

PROPOSAL
Yukon Mineral Potential Project

Background

In spite of Yukon's small population, Yukon land is coming under increasing pressure from competing and commonly conflicting interests. These include First Nation land claims, ongoing mining exploration and development, increasing wilderness tourism and demand for parks and recreational areas, and general concern for the environment and wilderness preservation. Two initiatives which have begun to address these concerns are: 1) the Territorial Government's commitment to implement a Protected Areas Strategy by the 2000 through the Parks System Plan, and 2) the establishment of a Land Use Planning Commission as called for in the Umbrella Final Agreement for Native Land Claims. During the next several years, pressure will increase to withdraw certain lands from disposition.

One of the most important considerations in selecting land for withdrawal is mineral potential. The Yukon Government has committed to doing mineral assessments prior to land being set aside for territorial parks. Typically, candidate areas are chosen by Parks, solely on ecological grounds, and then the Department of Economic Development evaluates their mineral potential using the two-phase approach outlined in "Mineral Assessments for Proposed Territorial Parks: Method" by the DIAND/YTG Mineral Assessment Steering Committee. A Phase 1 assessment produces a comparative ranking of the mineral potential of candidate areas based on analysis of existing data and some new fieldwork. A Phase 2 assessment, involving additional fieldwork and further evaluation and report writing, could be needed to refine park boundaries or in areas of potential resource conflict. Phase 1 alone is a process which requires one full-time geologist, a budget of about \$150 000, and 12-15 months to complete - for each candidate area.

Clearly, with the anticipated increase in the number of areas proposed for some type of withdrawal and a short time frame, this selection process will not be feasible without a large increase in budget and staff. A different approach and method will be necessary to meet YTG's goals. One way of streamlining the process would be to include consideration of mineral potential alongside ecological values in the early stage of the selection process. If mineral potential was included in the initial screening, the choice of candidate areas would be more straightforward as areas of high mineral potential could be immediately avoided in favour of lower potential areas of similar ecological character. No Yukon-wide mineral potential assessment exists. However, expertise, the tools and personnel are now available to undertake one. Once completed a Yukon mineral potential assessment would provide a way to streamline the selection process.

Proposed New Method

We are proposing a new method for selection of protected areas that would incorporate mineral potential into the initial screening process. The new method is one which has been applied in British Columbia in support of a comprehensive land-use plan (CORE process) and is used throughout Canada and the United States. The assessment process in these jurisdictions follows

several steps process such as those described above but is different in that large tracts of land are covered by the assessments, not specific target areas. The whole province of B.C. was ranked by this method. In Alaska, half of the lands selected for state ownership were chosen on the basis of their mineral potential.

By the proposed method, rankings of the relative potential of specific areas derive from computer-modelled probabilistic estimates. Following digital compilation of all available data, an expert panel is convened and each expert is asked to estimate the probability of finding one or more mineral deposits of a specific type within a certain area. The experts also give their level of confidence for their predictions. The results are tabulated using the Monte Carlo computer program that converts the experts' estimation into probability graphs. The program then combines the estimates with known grade and tonnage data to predict the amount of each commodity that can then be assigned a monetary value. The value of all commodities in each area are totalled and used to rank areas relative to one another.

Normally, this project would require a great amount of time and effort to compile a consistent and current regional geological map, data on mineral deposits and occurrences, and a set of mineral deposit models and grade/tonnage models upon which to base the assessment. For example the British Columbia assessment took 5 years to complete. In the Yukon, however, most of the necessary compilation for such an assessment in the Yukon is, or soon will be, available. In January 1998, a working copy of a digital geological map of the Yukon, commissioned from the Geological Survey of Canada by the Yukon Geology Program in 1996, will be available. Yukon MINFILE contains an adequate description of most mineral deposits and occurrences. Mineral deposit models developed by the B.C. Geological Survey Branch (B.C.G.S.B.) for their mineral resource assessment require minor modification for use in the Yukon. Experts are now in place in the Yukon to lead the work and B.C.G.S.B. personnel may also be available to assist with the assessment process. These factors combine to provide the opportunity to undertake a mineral potential assessment at minimal cost and in a relatively short period of time.

The proposed new Phase 1 method would involve a 3-steps:

- Step 1- Digital compilation of geoscientific data, tract selection and preparation of deposit models and grade and tonnage data
- Step 2- Expert estimator's workshop, production of a mineral potential map of the Yukon
- Step 3- Following initial selection of park candidates, review of that selection, recommendation to support selection or to go on to a phase 2 if more work is needed or if conflicting interests could be resolved or refined with further work

Phase 2 method would remain unchanged, but the level of detail and type of fieldwork would be evaluated case-by-case.

Limitations

Mineral potential studies offer a valuable tool in any comprehensive land use planning process by providing an unbiased scientific perspective on mineral potential. By incorporating essential

information on mineral resources into a multidisciplinary approach, they contribute to informed decision making and help alleviate potential land use conflicts. Through this process, adequate ecoregion representation can be obtained without compromising the access to the potential mineral wealth.

Mineral assessments are based on the best geoscientific information available when the assessment is made. Assessments must be revised and updated as the state of knowledge of mineral deposits evolves, new geological information becomes available, technological advances modify the way we find and exploit mineral deposits and socio-economic conditions change (e.g.: metal prices, infrastructures, etc.). Several pertinent examples serve to remind us that the ever-evolving nature of our geological knowledge affects our ability to predict the occurrence of mineral deposits. One such example is the present interest in diamonds in the NWT. Nobody would have thought 6 years ago that that area would be so rich in diamond-bearing kimberlite pipes (the host rock to the diamond deposits). Improving the geoscientific data base can lead to spectacular results as witnessed by the present activity and the discovery of significant mineral deposits in the Finlayson Lake area. New exploration ideas have led to the discovery of the ICE massive sulphide deposit, which is located in rocks that were, until the discovery in 1996, thought to be of low potential for this type of mineralization.

These examples are reminders that the concept of mineral potential is dynamic and this type of tool is best used when realizing its limitations. This type of study represents a “best guess at the time” on a resource that is hidden in the ground and cannot be quantified with absolute certainty. Conclusions derived from such a study are only as good as the data that are available for the evaluation.

Benefits and Products

A Yukon-wide mineral potential assessment will benefit implementation of the protected area strategy, and also provide fundamental data for: other land use planning initiatives, the mineral industry through generation of new exploration ideas, and the Yukon Geology Program through better planning and product development. We anticipate the following products and benefits.

- The main products will be 1:250 000 scale mineral potential maps of the Yukon, which rank geological tracts for use during initial selection of protected area candidates.
- An important secondary product will be a map showing the quality and completeness of information upon which the assessment is based. This information will be important not only for evaluating the reliability of the assessment, but also for planning future work by the Yukon Geology Program
- The process for selection of protected areas will be faster and more efficient if initial land selections are made with mineral potential in mind. Since the new Phase 1 assessment is not as rigorous or as detailed as the present Phase 1 assessment, we stress the need to make greater use of Phase 2 studies in areas where the potential of an area is contentious, but these too should be less expensive and more efficient.
- Staff from the Yukon Geology Program and other experts from the mineral industry and government will participate in the assessment. This will be a learning process that is

expected to lead to new mineral exploration ideas, and to identify gaps in the geoscience data base. The resulting new ideas and their possible applications will be published as a bulletin which would serve to stimulate mineral exploration. An analysis of gaps in the data base will be used as a guide to plan future work by the Yukon Geology Program.

- The assessment process requires that available geological, mineral occurrence, geochemical and geophysical data be compiled and integrated on a geographic information system. This exercise is an opportunity to upgrade the Yukon geoscience data base and to make much of it available in a digital format. Digital geological data is in demand from the mineral exploration community, and will be of use to other government agencies involved in land use issues.

Process

Develop GIS Capability (begin April 1,1997)

- Hire a GIS technician
- Undertake a GIS needs assessment
- Purchase GIS System and software
- Develop GIS-based system for internal and public access to: the geological map of Yukon, regional geochemical surveys, regional geophysical surveys, and MINFILE
- Produce maps for workshops
- Other products as required

Compilation (October 31, 1997 - February 28, 1998)

The co-ordinator, who is expected to be Danièle Héon, will have the following duties:

- Co-ordinate the entire process
- Consult with public interest groups such as the Yukon Chamber of Mines, C.Y.F.N.
- Oversee the GIS technician and data compilation
- Organise expert estimators meetings and workshops
- Complete final reports and maps
- Manipulate geochemical and geochemical data to highlight anomalies

It is assumed that the geological map of the Yukon (now being prepared by S. Gordey, at the Geological Survey of Canada), regional stream geochemistry, and geophysics is available digitally and that there will be minimal cost in obtaining and using these data.

The compilation phase will consist primarily of:

- Altering British Columbia deposit models, median tonnage and grades to fit the Yukon situation
- Selecting tracts consisting of rocks with common geological and metallogenic characteristics
- Plotting of tracts on geological map
- Deciding which deposit models are likely to occur in which tracts
- Compilation of digital topography, geology, geochemistry, geophysics, mineral deposit

information in digital layers that can be superimposed and analysed

Tract selection, deposit model fine tuning, and selection of deposit models will be a co-ordinated effort by Yukon Geology Program Staff. This phase would require about two weeks to complete, starting February 1. Digitizing of tracts will follow.

Estimators Workshops (March 1998)

This key phase of the project requires the bringing together of various experts from industry and government to solicit their input. A typical British Columbia workshop for estimating a region 1/5 the size of the province would last five days and cost \$30K. A number of these people live locally in the Vancouver area and experience has found that some companies pay for participation by their staff in the workshops. The worst case for here, using ten outside people paid at consultants wages including airfare, meals, and accommodation for a five day workshop would be in the order of \$45K.

Planning Workshop (late March 1998)

Yukon Geology Program Staff will meet to discuss Metallogeny and Exploration Targets Bulletin and work plan for the Yukon Geology Program in light of the results of the estimators workshop.

Synthesis of Estimators Workshop Results (April, 1998)

This phase is time consuming. Compiling the estimators results and enter these data into spreadsheets for processing in the Monte Carlo Simulation can be done by a local contractor, under supervision of the co-ordinator.

Products

- Evaluation map of geoscience database (to be completed March 1998)
- Proposal for future work by the Yukon Geology Program (to be completed April 1998)
- Final assessment maps (to be completed May 31, 1998)
 - compiled and plotted by the co-ordinating geologist
- Yukon Metallogeny and Exploration Targets Bulletin (to be completed Nov. 1998)
 - staff geologists write contributions in April, May 1998
 - co-ordinator compiles into bulletin over the summer
- Geological map of the Yukon (to be completed Nov. 1998)
 - compiled by S. Gordey, Geological Survey of Canada
 - joint G.S.C./Yukon Geology Program publication
- GIS database (ongoing, to be available to public Nov. 1998)
 - for public and internal use, containing geological map of the Yukon, regional geochemical surveys, regional aeromagnetic surveys, MINFILE, digital topography, and other data

Budget (does not include salary of current permanent staff)

1997/98

Compilation phase

- Computer workstation, and GIS software **\$30 K**
- GIS technician **\$40 K**
- Miscellaneous items required for this phase (no labour included): **\$10 K**

Estimators Workshop

- Estimator's wages, travel costs for participants etc. **\$45K**
- Miscellaneous material for workshop **5K**

TOTAL **130 K**

1998/99

- GIS technician **\$50 K**

Synthesis of Results

- Contract to compile data **\$5 K**

Products

- Miscellaneous administrative needs **\$10 K**

TOTAL: **\$65 K**