



# **NORTHERN GEOSCIENCE INVESTING IN CANADA'S FUTURE**

**Report presented to**

**The Honourable Robert Nault  
Minister of Indian Affairs and Northern  
Development**

**by**

**Industry Representatives of the Industry-  
Government Overview Committee (IGOC)**

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## NORTHERN GEOSCIENCE – INVESTING IN CANADA’S FUTURE

### EXECUTIVE SUMMARY

At the Northern Mines Ministers’ Conference (April 4, 2002), Minister Nault tasked the *Industry-Government Overview Committee (IGOC)* “to develop, within six months, a short-, medium- and long-term strategy for funding geoscience in the North.” Within the context of the federally, provincially and territorially endorsed *Cooperative Geological Mapping Strategies Across Canada (CGMS)*, this report proposes a short, medium and long term plan for funding Northern geoscience to meet the goals and objectives of CGMS.

There are numerous reasons to support increased government geoscience investment, including the following:

- ! The non-renewable resource industry has been and will continue to be the most important economic driver in the three territories.
- ! The three territories have enormous potential for new mineral, oil and gas discoveries.
- ! A good geoscience knowledge-base is a key competitive advantage to any jurisdiction that wants to attract investment in the non-renewable resource sector.
- ! Geoscience infrastructure – including basic regional geological, geochemical and geophysical knowledge – is missing in large areas of the territories.
- ! Current expenditures on the geoscience knowledge base of the territories are significantly lower than in any other jurisdiction in Canada on both a per capita and per unit area basis.
- ! Government expenditures on geoscience are an investment that encourages exploration, prompts discoveries and returns revenues to governments in the form of taxes and royalties.
- ! Grassroots exploration is primarily carried out by the junior exploration sector, which relies heavily on government geoscience to select areas for exploration.
- ! Government geoscience not only benefits our industry – it has other applications and benefits related to high government priority issues such as climate change, water, land use, science and technology and land management and Sustainable Development.

Given past performance and the fact that the territories are considered underexplored, it is reasonable to believe that all three territories have the potential for sustainable self-sufficient economies founded on non-renewable resource development. Government geoscience is an essential step to realizing that potential.

The government members of IGOC have developed, within the context of the CGMS, short-, medium- and long-term programs and budgets for the Northern Geoscience Strategy, based upon the need to:

- ! Increase investment in minerals and energy;
- ! Stimulate new discoveries;
- ! Address critical gaps in geoscience knowledge
- ! Train local human resources; and,
- ! Support Sustainable Development.

Responsible development of mineral resources will be the basis for future Northern economic sustainability and quality of life for northern Canadians, most of whom are Aboriginal or Inuit. The current state of the North's geoscience knowledge base is so inadequate that it is an impediment to investment by the private sector, which drives development of mineral resources and helps build a robust Northern economy. A number of key studies, carried out over the past several years, consistently conclude that a suitable level of investment to create a competitive, modern geoscience knowledge base for the North is approximately \$270M. This figure is a small fraction of what is required to actually complete the knowledge base for the North to the standard that already exists in all provincial jurisdictions in Canada. Current spending through the northern geoscience offices is roughly \$7M per year. Recognizing the current federal fiscal situation, and reflecting on capacity in the geoscience community, the present document outlines short-, medium- and long-term plans that, if implemented, would advance the state of Northern geoscience knowledge to a level approximately half of that outlined above by the year 2015.

The following table summarizes the additional investment required to meet the geoscience needs of the three territories

**New Resources Needed for Northern Geoscience Offices**  
**(\$K in constant 2002 dollars)**

<b>Territory</b>	<b>Short-Term (to April 2003)</b>	<b>Medium-Term (2003-2005)</b>	<b>Long-Term (1005-2015)</b>	<b>Projected Future Needs (2015+)</b>
Yukon	0	400	1,100	200
NWT	0	2,700	3,300	3,300
Nunavut	0	1,365	7,365	8,000

***For the reasons provided above and elaborated below, the industry members of the IGOC strongly support these proposals for renewed investment in geoscience.***

## 1. INTRODUCTION

### 1.1 The Challenge to Industry

The competitiveness of the North's geoscience database has been a recurring theme in Industry-Government Overview Committee (IGOC) discussions. An industry presentation at the Northern Mines Ministers' Conference (April 4, 2002) noted the important stimulus geoscience provides for exploration and economic development. It also noted the inadequacy of the North's geoscience knowledge base in providing that stimulus. Recognizing the importance of the issue, Minister Nault tasked, on behalf of Northern Mines Ministers, the IGOC "*to develop, within six months, a short-, medium- and long-term strategy for funding geoscience in the North.*"

This report responds to the Minister's request. Within the context of *Cooperative Geological Mapping Strategies Across Canada* (CGMS), which the federal and territorial governments have endorsed, this report proposes a short, medium and long term plan for investing in northern geoscience to meet the goals and objectives of CGMS.

### 1.2 Devolution

The territorial governments and DIAND deliver, in partnership, "provincial type" geological survey programs. With devolution, solely the territorial governments will hold this responsibility. The Geological Survey of Canada's (GSC) role in carrying out its national survey activities will remain constant in the territories before and after devolution.

Industry commends the territorial and federal governments for working together on the "seamless" delivery of geoscience. Industry also endorses the territorial governments' request for increased federal government investment in support of mineral and energy development.<sup>1</sup> In this document, we have not addressed issues such as which government(s) should be the source of any potential geoscience funds or potential arrangements between governments on funding transfers. It is assumed that the Northern Mines Ministers will hold discussions about funding arrangements that could support implementation of the Northern component of CGMS. The mining industry is more than willing to support Ministers in their efforts to obtain funding.

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<sup>1</sup> For example, the Government of the NWT's *Non Renewable Resource Development Strategy* requested \$235 million over four years from the federal government, including \$5 million/year for geoscience.

## 2. BACKGROUND

### 2.1 Resource Development and the Northern Economy

For decades, non-renewable resource development has been the most important private-sector economic driver in the three territories. In recent years, it has contributed 18-20 percent to the GDP in the Northwest Territories and Nunavut (Appendix 1). It also promises to be the key to the territories' future economic growth and associated social and political development. In 1999, mining and minerals contributed \$731 million or \$17,572 per capita to the NWT economy, \$129.9 million or \$5,196 per capita to the Nunavut economy, and \$91 million or \$2,972 per capita to the Yukon economy. In addition, renewed interest in frontier oil and gas is enhancing opportunities for the North. The territories contain 25 percent of Canada's known and 50 percent of projected oil and gas reserves.

Diamond mining presents important opportunities for growth. In 2000, it was projected that the Ekati™ Mine would generate annual revenues of \$400 million and provide long term employment for 600 people in the North. Over a 25-year mine life, revenues to the federal government alone will amount to \$4.4 billion. Over its life, the Diavik Project will contribute more than \$3 billion in direct, indirect and induced taxes. Diavik is expected to create between 400 and 450 long-term jobs for Northerners throughout its operating life. Other diamond developments are on the horizon that will enhance this economic picture.

All three territories have the potential for sustainable self-sufficient economies founded on non-renewable resource development, particularly given past performance and the fact that the territories are still significantly underexplored. Government geoscience is directly linked to the territories' ability to realize that potential. It is part of "making Canada a land of ever-widening opportunity".<sup>2</sup>

### 2.2 Geoscience - Foundation for Northern Resource Development

At the recent PDAC Workshop conducted during the Mines and Energy Ministers Conference in Winnipeg, Michael Doggett (Queen's University) pointed out that there are generally two types of mineral deposits, the giant deposits or "*Country Builders*" and the medium to small deposits or "*Country Sustainers*". The *Country Builders* include deposits such as Kidd Creek, Polaris and Brunswick, which together contributed 51 percent of Canada's zinc production in the period 1980 – 2000. After many decades of operation, most of our *Country Builders* are running out of reserves. They need to be replaced!

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<sup>2</sup>"*The Canada We Want*", Speech from the Throne, September 30, 2002

***The three most recent Country Builders  
were all found in Canada's North.***

The North is seen, however, as having a number of obstacles to investment and, therefore, to the potential for major new discoveries. Besides sparse geological knowledge, impediments include:

- ! a challenging, complex regulatory regime;
- ! a lack of infrastructure; and
- ! a climate that poses seasonal constraints to exploration and mining.

In its favour, the North is perceived to have high mineral potential. This perception is based largely on the North's mining history and exploration successes to date. Government can enhance this positive perception of mineral potential by providing basic geologic information. It is this type of information that reportedly influenced Charles Fipke to mount his search for diamonds in the NWT. It is this type of information that points to the potential for a diversity of commodities, regardless of production history or market trends for specific types of commodities. A strategic focus on factors in the investment climate where meaningful improvements can be made will increase investment in the territories. With political will and adequate investment, the quality and extent of the geoscience knowledge base can easily be improved, increasing the North's competitive advantage.

### **2.3 The Link Between Geoscience, Investment and Exploration Decisions**

The Northern geoscience knowledge base is the foundation upon which the mineral industry bases its plans. Showing a project has a similar setting and geological potential to a known deposit or mine attracts project funding. Government maps are the first indicators that similarities may exist. There is a strong partnership between government geological surveys and the exploration sector. Government surveys provide the base geological data. Industry enhances this through its exploration work and the resulting information is then reported to government. As well, industry at times provides logistical support to government field programs.

Government geoscience is a critical component in attracting investment in the competitive global market, particularly given Northern handicaps such as poor to non-existent infrastructure, remoteness and harsh climatic conditions. Geoscience also opens up new areas for development. A knowledge base that is continually expanding supports advancing exploration, while minimizing the potential impact of duplicative exploration activities on the land. It also contributes to the health of the junior sector, a critical part of the mineral industry. An active exploration sector in turn helps to develop clusters of economic activity in support of exploration and mining, attracts talent and encourages the development and deployment of new technologies.

The need for good geoscience information has been accentuated in the past 10-15 years by a major shift in industry's exploration activity. In the past, major mining companies had large exploration departments doing grassroots exploration including, on occasion, regional geophysics and geochemistry. Most of the major companies no longer do grassroots exploration and rely on the acquisition of more developed projects from the junior exploration companies. Junior companies therefore take most of the risks and make most of the discoveries. These junior companies rely heavily on government geoscience data because they do not have the resources to carry out regional surveys.

There is a fundamental relationship between the quality and relevance of the geoscience knowledge base and exploration activity. If prospectivity, land tenure, and socio-political environment are equal among jurisdictions, the geoscience knowledge base will strongly influence a company's decision to invest. Government geoscience gives a competitive edge in the competitive global investment climate.

**“Geoscience knowledge provided by government geological surveys is a critical factor in determining where the private sector will focus its exploration activities and how it will spend”**

**-1999 report prepared for the GSC titled Refinement and Validation of a Costs Benefits and Impacts Model for the Targeted**

## **2.4 Economic Impacts of Geoscience**

Despite the clearly established link between provision of government geoscience and the ability of a jurisdiction to attract exploration (which is a prerequisite to having mines), there has been a significant decline over the past two decades in government geoscience investment in the North. This has paralleled an overall drop in exploration North of 60°. The impact of declining government geoscience investment is exacerbated by the trend in the minerals industry where grassroots exploration is increasingly becoming the responsibility of the junior sector.

**Results released in 1988 from a GSC \$212 K stream sediment survey led directly to Cominco's discovery of the Kudz Ze Kayah massive sulphide deposit. By the end of 1994, Kudz Ze Kayah contained a drill-indicated resource with an in situ value of \$2.2 billion and spurred subsequent exploration leading to additional discoveries, including the 5.3 Mt Wolverine deposit and the Kona deposit. Exploration and development expenditures around this series of discoveries amounted to more than \$40**

**In 2000, the Canada-Nunavut Geoscience Office, in collaboration with the GSC, initiated a new multi-disciplinary regional mapping project in a poorly understood but highly prospective area of central Baffin Island. Upon release of preliminary results following the first field season, BHP, Cominco, and Falconbridge obtained land positions in the project area; land positions were increased following release of information following the second year of regional mapping. To date, the companies have invested nearly \$4M, double the initial government investment.**

Other public interests are also at stake. A comprehensive Northern geoscience knowledge-base will meet a number of societal needs regarding energy development, assessment of groundwater resources, land use planning, and natural hazards (earthquakes, landslides). It adds to environmental base line knowledge in the North, better positioning

Canada to monitor and understand climate change effects, long-range transport of organic pollutants and other environmental concerns. It contributes to site-specific understanding of environmental issues related to mine site reclamation. It provides fieldwork opportunities and training for new graduates and students and, increasingly in the North, Aboriginal Canadians.

Geoscience is essential to making informed decisions regarding land use and contributes to Canadian sovereignty and security. It can also help governments make sound decisions relating to public investment in infrastructure. A high quality geoscience knowledge base ensures infrastructure development meets the public's needs for access and yields long-term maximum economic benefits by providing access to areas of high mineral potential.

These types of studies may not directly result in revenue-producing mines, but can further governments' public safety and environmental stewardship agendas, reduce the risk of future government liabilities and provide a solid foundation for evidence-based policy and decisions around Sustainable Development of the North. All these factors contribute to a jurisdictions' investment attractiveness.

Government investment in geoscience makes good economic sense. Historical information indicates that, on average, for every million dollars invested in geoscience in Canada:

- ! there is a corresponding investment of \$5 million by the private sector in exploration activities;
- ! that leads to the discovery of \$125 million worth of in-situ new resources.

These benefits do not include the exploration jobs created from geoscience investment, nor, of course, the many more created if a mine is brought into development.

*"...The fuel of the new economy is knowledge...[the federal government] will strengthen government science..."*

September 30, 2002  
Speech from the Throne - *The Canada We*

Given the tax regime in Canada, it can be assumed that the territorial and federal governments will receive approximately 40 percent of the value of economic activity as direct and indirect taxes. It follows that, if \$1 million of geoscience generates \$5 million of exploration, this private sector activity will generate, in the short term, approximately \$2 million in taxes (see box on previous page). This excellent rate of return on investment, which helps to fund government priorities such as health and education, is caused by the multiplier effect of geoscience.

**1997 DIAND and GNWT mapping of the Nowyak Lake area (in Nunavut) has resulted in \$2 -3 million worth of expenditures on gold, silver and zinc exploration between the years of 1998 and 2000.**

This multiplier effect tends to be greatest in less explored areas. For example, a recent cost/benefit analysis conducted by Stanford University revealed that government investment in the South Baffin integrated geoscience mapping project completed in 1998 had a 10-fold multiplier for private sector spending.

To put it simply, government investment in Northern geoscience stimulates exploration activity that leads to an inventory of mineral deposits and the development of new mines. Continuous exploration to replace depleting reserves and identify new economic deposits is a prerequisite for the future survival of the Northern mineral industry. In addition, exploration success targeting a variety of commodities decreases the North's vulnerability to "boom-bust" cycles.

**Based on the government geoscience knowledge base, and subsequent reconnaissance sampling, De Beers Canada Exploration acquired mineral rights through an area of Northern Baffin Island that is more than one and a half times the size of Prince Edward Island. In 2002, project expenditures approached \$2 Million, the company employed 30 local people, and obtained significant goods and services from several Nunavut communities; an increased level of activity is planned for 2003. The impact of this investment and activity has been noted in a front-page headline in the local weekly newspaper: "North Baffin Diamond Rush!"**

Operating mines increase the Canadian presence in the North, purchase northern and Canadian goods and services, and help to build local and Canadian skills and capacity through employment and training. Operating mines pay royalties and taxes back to the federal government in amounts that dwarf the original investment in geoscience. Data collected for 1996-97 shows that territorial government and DIAND geological survey expenditures in Yukon and NWT (which then included Nunavut) amounted to 0.58 percent and 0.30 percent respectively of the value of mineral production in the two territories. In the NWT, in 2000 that figure was 0.17 percent.

## 2.5 How the North Compares

In 1999, an industry-led task force examined regional geoscience coverage across Canada on the basis of four key criteria:

- ! bedrock geology,
- ! surficial geology,
- ! aeromagnetism and geochemistry.

The analysis (Appendix 4), with respect to the territories, was not comprehensive since not all territories needs were tabulated (for example, NWT excluded geochemistry needs). However, it showed that the territories accounted for at least 40 percent of the identified gaps in Canada, with Nunavut having the most significant gaps in regional geoscience coverage of any Canadian jurisdiction.

Despite the importance of the mineral industry and the North's high mineral potential, it lags far behind the provinces in terms of government expenditures on geoscience. In 2000-2001, Ontario and Quebec (who are comparable in size to NWT and Nunavut) spent \$20.1 million and \$16.4 million respectively on provincial-type geological surveys. In the same period, the national average for provincial/territorial expenditures per km<sup>2</sup> was \$10.91/km<sup>2</sup>. Expenditures per km<sup>2</sup> in Yukon, NWT and Nunavut were \$6.33/km<sup>2</sup>, \$1.98/km<sup>2</sup> and \$1.62/km<sup>2</sup> respectively. Even when considering survey expenditures as expenditure per capita (using the population base of the jurisdiction that collects mineral royalties), the territories again do not compare favourably. The provinces invest \$2.95 on a per capita basis in their geological surveys. In the territories, where royalties are collected

### The Value of Partnership

Geoscience delivery in the North is based on partnerships. The territorial governments, the federal Department of Indian Affairs and Northern Development, and Natural Resources Canada, through the Geological Survey of Canada, have distinct but complementary roles in addressing the geoscience needs of the North. The agencies work cooperatively and collaboratively in the spirit of the federal/provincial/territorial Intergovernmental Geoscience Accord.

In all three territories, the territorial and federal governments have co-located most of their geoscience staff in Canada-territorial geoscience centres to deliver (for the most part) provincial-type geological survey activities. The Geological Survey of Canada (GSC), with staff in two of the three centres, contributes to and augments the work of all three centres by carrying out GSC's national geological survey program in the North. These working arrangements, in place for a number of years, have proven to be highly-effective and efficient, maximizing the impact of well-planned and coordinated geoscience activities, despite limited budgets.

Besides increased collaboration between different levels of government, strong links have been forged with earth science departments in Canadian universities. Support for undergraduate and graduate student research not only increases the scope and impact of the northern geoscience offices' projects, but also contributes to training of the next generation of Canadian geologists, explorationists and scientists. Increasingly, geoscience and exploration activity is providing training opportunities for Aboriginal Canadians.

The role of industry, as a significant partner in government geological survey activities in the North, cannot be overstated. At times, industry helps government geoscientists with provision of logistical support that reduces the costs of government field programs. More significantly, hundreds of millions of dollars worth of industry-generated geoscientific information, spanning decades of field work in the North, resides in government archives. After a period of confidentiality, this information is available to government and industry geoscientists and the public. Government can compile, synthesize or reprocess the information into new geoscience products. Through this type of partnership, recent government investments of about \$100 K in Information Management/Information Technology products in the NWT resulted in the synthesis and dissemination of about \$250 million worth of industry-funded geoscience data relating to kimberlite exploration. Although the economic impact of these products has not been documented, industry feedback indicates that the products have been used by junior mining companies to generate projects that

by the federal government for the benefit of all Canadians, the expenditures on geological surveys, on a per capita basis (using the population of Canada) are \$0.10 in Yukon, \$0.09 in NWT and \$0.11 in Nunavut.

### 3. THE WAY FORWARD

#### 3.1 Cooperative Geological Mapping Strategies Across Canada (CGMS)

Formal priority setting exercises (Geoscience Needs workshops) are held regularly by all three centres with the active participation of their GSC liaison. They are attended by federal (GSC and DIAND) and territorial government geoscientists, industry, and other interested parties. These priority-setting exercises form the basis for program planning.

**Government mapping east of Bathurst Inlet, at an approximate cost of \$450,000, has generated exploration expenditures in the Hope Bay area of \$133 million. The Doris Hinge gold mine is in the early stages of the environmental screening process and, if it goes into production, is expected to create 70 to 80**

In addition, all three Canada-territorial Northern geoscience centres interact directly with industry on a day-to-day basis, and periodically through the Northern geoscience conferences (for example, “Geoscience Forum”), and national mining conferences such as the Cordilleran Roundup and the PDAC. This interaction provides government with a clear sense of industry’s geoscience needs.

Moreover, the three geoscience centres participate on the National Geological Surveys Committee, the Provincial Geologists Committee and, through the Intergovernmental Working Group (IGWG) of the federal/provincial/territorial mines ministers, have studied geoscience service delivery issues. Combined, a solid information base has been developed for the territories. Recent studies, reviews and analyses have focused on:

- ! the competitiveness of Canada’s geoscience knowledge base (Appendix 2),
- ! alternative funding mechanisms for geological surveys (Appendix 3), and
- ! an assessment of the level of funding (in each province and territory) necessary to close, over the next ten years, significant gaps in geological, geophysical, and geochemical map coverage in each province and territory (Appendix 4).

These reports prompted Mines Ministers nationally to accept the importance of geoscience in maintaining Canada’s competitive position in attracting mineral exploration. In 2000, the Ministers endorsed the document “Cooperative Geological Mapping Strategies Across Canada (CGMS)” (Appendix 5). CGMS implementation, predicated on the availability of new funding, outlines economic objectives of:

- ! increasing investment in mineral and energy exploration;
- ! stimulating new discoveries;
- ! identifying new resources in mature areas; and
- ! promoting Sustainable Development.

Its technical objectives are to:

- ! fill important gaps in subsurface and surface geological map coverage; and
- ! present results in a format that is easy for clients to understand and use.

The CGMS recognizes that a strategy will have to be developed for each participating province or territory and different approaches and budget considerations will apply in each jurisdiction.

***The IGOC believes we have an important opportunity to link the Northern Mines Ministers' and National Mines Ministers' agendas through the geoscience initiatives.***

### **3.2 The Cooperative Geological Mapping Strategy in the North**

What sets the territories apart in terms of geoscience delivery is the role of DIAND in discharging some "provincial-type" responsibilities, and (in relation to DIAND's role) the important role played by the three northern geoscience centres. Whereas implementation of the CGMS in the provinces would see federal funding going to the GSC, in the territories, federal funding is needed to support both the GSC and Northern geoscience offices.

The territorial ministers have already endorsed the CGMS, as has the Minister of Natural Resources Canada.

**IGOC, therefore, strongly recommends that:**

- ! **the DIAND Minister and his territorial counterparts become champions for the northern component of the CGMS;**
- ! **a concerted effort, co-sponsored by the Ministers of DIAND and NRCan, be placed on securing additional funding for Northern geoscience; and last but not least,**
- ! **priority for the northern strategy be based on CGMS economic and technical objectives.**

Funding minimums must be sufficient to complete the technical objective of filling important gaps in surface and subsurface geological map coverage (CGMS Annex B, Number 5).

#### 4. ACTION PLAN

A number of key studies, carried out over the past several years, consistently conclude that a suitable level of investment to create a competitive, modern geoscience knowledge base for the North is in the order of \$270M. This figure is a small fraction of what is required to actually complete the knowledge base for the North to the standard that already exists in all provincial jurisdictions in Canada. Current spending through the northern geoscience offices is roughly \$7M per year. Recognizing the current federal fiscal situation, and reflecting on capacity in the geoscience community, the present document outlines short-, medium- and long-term plans that, if implemented, would advance the state of northern geoscience knowledge to a level approximately half of that of provincial standards by the year 2015. The actual funding requirements, broken down by Territory, are summarized in Appendix 6.

##### Short-Term Work Plan (to 31/03/03)

##### Additional Investment Required: None (within existing budgets)

An ongoing challenge to public geoscience providers is to demonstrate relevance to clients and stakeholders through the immediate utility and impact of their data. This requires timely release of new information and interpretations from ongoing data gathering projects, as well as development of selected strategic products that incorporate subsets of new or pre-existing data aimed at specific sectors of the mining industry. Clients in the exploration industry eagerly await the presentation of new field observations, assay results and maps following a field season. The North Slave Diamond Exploration Data compilation CD-ROM is an example of a product that was jointly conceived, compiled from existing data, and released by the Canada-NWT C.S. Lord Centre and the Canada-Nunavut Geoscience Office in January 2002, less than two months after the Coronation Gulf staking rush began in the North Slave. Such timely release of new field data and digital compilation products are widely used by exploration companies to enhance the likelihood of exploration success by expediting their immediate (i.e., "next season") exploration strategies. The impacts of the following products are expected to be seen in 2003.

Strategic products that will be delivered prior to the end of the current fiscal year include:

- ! Debut **presentations of new results from fieldwork conducted during 2002**, in oral and poster format, at regional Geoscience Forums (Whitehorse and Yellowknife, November 2002), Exploration Roundup (Vancouver, January 2003) and the PDAC Convention and Trade Show (Toronto, March 2003). Such presentations have frequently led to targeted ground acquisition by the exploration industry.
  
- ! **On-line release of written reports of fieldwork and publication of new, full colour geological maps** (digital and paper versions) between January and April. Industry application of these data sets commonly leads to acquisition of additional exploration ground, and preliminary development and budgeting of exploration programs.

- ! **Acceleration of conversion of existing hard-copy bedrock geological maps to on-line-GIS-compatible digital format to increase the accessibility and thus utility of these baseline data that are a critical foundation element in exploration projects.** This initiative would begin to establish global access to Northern geoscience data via the internet-based Canadian Geoscience Knowledge Network.
- ! **Initiation of new digital compilations in strategic areas of industry interest.** These compilations will include historical exploration data and sample collections, diamond drillhole locations in GIS format, linked to drill logs and NORMIN, conversion of existing hard-copy government geological maps to on-line-GIS-compatible format, and integration with high resolution satellite data. This initiative will increase the accessibility, and thus utility, of baseline data that are a critical foundation element in exploration projects. Examples of two poorly understood areas with high mineral potential are Cornwallis Island and the Melville Peninsula; new digital products integrating multiple data layers will facilitate reinterpretation of these areas and help identify new exploration targets in these under-explored areas.

Other compilation products could be developed and delivered in a matter of weeks or months, in response to currently unforeseen industry needs. These outputs will be delivered by the Northern geoscience offices, in collaboration with current project partners, including NRCan's Geological Survey of Canada, and the Northern Regional Offices of the Department of Indian Affairs and Northern Development.

**Medium-Term Work Plan (01/04/03 to 31/03/05)**  
**Additional Investment Required: \$4.6 million**

In addition to timely release of new information and interpretations from ongoing data gathering projects and conversion of archived data into modern formats, the northern geoscience offices will start collecting new field data, as described in their respective current workplans. Anticipated new funding would allow more thorough examination as well as additional geographic area to be covered by these new field projects, and would provide opportunities for Aboriginal and Inuit participation in the activities of the northern geoscience offices.

Under the proposed strategy, objectives that would be delivered over the next two fiscal years include:

- ! **Initiation of new field work** (such as new systematic regional mapping, detailed mapping, targeted regional geochemical and geophysical surveys, and thematic investigations of mineral deposits) in strategic locations as determined by the current Needs Assessments for each territory. Local outreach and capacity-building would become standard operating practice, facilitating engagement of local people. Exploration spending and consequent community benefits increase significantly.

- ! **Implementation of existing planned (but unfunded) strategies to employ and train Aboriginal and Inuit youth.** On-the-job experience, combined with participation in post-secondary education and co-operative work experiences leads to increased levels of meaningful participation by our northern peoples.
- ! **Completion of the conversion of existing hard-copy geological maps (bedrock, surficial, geochemical) to on-line-GIS-compatible digital format.** Data standards and best practices developed in the Short Term Plan will be applied to the balance of existing geoscience maps. Complete on-line availability of these basic data sets through the Canadian Geoscience Knowledge Network would place the Territories on par with other jurisdictions in Canada in a competitive global exploration market.
- ! **Digital compilations of historical exploration data in additional areas of industry interest.** As data that are currently confidential become public, there will be ongoing opportunities to create new digital products in areas that will be of interest to the exploration sector. Selection of areas to be compiled will be based on industry interests and global commodity trends.
- ! **Historical mineral exploration data,** including geological maps and geophysical and geochemical data, **will be converted** from microfiche and hard copy to web-searchable digital form, and on-line catalogues of rock samples and diamond drill core within government collections will be established, facilitating immediate use by industry, prospectors, and government anywhere in the country.

These outputs will be delivered by the Northern geoscience offices, in collaboration with current project partners, including NRCan's Geological Survey of Canada, the Northern Regional Offices of the Department of Indian Affairs and Northern Development, and relevant departments of the respective territorial governments.

**Long-Term Work Plan (01/04/05 to 31/03/15)**  
**Additional Investment Required: \$11.8 million**

Based on the foundations created under the Medium-Term Workplan, strategically targeted work would begin that would, over a 10-year period, result in a dramatic improvement in the state of the northern geoscience knowledge framework and level of participation in geoscience by Aboriginal and Inuit peoples. Ten years hence, the quality of life and economic self-sufficiency among northerners would be significantly improved in keeping with the priorities of the territorial and federal governments, although the task of completing the geoscience knowledge framework for the territories would not be complete.

Under the proposed strategy, - outcomes that will be achieved over the 10-year period include:

- ! Completion of framework bedrock and surficial mapping in 16 of the highest priority areas, where potential for new resource discoveries is greatest. By 2015, we expect that significant new exploration dollars will have been invested by the private sector, offering the potential of significant new gold and base metal discoveries and the opportunity that some will be in or nearing production. This would add several thousand new jobs to the territorial economies and billions of dollars in tax revenues.
- ! Completion of framework surficial mapping and ice-flow studies in four of the highest priority areas, where drift prospecting is the key to successful exploration. By 2015, the North could have six or more world-class diamond mines, solidifying Canada position as one of the world leading diamond producers creating thousands of new jobs and increasing tax revenues.
- ! Filling essentially all of the remaining holes in the regional geophysical and geochemical data coverage, and upgrading of numerous currently sub-standard areas. By 2015, potential new exploration and development in these areas will further contribute to increased employment in the North and tax revenues for all levels of governments.
- ! Dramatically increased diversification of territorial economies, based on secondary developments in response to a robust and healthy resource-based economic sector. These effects are most pronounced in our smaller communities where development options are limited.
- ! Meaningful inclusion of Aboriginal and Inuit people in the northern geoscience workforce, contributing to quality of life and economic self-sufficiency among Northerners. By 2015, numerous fully-qualified Aboriginal and Inuit geologists will be employed in the North by governments and the private sector, ensuring that benefits to local families and communities are maximized, and that the capacities of communities to participate in and benefit from the resource development-based economy are realized.

These outputs will be delivered by the Northern geoscience offices, in partnership with Natural Resources Canada, Department of Indian Affairs and Northern Development, and relevant departments of the respective territorial governments.

## 5. CONCLUSIONS

Both prudent analysis and overwhelming anecdotal evidence demonstrate that government geoscience is not only a fundamental prerequisite to active exploration and resource development, it is an investment whose significant returns underscore the important contribution of geoscience to Sustainable Development. Like many other public goods provided by government,

**In the NWT, 320 people -- mostly Aboriginal -- have been placed in mining and related jobs over the past three years in an industry-led training initiative. Similarly, the Joint Aboriginal/Industry Resource Development Initiative is developing resource sector and Aboriginal capacity in communities**

geoscience is one of the building blocks of a modern nation. In Canada's North, geoscience has a pivotal role to play in securing the economic self-sufficiency of the territorial economies and the socio-economic development of its people, including and in particular its Aboriginal people.

Key conclusions of the industry members of the IGOC are that:

- ! Government geoscience is an investment that is proven to have an excellent rate of return on the original investment through increased private-sector investment in mineral exploration and the development of new mines, both of which generate returns to government and society, in terms of tax revenue, employment and skills development.
- ! government geoscience underpins the development and growth of exploration and mining infrastructure, including the development of mining suppliers and services and the attraction of talent and expertise to Canada.
- ! Government geoscience is of particular importance to the junior mining sector, which is currently responsible for grassroots exploration and the discovery of new mineral deposits, which are subsequently marketed to major Canadian and/or multinational mining companies.
- ! Non-renewable resource development is essential to the economic well-being of Northern communities.
- ! Government geoscience also provides important information on sustainable development, the environment and climate change.
- ! Northern geoscience is severely underfunded compared to other jurisdictions in Canada on both a per unit area and per capita basis.
- ! The Northern Geoscience Strategy should incorporate the technical and economic objectives of the Cooperative Mapping Strategies Across Canada Program.
- ! The programs and funding requirements developed by the government members of the IGOC subcommittee are reasonable targets for the short, medium and long term.

The industry members strongly urge federal and territorial governments to move expeditiously to implement the recommendations of this paper; to invest in the territories' economic future by providing badly needed geoscience information.

## **GLOSSARY OF TERMS AND ACRONYMS**

**CGMS** - Cooperative Geological Mapping Strategies Across Canada

**GSC** - Geological Survey of Canada

**IGOC** - Industry Government Overview Committee, a committee with representatives from DIAND, the territorial governments, Natural Resources Canada and the mining industry, providing DIAND, the territorial governments and industry with a forum to exchange views on key Northern mining issues and developments.

**National Geological Survey (or National Survey)** - refers to the Geological Survey of Canada's roles and responsibilities in carrying out national geoscience programs to define the geology and resources of Canada. The GSC's programs are typically thematically based and national or broadly regional in scope and significance. They are operated across Canada, and include aspects of fundamental research, technology development and information transfer not contained in the programs of all of the provincial and territorial survey organizations.

**NRTEE** - National Round Table on Environment and Economy

**PDAC** - Prospectors and Developers Association of Canada

**"Provincial-Type" Geological Survey (or Provincial-Type Survey)** - in this document refers to the geological survey activities carried out in partnership by DIAND (delivering its "provincial type" responsibilities) and the territorial governments. These programs are specific to the governments' economic development and resource management mandates specific to each individual territory. The programs are typically carried out at a scale appropriate to addressing territorial responsibilities and are geographically limited to the jurisdiction over resources, environment and land of the territory. They contribute to a systematic description of the geology of the territory including its mineral and energy endowment. The programs are largely directed toward sustainable economic development and are closely linked to the local needs of clients. They are also related to territorial land use and social issues.