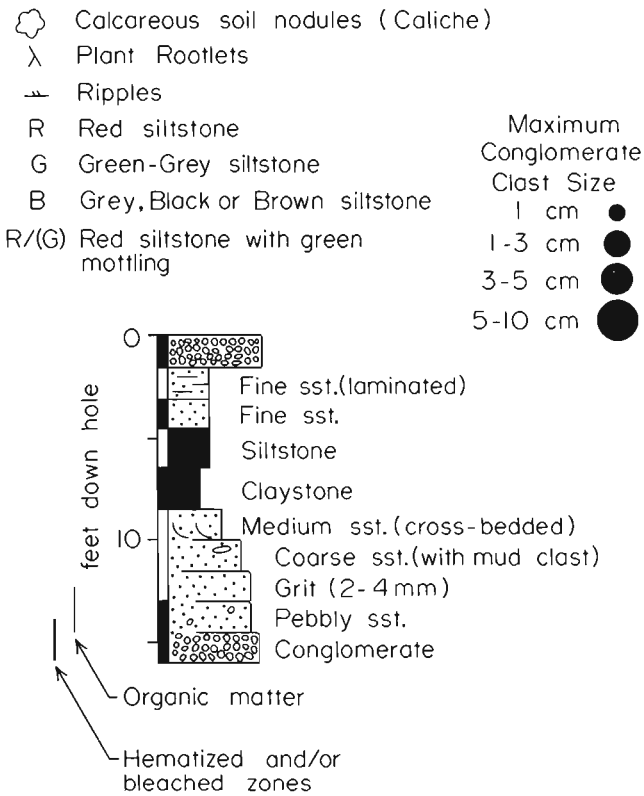


Figure 4. *Cross-section through drillhole WB-79-12.*

SYMBOLS (Figure 4)



Wigwam Brook. The Wigwam Brook radioactive zone was discovered by Westfield Minerals in 1978 as a result of a ground radiometric survey. Subsequent trenching and diamond drilling of 21 shallow holes discovered highly radioactive sandstone boulders in overburden, and moderately radioactive zones at the 1.5-m to 4.5-m level in several drillholes, but no uranium mineralization was found in bedrock. A summary of diamond drilling at Wigwam Brook is given in Table 1.

The drillhole-location plan is shown in Figure 3. The department is presently storing core from thirteen of the twenty-one holes drilled.

All drillholes are collared in the Humber Falls Formation and only three penetrated the calcareous shales of the upper part of the Rocky Brook Formation. These three deeper holes permit a description of the entire Humber Falls sequence at Wigwam Brook. They are too widely spaced to permit detailed correlations between individual units. However, all three holes contain the same rock types in varying thicknesses, and although the exact stratigraphic position of rock units are not replicated, the gross stratigraphy is similar.

A sedimentological study of the Humber Falls Formation in the Wigwam Brook area (Hiscott, 1979a,b), utilizing the core samples, conclud d that 'lateral continuity in the Humber Falls Formation is poor, particularly in the coarse-grained intervals where channelling is believed to be common. Only thick siltstone units can be used as reliable horizons for correlation purposes.'

Table 1. *Wigwam Brook–drillhole summary*

Hole No.	Depth (m)	Dip	Collared In	Terminated In	Core Availability (% Stored)
WB-78-1	39.6	−90°	Humber Falls Formation	Humber Falls Formation	90
WB-78-2	39.6	−90°	Humber Falls Formation	Humber Falls Formation	0
WB-78-3	44.4	−90°	Humber Falls Formation	Humber Falls Formation	78
WB-78-4	45.7	−90°	Humber Falls Formation	Humber Falls Formation	0
WB-78-5	110.6	−90°	Humber Falls Formation	Rocky Brook Formation	65
WB-78-6	42.6	−90°	Humber Falls Formation	Humber Falls Formation	92
WB-79-7	36.5	−90°	Humber Falls Formation	Humber Falls Formation	92
WB-79-8	36.5	−90°	Humber Falls Formation	Humber Falls Formation	0
WB-79-9	35.7	−90°	Humber Falls Formation	Humber Falls Formation	74
WB-79-10	36.5	−90°	Humber Falls Formation	Humber Falls Formation	0
WB-79-11	36.5	−90°	Humber Falls Formation	Humber Falls Formation	0
WB-79-12	94.5	−90°	Humber Falls Formation	Rocky Brook Formation	85
WB-79-13	30.4	−90°	Humber Falls Formation	Humber Falls Formation	90
WB-79-14	30.4	−90°	Humber Falls Formation	Humber Falls Formation	74
WB-79-15	30.4	−90°	Humber Falls Formation	Humber Falls Formation	0
WB-79-16	30.4	−90°	Humber Falls Formation	Humber Falls Formation	90
WB-79-17	30.4	−90°	Humber Falls Formation	Humber Falls Formation	90
WB-79-18	30.4	−90°	Humber Falls Formation	Humber Falls Formation	0
WB-79-19	30.4	−90°	Humber Falls Formation	Humber Falls Formation	92
WB-79-20	30.4	−90°	Humber Falls Formation	Humber Falls Formation	0
WB-79-21	101.8	−90°	Humber Falls Formation	Rocky Brook Formation	100

Stratigraphically, the three deeper holes are representative of the Humber Falls Formation in the Wigwam Brook area. Therefore all the core samples from these three holes will form the permanent collection from this area.

As there are no mineralized zones in any of the remaining ten holes, these samples will be reduced and a minimum of 25 percent kept, i.e., one-half-metre core retained for every two-metre section. Where this is not sufficient to show all of the rock types, variations in rock types and different structural features, more core will be retained to show these features. As the object of the core-reduction process is to discard only the obviously 'redundant' core samples, when there is some doubt as to whether core should be kept or discarded, it will be kept. In addition, a photographic record will be made of all core before it is condensed.

Cormack Area. The department is presently storing 2,524 m of core samples from widely spaced drillholes (22) within the Deer Lake Basin between Adies Pond in the north and the town of Deer Lake in the south. Drillhole sections for all of these holes are available from company assessment reports, and stratigraphic cross-sections across the basin (AA, BB, CC and DD) have been completed (Figure 2).

These core samples define the boundaries of the basin in that area, and give complete sections through the Rocky Brook Formation and partial sections through the North Brook and Humber Falls formations. The wide spacing of these drillholes and the variability of depositional environments within the same formation make the correlation of individual rock units impossible. Therefore, the application of the core-reduction guidelines to this set of core samples dictates that all samples be kept from drillholes that define the borders of the basin, and that core samples from the deepest holes representative of the stratigraphy through the centre of the basin be also kept. The only samples to be considered for core reduction will be those from adjacent holes that exhibit similar stratigraphy. And, of course, all mineralized sections will be kept intact.

SUMMARY

Geological mapping and mineral exploration work provide a comprehensive written record of the geology of the Deer Lake Basin. The preservation of drill-core samples provides a useful data base for future geological investigations and mineral exploration. However, core-storage space and project funding permit the preservation of *representative* drill-core samples only. Therefore, drill-core collection and reduction guidelines must be applied. These guidelines are designed to ensure that sufficient representative core samples are retained for future use and that any core samples discarded are well described by written and photographic records. A review of all available data on the core samples described in this report, and the examination and partial relogging of some 3,180 m of core samples from 45 holes, indicate that core reduction can be carried out by following existing guidelines without seriously compromising the drillhole information available for the Deer Lake Basin.

It is apparent that little core reduction can be undertaken with samples from the widely spaced holes. However, samples from closely spaced drillholes, e.g., at Wigwam Brook, through the same stratigraphy can be reduced. Application of the core-reduction guidelines to the Wigwam Brook samples will result in a 40 percent reduction in the amount of core currently being stored from that particular project. The future application of the guidelines to selected core-sample suites in all of the department's core-storage facilities will result in more efficient use of existing core-storage capacity. This will aid the core-storage program in meeting its primary objective of preserving representative core samples from as many drilling projects as is possible.

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Note: Mineral Development Division file numbers are included in square brackets.

APPENDIX I

DRILL-CORE COLLECTION AND REDUCTION GUIDELINES

I CLASSIFICATION OF DRILL-CORE COLLECTIONS

The collection of mineral exploration core will fall into three categories, based on collection from a single mineral exploration prospect.

1) Permanent collection

The permanent collection will consist of:

i) type stratigraphic sections (complete drillholes);
ii) representative mineralized sections (complete drillholes) may be made available for sampling on a limited basis, but as a rule the permanent collection will not be available for sampling.

2) Working collection

The working collection will contain:

i) Intact mineralized sections
ii) Condensed sections of redundant country rock, and footwall–hanging-wall sections
iii) Sufficient number of complete holes will be kept to show contacts and alteration patterns where identifiable

3) Confidential core collection

i) accomodate all reasonable requests for space where space is available;
ii) when core becomes open, selection of permanent and working collections will be made

II CLASSIFICATION OF DRILL-CORE SOURCES

The sources of drill-core samples considered for storage in our core libraries can be classified as follows:

1. Small prospects (1 to 5 drillholes)
2. Developed prospects (more than 5 drillholes)
3. Active mine
4. Abandoned mine:
   i) insignificant or no known reserves
   ii) known reserves, possible future reactivation
5. Other:
   i) geotechnical drilling

The following guidelines will be applied when considering core samples for collection and addition to our core libraries:

1. Small prospects

i) Permanent collection:

The permanent collection will consist of 1 to 2 drillholes that best exhibit the mineralogy, structural features and stratigraphy of the prospect. The geological complexity of the prospect, degree of exposure, amount of data available, and how well the regional metallogenesis is understood will determine if more than two drillholes are to be included in the permanent collection. (The input of project geologists who have mapped particular areas will be invaluable in making decisions on the makeup of the permanent collection.)

ii) Working collection:

Mineralized portions will be stored intact; barren country rock will be condensed. Samples will be limited to those necessary to illustrate the various rock types and their megascopically identifiable petrographic and structural features.

2. Developed prospects

i) Permanent collection:

Sufficient drillholes will be collected and added to the permanent collection to show the character of the deposits, e.g., mineralogy, alteration, structural features and stratigraphy. Additional drillholes that show variations in these features will be collected and/or retained. Drillholes that establish the physical boundaries of the prospect will be added to the permanent collection, and those showing typical stratigraphy outside of mineralized zones will be kept.

ii) Working collection:

Depending on drilling density, 25 to 50 percent of remaining drillholes, after the permanent collection has been selected, will be condensed and stored. Mineralized sections will be stored intact. Any core samples remaining will be preserved (boxed, relabelled and stacked) on site.

Exceptions to this practice include developed prospects that appear headed toward production where attempts will be made to preserve all drill-core samples. All samples will continue to be stored on-site or in the Department's core libraries until the economic viability of the deposit has been established. Similar considerations apply to remote mineral prospects in Labrador.

3. Active Mine

i) Permanent collection:

Drillholes that are representative of the mineral deposit(s), the mine and local geology will be solicited from the mine operator. There will not be a working collection as department staff have access to core samples in company storage.

4. Abandoned mine

i) Permanent collection—no known reserves:

The permanent collection will consist of sufficient core samples (complete drillholes) to show local geology, mine geology, and significant variations and character of mineralization of the deposit(s), and any other geological features unique to the deposit and mine area. There will not be a working collection in our core libraries, but where possible all remaining core, after selection of permanent collection, will be preserved on site.

ii) Permanent collection—known reserves (possible future reactivation):

All core samples that could possibly be useful in expanding reserves of the mine (basically everything except closely spaced production drilling in mined-out areas) will be added to our permanent collection. Core from production drilling in mined-out zones will be discarded. Core samples will be preserved on the mine site (indoors) where possible. After a period of at least 10 years from mine closure, and with consideration of land disposition and exploration during the 10-year period, the status of our core collection will be reviewed. At this time it is likely that a smaller permanent collection and a working collection will be selected for continued storage in our core libraries.

iii) Working collection–known reserves (possible future reactivation):

A working collection will not be selected until 10 years after the mine is closed. All core will have permanent-collection status for 10 years, and sampling will be permitted only by a company making a serious and organized attempt to re-open the mine.

5. Other

Drill-core samples in this category include samples from geotechnical drilling projects, such as well drilling and hydroelectric projects. Lithological logs will be compiled for core samples in this category and a representative drillhole or drillholes will be added to the permanent collection, depending on drilling density in the area and what new data the core samples may add to our collection.

III EXCEPTIONS TO CORE-REDUCTION GUIDELINES

Any core samples available to us that fit into either of the categories below will be collected intact and will be placed primarily into the permanent collection:

1. Core samples from 'new' areas where very little previous mineral exploration or drilling has been done.
2. Core samples acquired as the result of drilling for 'new' commodities, e.g., platinum-group metals in the Bay of Islands area.
3. Core samples from areas of heavy drift cover, e.g., potash exploration, Bay St. George area.

IV PROCEDURES FOR CONDENSING DRILL CORE

1) Before core is condensed, drillhole logs, assays and cross-sections must be collected or compiled by the core-storage project geologist. If company logs and sections are not available or lack sufficient detail, the core should be relogged and new sections drawn.

2) If drill-core samples are from an area mapped by one of our project geologists, he/she will be consulted before the core is condensed.

3) Only core samples in the working collection will be condensed. The mineralized sections will be stored intact, and the country rock will be sampled at regular intervals, depending on stratigraphy, structural features and variations in rock types.

4) Sampling will be permitted from the working collection. Sampling will be permitted from the permanent collection with the proviso that a half split of core must remain for continued storage.

5) Core samples to be discarded will be systematically chip sampled to provide material for future assay and analysis.