Summary of Geoscience BC Program Activities 2005[1]

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INTRODUCTION

Geoscience BC is an innovative and applied geoscience centre formed in 2005 and dedicated to the collection, interpretation and marketing of geoscience expertise, information and products in support of resource exploration in British Columbia. The mandate is to attract investment in the mineral and oil and gas industries in BC through applied geoscience work. In support of this mandate, Geoscience BC is pleased to present its first set of technical progress reports for projects funded during the spring and summer of 2005. These projects build on previous geoscience work completed and supported by the BC Geological Survey and the Resource Development and Geosciences Branch of the BC Ministry of Energy, Mines and Petroleum Resources, by the Geological Survey of Canada and by universities and industry.

The Geoscience BC projects (Fig. 1) include

- regional geochemical survey programs (the BC portions of six 1:250 000-scale NTS sheets were completed);
- geochemical studies to develop methods for detecting blind deposits in central BC;
- northeastern BC kimberlite indicator mineral study;
- mapping and mineral potential projects on Vancouver Island and in central BC;
- hydrocarbon potential study of the Bowser Basin;
- Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) imagery project;
- community geoscience needs for the Lillooet – Lytton area; and
- Placer Dome archived data capture project in central BC.

The Geoscience BC programs presented in this volume are one and two-year projects. Final data releases will be as early as January 2006 for the ASTER project by Kilby and Kilby (2006) and April 2006 for the RGS programs by Jackaman (2006) and Naas (2006). Other projects will produce final results from the fall of 2006 through to the spring of 2007. All data will be released through the publication systems of the BC Geological Survey and will be made available for viewing on their MapPlace website (www.MapPlace.ca) and on Geoscience BC's website (www.geosciencebc.com).

GEOCHEMISTRY PROJECTS

Regional geochemical survey (RGS) programs have a history of success in BC, and targets produced by these surveys are well known to generate grass-roots exploration that leads to new mineral deposit discoveries. During the 2005 field season, Geoscience BC completed RGS programs over two 1:250 000-scale NTS map sheets in central BC (NTS 093C, F; Jackaman, 2006) and over the BC parts of four 1:250 000-scale, NTS map sheets in the southeastern part of the province (NTS 083C, D, E and 082N; Naas, 2006). The RGS program in central BC covers a large portion of the Nechako Plateau, and these two sheets are the last remaining NTS sheets in the interior of BC to receive RGS coverage. The Nechako Plateau is a relatively flat interior region with poor drainage and an abundance of lakes; as a result, most of the samples collected in this area are lake sediments. In total, 1885 lake sediment and water samples and 102 stream sediment and water samples were collected at 1957 sites (Fig. 2). This program was the largest lake sediment sampling program ever completed in BC. The NTS map sheets completed in southeastern BC are the first of what is expected to be a series of programs to complete RGS coverage in the eastern part of the province. In total, 1409 sites were sampled for stream sediment and water. The RGS results from both survey areas are expected to be released in April 2006.

A significant part of the central interior of BC is covered by unconsolidated Quaternary cover and Tertiary volcanic rocks that hinder exploration for mineral deposits in the underlying, potentially productive bedrock. Even though the central interior of BC contains prospective geology, a map of known mineral occurrences (MINFILE, 2005) shows a dearth of occurrences in this drift-covered area. To address these challenges to mineral exploration, two Geoscience BC projects were undertaken during 2005 (Cook and Dunn, 2006; Dunn *et al.,* 2006) to develop geochemical methods for detecting blind deposits. The project by Cook and Dunn (2006) was designed to determine and recommend the most effective geochemical methods of exploration for buried mineral targets in drift-covered terrain in central BC by evaluating the most suitable soil horizons for field sampling, and evaluating and comparing commercially available analytical methods. In 2005, 7 samples were collected at each of 36 sample sites along profiles across epithermal veins on a Au-Ag epithermal prospect

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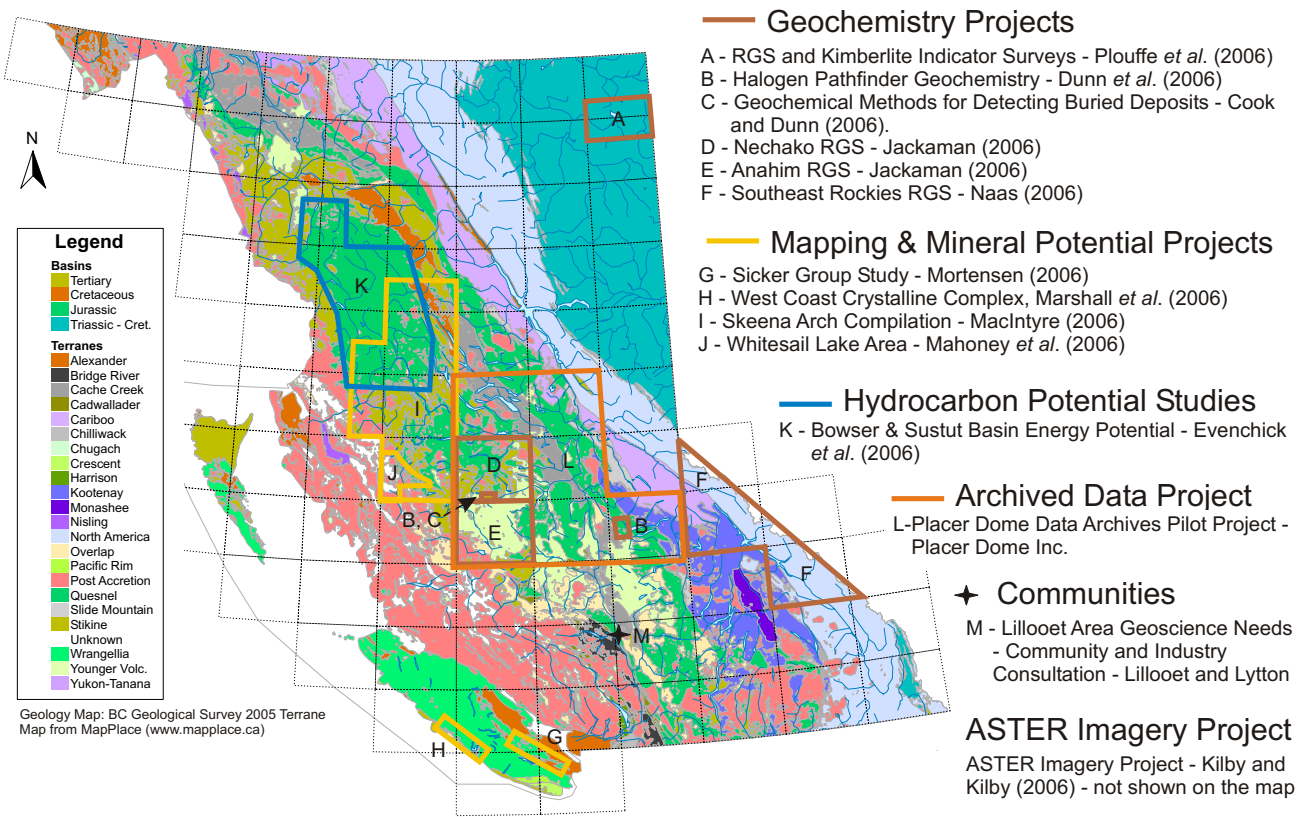

Figure 1. Location of Geoscience BC projects initiated in 2005.

(3Ts prospect). The samples will be analyzed using 6 different analytical methods, including selective extraction methods. The project, outlined in Dunn *et al.* (2006), will evaluate the use of halogens in both soils and vegetation as a means of detecting buried deposits. The use of halogens in geochemical exploration has received little attention in Canada; however, the results of studies recently translated from Russian suggest they may be effective for detecting buried deposits (Trofimov and Rychkov, 2004). As a first step in evaluating the use of halogens, Dunn *et al.* (2006) will determine the response of halogens in soils and vegetation to known mineralization and compare these responses to multielement inductively coupled plasma – mass spectrometry (ICP-MS) data on the same samples. In 2005, over 450 vegetation samples and almost 200 soil samples were collected from three properties, the 3Ts, QR and Mt. Polley deposits, in central BC.

The announcement of kimberlite indicator minerals (KIMs) from glaciofluvial samples in northeastern BC (Simandl, 2005a, b) has highlighted the possibility of diamond occurrences in this part of the province. To evaluate this potential, the project by Plouffe *et al.* (2006) involves the collection of glacial sediment, as well as stream sediment, water and heavy mineral concentrate samples, that will be used to better understand the potential sources of KIMs in this region. The samples will also be used to investigate the potential for gold, base metal and other economic commodities. In addition, this project will help evaluate aggregate resources in this region, resources that are critical to the development of infrastructure for oil and gas exploration in northeastern BC. In 2005, 123 glacial sediment samples, comprising 25

Figure 2: Regional lake sediment and water sampling in the Nechako Plateau using a float-equipped helicopter. Photo courtesy of W. Jackaman.

Figure 3: Glacial sediment sampling in support of kimberlite exploration in northeastern BC. Photo courtesy of I.R. Smith.

Figure 4: Chatsquot layered mafic intrusion on the southern flank of Chatsquot Mountain in the Whitesail Lake map area. Photo courtesy of Robert L. Hooper.

glaciofluvial samples and 98 till samples, were collected (Fig. 3). Analytical results are pending.

MAPPING AND MINERAL POTENTIAL PROJECTS

Detailed geological mapping has long been recognized as an important geoscience tool to improve exploration activity and success in a given region. To this end, Geoscience BC has supported three mapping projects in key geological areas, in order to improve the understanding of basic geology and mineral potential in these regions. The project reported by Mortensen (2006) will evaluate the Sicker Group on Vancouver Island, which is known to host volcanogenic massive sulphide (VMS) occurrences and deposits, such as the Myra Falls deposit. Despite the potential of the Sicker Group, exploration activity within it has been at a low level for the past decade. In addition to low commodity markets, this is likely due to a poor overall understanding of the geology and a lack of identification of the key stratigraphic level(s) that may host mineralization. The project by Mortensen (2006) will address these challenges through detailed geological mapping, lithogeochemistry, stratigraphic correlation, Pb-isotope geochemistry and geochronology. During the 2005 field season, 42 samples were collected for major, trace and rare earth elements, and 15 samples for U-Pb dating.

Also on Vancouver Island, Marshall *et al.* (2006) outlined a study to evaluate the geology and mineralization in the Nootka Sound area. Recent work by Marshall *et al.* (2005) suggests that a number of the rock units in the area correlate with volcanic assemblages and intrusive rocks that are known to host mineralization outside the area (*e.g.,* Zeballos or Myra Falls deposits). The primary goals of this study are to better understand the mineral potential of the area through improved geological mapping, lithogeochemistry, and metallogenic and mineral deposit studies. A number of potential exploration targets were identified during mapping in 2005.

The third mapping and mineral potential project is outlined by Mahoney *et al.* (2006). This project involves detailed geological mapping and mineral deposit studies of Mesozoic volcanic rocks of the western Stikinia Terrane and Mesozoic plutonic rocks along the eastern edge of the Coast Plutonic Complex in the Whitesail Lake map area (NTS 093E). This area has high mineral potential: stream sediment geochemistry and MINFILE (2005) data and detailed geological mapping to the north and south indicate potential for volcanogenic massive sulphide, Cu±Mo±Au porphyry and Ni-Cu-Cr-platinum group element mineralization (Mahoney *et al.,* 2006). Work during 2005 focused on bedrock mapping and preliminary evaluation of min-

eral potential in the southwestern corner of the Whitesail Lake map area (Fig. 4).

In addition to the mapping projects outlined above, MacIntyre (2006) discusses a project to produce a digital data compilation of the geology and mineral deposits of the Skeena arch in west-central BC. The Skeena arch is a belt of uplifted Jurassic and older rocks in central BC exposing a long-lived magmatic arc that has produced a diverse range of mineral deposits in a wide variety of geological settings. This area represents some of the most richly endowed terrain in BC and has been the site of extensive mineral exploration. This project will compile all geoscience data relevant to mineral exploration into a comprehensive GIS database that will include definition of exploration targets based on the positive correlation of indicators such as geochemical and geophysical anomalies and stratigraphic setting. A set of updated and standardized 1:100 000-scale maps will be generated for the Skeena arch, and all products will be provided on CD and available on the MapPlace website.

HYDROCARBON POTENTIAL STUDY

The interior sedimentary basins of BC, such as the Nechako, Bowser and Sustut basins, have generally been underexplored for hydrocarbon resources, largely due to the reconnaissance nature of geoscience data that evaluates this potential. Geoscience BC will address this need for more geoscience data to evaluate the hydrocarbon potential of the interior sedimentary basins over the coming few years. In 2005, one multicomponent project was initiated to address the hydrocarbon potential in the Bowser Basin (Evenchick *et al.,* 2006; Waldron *et al.,* 2006). One component of this project involves fission-track thermochronolgy studies in the southern part of the basin (Evenchick *et al.,* 2006). These studies are important to establish the timing of hydrocarbon maturation relative to the development of structures in the basin. In the 2005 field season, 29 samples were collected for fission track studies. The second component of the project includes an integration and publication of all field data from geoscience and hydrocarbon potential studies undertaken in the Bowser and Sustut basins over the past several years by the Geological Survey of Canada and the BC Ministry of Energy, Mines and Petroleum Resources (Evenchick *et al.,* 2006).

The third component of the project, outlined in Waldron *et al.* (2006), involves a detailed study of the early geological history and structural development of the Bowser Basin. This study will focus on better understanding the stratigraphic succession at the base of the Bowser Basin, which is thought to contain the best potential source rocks for hydrocarbon deposits. In addition, it will examine the structural development and character of the Cretaceous–Tertiary Skeena fold belt, which will assist in identifying potential hydrocarbon traps. In particular, the study will examine the development of structural domes and the relationship between folds and faults in the Bowser Basin.

ASTER IMAGERY PROJECT

The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) imagery project by Kilby and Kilby (2006) will make available 100 new ASTER images of BC for analysis and download through the Image Analysis Toolbox (IAT) on the BC Geological Survey's MapPlace website. The ASTER instrument captures readings from the surface of the Earth in a range of wavelengths within the electromagnetic spectrum. The information captured in these images can be processed to produce a number of different products that are useful for the exploration industry. This project will provide the raw ASTER imagery for download, as well as a number of derived products, including a rock-mask filter, alteration images, a digital elevation model, 3-D images and digital stereo pairs. In addition, several of the products from this project can be incorporated into Google Earth for an enhanced level of data viewing.

OTHER PROJECTS (COMMUNITIES AND ARCHIVED DATA)

In addition to the projects summarized above, for which papers are presented in this volume, Geoscience BC initiated two other innovative projects in 2005. One of these projects was co-sponsorship of a community geoscience forum in Lillooet in October 2005. This project stemmed from a proposal submitted to Geoscience BC from the communities of Lillooet and Lytton. The forum brought together community leaders, industry, local prospectors, government and local First Nations to examine the geoscience needs of the Lillooet – Lytton area. The aim was to develop an updated list of key geoscience projects in the area that would help to increase exploration within the region and thus diversify and strengthen the local economy. A total of 25 projects was identified and prioritized during the meeting (see www.geosciencebc.com for the list of projects). The list of projects will assist the communities, industry, consultants, government and others with formulating project proposals, which may be submitted to Geoscience BC in response to future requests for proposals.

Geoscience BC has also initiated an archived data capture pilot project in partnership with Placer Dome Inc. The scope of this project is to publicly release Placer Dome's geoscience data from undeveloped properties within an area of central BC that incorporates seven 1:250 000-scale NTS map sheets. The data will be scanned, converted into a modern GIS database and made publicly available through MapPlace. Geoscience BC hopes to use this pilot project to establish the most effective means of capturing, organizing and disseminating large quantities of diverse geoscience data. Once an optimum process is established, the intention is to expand the pilot project to include Placer Dome's archived data in the rest of BC and to encourage other companies to move their archived data into the public domain.

SUMMARY

Geoscience BC is pleased to present the technical progress reports found in this volume. These reports highlight the high-quality projects that are underway in partnership with industry, universities and government. The results of these projects will enhance the geoscience database for the province of BC and encourage new and more exploration for minerals and oil and gas.

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