GOVERNMENT

Yukon Geology Program

Grant Abbott
Yukon Geology Program

Yukon Mining Incentives Program Overview, 1999

Ken Galambos
Mineral Resources Branch
Yukon Government

The Robert E. Leckie Award for Outstanding Reclamation Practices

Hugh Copland
Mining Land Use Division
Indian and Northern Affairs Canada

Yukon Geology Program

Grant Abbott[1]
Yukon Geology Program

Abbott, G., 2000. Yukon Geology Program. *In:* Yukon Exploration and Geology 1999, D.S. Emond and L.H. Weston (eds.), Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada, p. 39-48.

OVERVIEW

Now in its fourth year, the Yukon Geology Program (Fig. 1) is a *de facto* Yukon Geological Survey consisting of two integrated and jointly managed offices with different administrative structures (Fig. 2). Federal funding is provided through the Exploration and Geological Services Division (EGSD) of the Department of Indian Affairs and Northern Development (DIAND), while territorial and cost-shared (YTG/DIAND) funding comes through the Mineral Resources Branch of the Department of Economic Development, Yukon Government (YTG). The Geological Survey of Canada (GSC) also maintains an office with the Program.

Figure 1. *(Top) Grant Abbott, Shirley Abercrombie. (Bottom, from left to right) Tanya Gates, Diane Emond, Jo-anne vanRanden, Bill Lebarge, Ali Wagner, Robert Deklerk, Mike Burke, Leyla Weston, Don Murphy, Gord Nevin, Dennis Ouelette, Lee Pigage, Craig Hart, Ken Galambos, Danièle Héon, Maurice Colpron, Jeff Bond, Kaori Torigai, Julie Hunt, Melanie Reinecke, Grant Lowey, Charlie Roots, Panya Lipovski, Anna Fonseca, Mark Nowasad. Missing: Monique Shoniker, Tammy Allen and Jason Adams.*

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The Yukon Geology Program (YGP) is an informal and temporary organization that will be transformed into a Yukon Geological Survey when the responsibilities of the Northern Affairs Program are devolved to YTG. Negotiations have met delays, and the target date for devolution has been moved ahead one year to April 1, 2001. The agreement in principal for the transfer is near completion and all parties expect negotiations to be successful.

During the past year, the Program benefited greatly from staff stability after the turnover of five management positions and five technical positions in the previous two years. Staff changes this year included the appointment by the Government of Yukon, of Anna Fonseca as a third Resource Assessment Geologist and Dennis Ouelette as a term Yukon Minfile geologist. YTG is also in the process of hiring two GIS technicians. Grant Abbott and Jeff Bond now have permanent positions.

A milestone for the program this year was the completion of the second Yukon Geoscience Planning Workshop in March, when 42 representatives from industry, academia, and government met for two days in Whitehorse to re-examine the state of Yukon Geoscience. The group produced a new set of priorities that will be an essential planning tool for the Yukon Geology Program over the next few years.

PROGRAM HIGHLIGHTS FOR 1999

FIELDWORK

The Yukon Geology Program has committed substantial resources to a joint Geological Survey of Canada – British Columbia Geological Survey Branch – Yukon Geology Program initiative, the Ancient Pacific Margin NATMAP (National Mapping Program) project. This project is a multidisciplinary

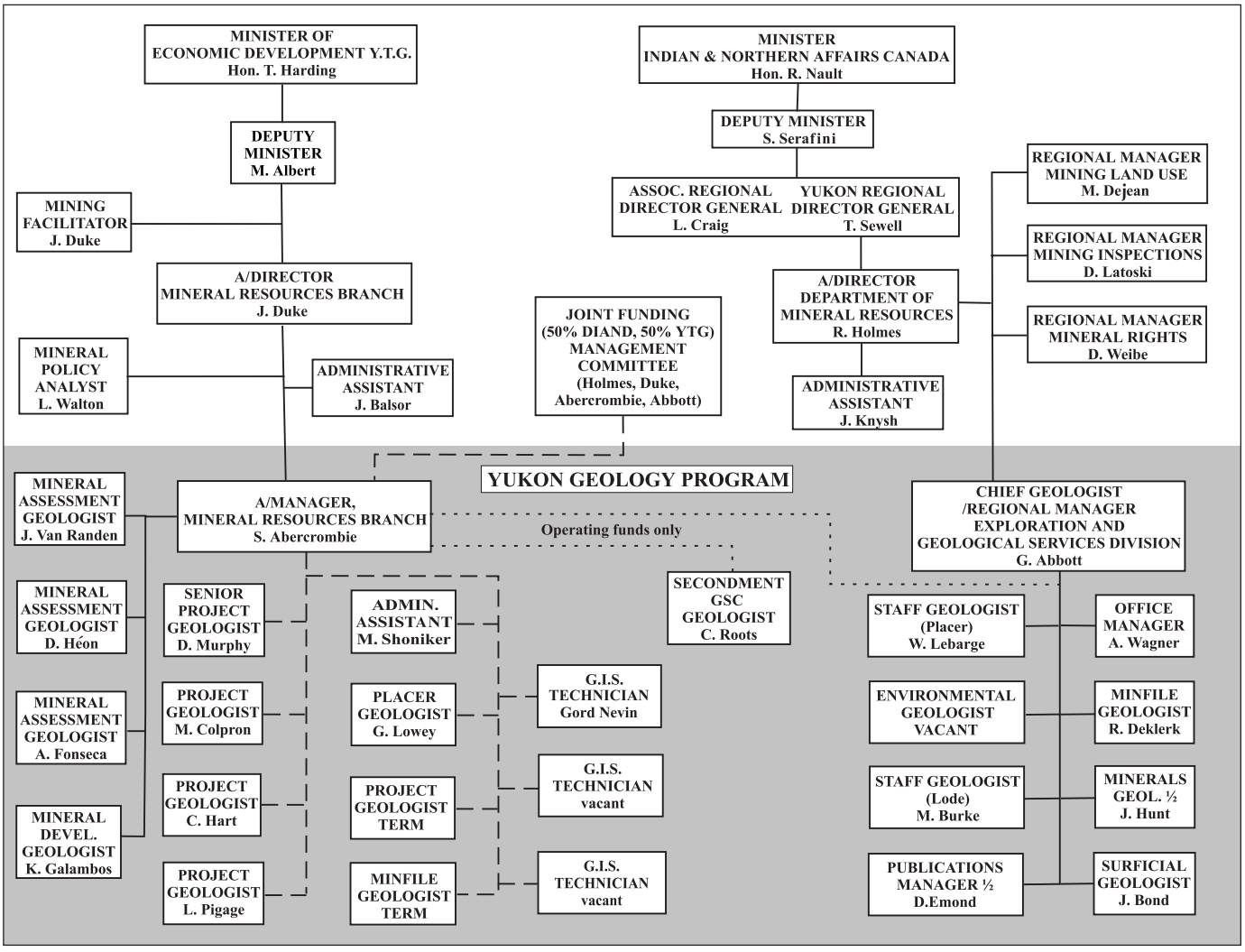

Figure 2. *Yukon Mineral Resources organization chart.*

effort to better understand Yukon-Tanana (YTT) and Kootenay terranes, arguably the least understood parts of the North American Cordillera. The Yukon Geology Program contribution includes the ongoing work of Don Murphy in the Finlayson Lake massive sulphide district; fieldwork begun last year by Maurice Colpron in the Glenlyon area; mapping by Charlie Roots of the western half of Wolf Lake map area and the northern half of Jennings River map area in B.C. in partnership with Joanne Nelson and Mitch Mihalynuk of the B.C. Geological Survey Branch; and surficial studies by Grant Lowey in the Stewart River map area in conjunction with regional surficial studies by Lionel Jackson of the GSC. Other parts of the Ancient Pacific Margin NATMAP include bedrock mapping of Stewart River map area in the Yukon by Steve Gordey of the GSC; in southern B.C., regional mapping by Bob Thompson of the GSC; and in east-central Alaska, mapping by David Szumigala of the Alaska State Geological Survey, and mineral deposit studies by Cynthia Dusel-Bacon of the U.S. Geological Survey. Participation by numerous university researchers, graduate students and other specialists has greatly added to the depth and complexity of the project. In the Yukon, these include lithogeochemical studies in the Finlayson Lake area by Steve Piercey and Jim Mortenson of the University of British Columbia, and mineral deposit studies by Suzanne Paradis of the GSC. Regular workshops and field trips are one of the main benefits of such a large and diverse project. This summer Don Murphy and Maurice Colpron led a field trip to the Finlayson Lake and Glenlyon areas. Already the benefits of this multidisciplinary, collaborative approach are being seen in the publication of papers, which begin to define the architecture of the YTT over great distances.

Another major effort by the YGP is to synthesize and enhance the geological database of the Anvil District. The Faro mine remains closed for the foreseeable future, but the possibility remains for renewed exploration and mining at some point. Lee Pigage has completed bedrock mapping and expects to release a complete set of 11 geological compilation maps of the district at 1:25 000 scale by the end of 2000. Jeff Bond has completed surficial mapping and a till-geochemical survey and expects to release 11 final maps and a bulletin in the spring of 2000. Cliff Stanley has completed a lithogeochemical study of the Grizzly deposit, and will release a report later in the year.

In 1998, responsibility for oil and gas resources was transferred to YTG from the federal government, and in 1999, the Yukon's first land sale in more than 20 years was successfully completed. In order to accommodate increasing interest from YTG and industry in hydrocarbon-related geoscience, Tammy Allen began a mapping project near Division Mountain along the western margin of Whitehorse Trough. The area has some of the most prospective coal deposits in the Yukon. The area was poorly understood and previously untested for oil and gas potential.

Craig Hart continued his studies of Yukon gold occurrences, splitting his time between those related to the Tombstone intrusive suite northeast of the Tintina Fault, and those in the Dawson Range along trend from the Pogo deposit in Alaska. Craig also assisted some of the students who received support from the YGP to study various aspects of Yukon gold deposits. These included Mark Lindsay and Julian Stephans, under the supervision of Tim Baker at James Cook University, Australia; John Mair at University of Western Australia; Erin Marsh and Seth Mueller under the supervision of Rich Goldfarb at the U.S. Geological Survey; and Scott Heffernan and Kelly Emon under the supervision of Jim Mortensen at the University of British Columbia.

Bill Lebarge and Mark Nowasad continued their studies of the relationship between sedimentology, grain size distribution, and water quality of effluent from placer deposits. Data gathered from this study should assist with the review of the Yukon Placer Authorization in 2001.

OTHER PROJECTS

The YGP supported the work of several scientists at the Geological Survey of Canada. The Yukon Digital Geology Compilation by Steve Gordey and Andrew Makepeace was finally completed at the end of the year and is now available. It includes compiled data sets of bedrock geology and glacial limits (new syntheses), geochronology, paleontology, mineral occurrences (Yukon Minfile), a compendium of coloured aeromagnetic images, Yukon Park boundaries, and physiography. The glacial limits map for the Yukon, by Alejandra Duk-Rodkin, has also been released separately.

Julie Hunt who is now working half time, is nearing completion of her bulletin on Yukon volcanogenic massive sulphide deposits and has begun an overview of the metallogeny of the Yukon, which combines the new Yukon Digital Geology with the Yukon Minfile.

Diane Emond, is also working half time as publications manager. Diane also represents DIAND on the Mining and Environmental Research Group (MERG), and manages the Yukon Geoprocess File (see below). MERG is a cooperative working group promoting research into mining-related environmental issues. It is made up of the federal and Yukon governments, mining companies, Yukon First Nations and non-governmental organizations.

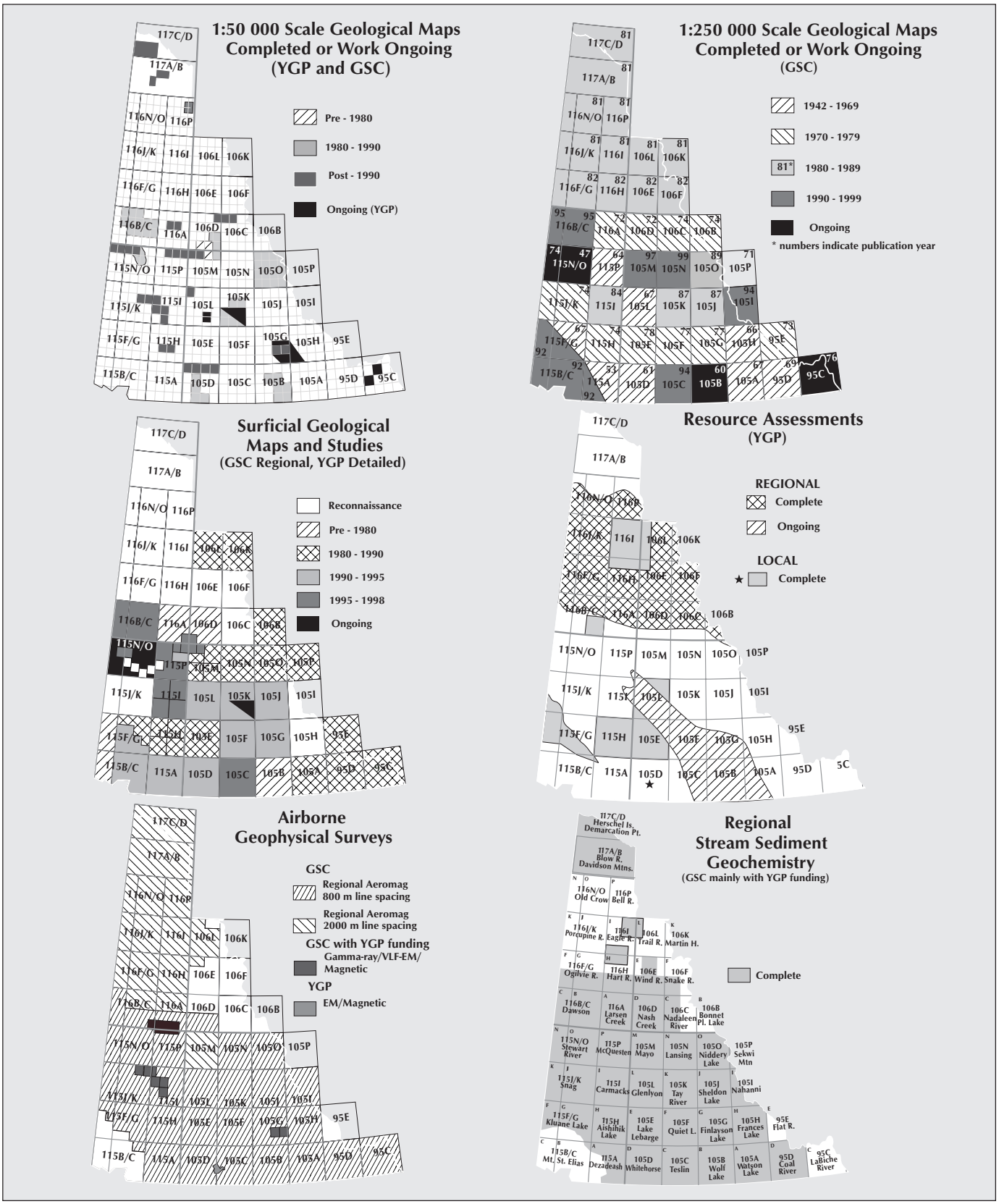

Figure 3. *Summary of available geological maps and regional geochemical and geophysical surveys in the Yukon.*

INDUSTRY LIAISON AND SUPPORT

Mike Burke and Bill Lebarge, our main links to the exploration industry, continued to monitor Yukon hard rock and placer mining and mineral exploration activity, visit active properties, review reports for assessment credit, and maintain the assessment report library.

YUKON MINFILE

Yukon Minfile, another mainstay of the Yukon Geology Program, is maintained by Robert Deklerk. We have completed an upgrade from Microsoft Access Version 2 to Access 97 with major revision and simplification of the database structure. The updated digital version will be released on CD-ROM this spring and sold by Hyperborean Productions of Whitehorse. The text version of Minfile is available on our Website and in hard copy through the Geoscience and Information Sales office, c/o the Whitehorse Mining Recorder's Office.

YUKON GEOPROCESS FILE

The Yukon Geoprocess File, under the direction of Diane Emond, is an inventory of information on geological process and terrain hazards, including 1:250 000 scale maps showing permafrost, landslides, recent volcanic rocks, structural geology, and seismic events, and also includes references and summaries of bedrock and surficial geology. The Geoprocess File is intended as a planning aid for development activities and is available for most areas south of 66° latitude. The maps will soon be available in colour, on a single compact disk.

H.S. BOSTOCK CORE LIBRARY

The H.S. Bostock Core Library is maintained by Mike Burke and Ken Galambos. The facility contains about 128 000 m of diamond drill core from about 200 Yukon mineral occurrences. Confidentiality of material is determined on the same basis as mineral assessment reports. Confidential core can be viewed with a letter of release from the owner. Rock saws and other rock preparation equipment are available to the public.

MINERAL RESOURCE ASSESSMENTS

The Yukon Geology Program is responding to an increasing need for geological and metallogenic information to assist resolution of land use issues and conflicts. Some of the pressures have come from native land claims negotiations, and localized land use conflicts such as one within the city limits of Whitehorse. Also important is the priority of the Yukon government to implement the Yukon Protected Areas Strategy. The goal of the Yukon Protected Areas Strategy is protection and withdrawal of land from industrial activity in all 23 ecoregions in the Yukon. YTG Economic Development intends to provide efficient and cost-effective input into the selection process by undertaking a Yukon-wide mineral potential study. Providing information on mineral potential at a regional scale will assist in guiding the selection of candidate protected areas towards areas of lower potential, in order to minimize the impact on the access to mineral wealth.

A regional mineral potential exercise was conducted in the spring of 1999 for northern Yukon (Fig. 3). A panel of experts estimated the probability of discovering new mineral deposits in 80 geological tracts. Their estimations were processed through the Monte Carlo computer simulator and the resulting map displays the relative mineral potential of the tracts. The draft mineral potential map was used in the planning of the proposed Fishing Branch Park. The final map will also be used in other upcoming protected area plans.

A mineral assessment was conducted in June, 1999 for the proposed Tombstone Territorial Park, based on a compilation of public data as well as the results of the previous field season. An expert panel ranked the different geological tracts relative to one another but insisted on the fact that the whole area was considered to have high mineral potential. The resulting mineral potential map was provided to the Tombstone Steering Committee, as well as comments on access considerations.

Presentations were made to the planning teams of both Tombstone and Fishing Branch proposed parks. One week of fieldwork was spent documenting known mineral occurrences in the Fishing Branch study area. No mineral assessment was conducted for Fishing Branch, due to the paucity of data and extremely short timeframe.

Staff thoroughly review Land Claim selections and provide technical information to territorial Land Claim negotiators. We comment on mineral potential, exploration history, mineral land tenure and access. We also update and distribute the Yukon Land Status Map.

Compilation is ongoing for the next regional assessment, which will address Cassiar Platform and southern Yukon-Tanana Terrane. This project will provide a regional context for proposed protected areas within the Teslin Tlingit Council Traditional Territory, one of which is the Wolf Lake Federal initiative. Our study area covers most of the Traditional Territory and the portions of Pelly Mountains and the Yukon southern lakes ecoregions within it. The assessment is planned for early February, 2000.

YUKON MINING INCENTIVE PROGRAM

The Yukon government provides grants for grass roots exploration and initial developmegt of properties. This year, a total of $378,000 was distributed to 27 prospectors under the supervision of Ken Galambos.

PUBLICATIONS

The Yukon Geology Program is now converted to fully digital publishing. All geological maps are now printed and new publications are being produced from a digital format, on-demand. This advance will greatly reduce our printing and storage costs. We expect to eventually distribute digital files through our website. Yukon Geology Program publications are published by Exploration and Geological Services Division, DIAND and are available through:

Geoscience Information and Sales
c/o Whitehorse Mining Recorder
102-300 Main Street
Whitehorse Yukon Y1A 2B5
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To learn more about the Yukon Geology Program, visit our homepage at *http://www.yukonweb.com/government/geoscience/* or contact us directly:

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RÉSUMÉ

Le Service de géologie du Yukon (Fig. 1), qui en est maintenant à sa quatrième année d'existence, est dans les faits la commission géologique du Yukon et consiste en deux bureaux intégrés présentant des structures administratives différentes mais qui sont gérés conjointement (Fig. 2). Le financement par le fédéral est fourni par l'entremise de la Division des Services d'exploration et de géologie du ministère des Affaires indiennes et du Nord canadien (MAIN), alors que le financement par le territoire et à coûts partagés (GTY/MAIN) est obtenu par l'entremise de la Direction des ressources minérales du ministère de l'Expansion économique, gouvernement du territoire du Yukon (GTY). La Commission géologique du Canada (CGC) maintient également un bureau auprès du Service.

Le Service de géologie du Yukon est une organisation informelle et temporaire qui sera transformée en commission géologique du Yukon lorsque les responsabilités du Programme des affaires du Nord seront dévolues au GTY. Il y a eu des retards dans les négociations et la date cible de cette dévolution a été devancée d'un an et fixée au premier avril 2001. L'entente de principe concernant le transfert est presque complétée et toutes les parties s'attendent à ce que les négociations soient couronnées de succès.

Pendant l'année écoulée, le Service a grandement profité de la stabilité de son effectif après le remplacement de cinq de ses gestionnaires et de cinq de ses techniciens au cours des deux années précédentes. Parmi les changements de personnel survenus cette année, mentionnons la nomination par le gouvernement du Yukon d'Anna Fonseca comme troisième géologue responsable de l'évaluation des ressources et de Dennis Ouelette comme géologue affecté pour une durée déterminée au projet MINFILE. Le GTY procède en outre actuellement à l'embauche de deux techniciens en systèmes d'informations géographiques. Grant Abbott et Jeff Bond occupent maintenant des postes permanents.

La tenue en mars du deuxième atelier de planification pour les géosciences au Yukon a été l'un des faits marquants du programme cette année; il a permis de réunir à Whitehorse pendant 2 jours 42 représentants de l'industrie, du secteur de l'enseignement et du gouvernement pour un nouvel examen de l'état des géosciences au Yukon. Le groupe a élaboré un nouvel ensemble de priorités qui s'avérera un outil essentiel de planification des activités du Service de géologie du Yukon pendant les quelques années à venir.

APPENDIX 1: RECENT PUBLICATIONS

EGSD GEOSCIENCE MAPS

Geoscience Map 1999-2 or GSC Open File 3694: Glacial limits map of Yukon (1: 1 000 000 scale), by Alejandra Duk-Rodkin.

EGSD OPEN FILES

Bond, J.D., 1999. Surficial geology map and till geochemistry of Swim Lakes (105K/2 NW), central Yukon (1:25 000 scale); Open File 1999-5.

Bond, J.D., 1999. Surficial geology map and till geochemistry of Swim Lakes (105K/2 NE), central Yukon (1:25 000 scale); Open File 1999-19.

Bond, J.D., 1999. Surficial geology map of Mount Mye and Faro (105K/3 W and 6 W), central Yukon (1:25 000 scale); Open File 1999-8.

Bond, J.D., 1999. Surficial geology map and till geochemistry of Mount Mye and Faro (105K/3 E and 6 E), central Yukon (1:25 000 scale); Open File 1999-7.

Bond, J.D., 1999. Surficial geology map and till geochemistry of Rose Mountain (105K/5 NW), central Yukon (1:25 000 scale); Open File 1999-18.

Bond, J.D., 1999. Surficial geology map and till geochemistry of Rose Mountain (105K/5 NE), central Yukon (1:25 000 scale); Open File 1999-16.

Bond, J.D., 1999. Surficial geology map of Rose Mountain (105K/5 SE), central Yukon (1:25 000 scale); Open File 1999-17.

Bond, J.D., 1999. Surficial geology map and till geochemistry of Mount Mye (105K/6 W), central Yukon (1:25 000 scale); Open File 1999-10.

Bond, J.D., 1999. Surficial geology map and till geochemistry of Blind Creek (105K/7 SW), central Yukon (1:25 000 scale); Open File 1999-6.

Bond, J.D., 1999. Surficial geology map and till geochemistry of Blind Creek (105K/7 SE), central Yukon (1:25 000 scale); Open File 1999-20.

Bond, J.D., 1999. McConnell ice-flow map of the Anvil District (105K), central Yukon (1:250 000 scale); Open File 1999-14.

Bond, J.D., 1999. Glacial limits and ice-flow map, Mayo area (105M), central Yukon (1:250 000 scale); Open File 1999-13.

Bond, J.D. and Lipovsky, P., 1999. Surficial geology map and till geochemistry of Mount Mye (105K/6 E), central Yukon (1:25 000 scale); Open File 1999-9.

Colpron, M., 1999. Preliminary geological map of Little Salmon Range (parts of 105L/1, 2 and 7), central Yukon (1:50 000 scale); Open File 1999-2.

Gordey, S.P. and Makepeace, A.J., 1999. Yukon Digital Geology, 2 CD-ROMs; Open File 1999-1(D); (or GSC Open File D3826).

Murphy, D.C. and Piercey, S.J., 1999. Geological map of Finlayson Lake area, southeast quarter (105G/7, 8 and parts of 1, 2 and 9), southeastern Yukon (1:100 000 scale); Open File 1999-4.

Murphy, D.C. and Piercey, S.J., 1999. Geological map of Wolverine Lake area (105G/8), Pelly Mountains, southeastern Yukon (1:50 000 scale); Open File 1999-3.

Pigage, L.C., 1999. Geological map of Rose Mountain (105K/5 NW), central Yukon (1:25 000 scale); Open File 1999-11.

Pigage, L.C., 1999. Geological map of Blind Creek (105K/7 NW), central Yukon (1:25 000 scale); Open File 1999-12.

Pigage, L.C., 1999. Geological Map of Blind Creek (105K/7 SE), central Yukon (1:25 000 scale); Open File 1999-15.

OUTSIDE ARTICLES

Colpron, M., Price, R.A. and Archibald, D.A., 1999 (in press). $^{40}Ar/^{39}Ar$ thermochronometric constraints on the tectonic evolution of the Clachnacudainn complex, southeastern British Columbia. Canadian Journal of Earth Sciences, vol. 36.

Goldfarb, R.J., Hart, C.J.R. and Mortensen, J., 1999. Metallogeny of the northeastern Pacific Rim: An example of the distribution of ore deposits along a growing continental margin. PacRim Proceedings Volume, AusIMM, Bali, Indonesia, p. 273-286.

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Johnston, S.T., Mihalynuk, M.G., Brew, D.A., Hart, C.J.R., Erdmer, P., and Gehrels, G.E., 1999. Paleozoic and Mesozoic rocks of Stikinia exposed in northwestern British Columbia: Implications for correlations in the northern Cordillera: Discussion. Geological Society of America Bulletin, vol. 111, p. 1103-1104.

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Hart, C.J.R., 1999. Variations in styles of gold mineralization associated with the Tombstone Plutonic Suite, Yukon. 1999 Cordilleran Roundup, Program and Abstracts, Vancouver.

Hunt, J.A., 1999. Finlayson Lake district, Yukon: Canada's newest VMS camp. *In:* Mineral Deposits: Processes to Processing, volume 1, C.J. Stanley et al. (eds.), Balkema, Rotterdam, p. 535-537.

McCausland, P.J.A., Symons, D.T.A., Hart, C.J.R. and Blackburn, W.H., 1999. The pericratonic Yukon-Tanana Terrane: Paleomagnetism of the Early Jurassic Big Creek and Late Cretaceous Seymour Creek plutons, Yukon Territory. Geological Association of Canada, Annual Meeting Abstracts with Program, Sudbury, Ontario.

McCausland, P.J.A., Symons, D.T.A., Hart, C.J.R. and Blackburn, W.H., 1999. Further paleomagnetic evidence for minimal motion of the pericratonic Yukon-Tanana Terrane relative to North America. Abstracts with Program, AGU Fall Meeting, San Francisco, California.

Mihalynuk, M.G., Nelson, J.L., Roots, C.F., Friedman, R.M. and de Keijzer, M., 1999. Ancient Pacific Margin Part III: Regional geology and mineralization of the Big Salmon Complex (NTS 104N/9E, 16 & 104O/12, 13, 14W). *In:* Geological Fieldwork 1999, B.C. Geological Survey Branch.

Roots, C.F., de Keijzer, M., Nelson, J.L. and Mihalynuk, M., 1999. Revision mapping of the Yukon-Tanana and equivalent terranes in northern B.C. and southern Yukon between 131° and 133° W. *In:* Current Research 2000A, Geological Survey of Canada.

Symons, D.T.A., McCausland, P.J.A., Hart, C.J.R., Blackburn, W.H., Harris, M.J. and Williams, P.R., 1999. Geotectonic motion history of the Yukon-Tanana Terrane: Preliminary paleomagnetic results from the Big Creek and Seymore Creek intrusions. Lithoprobe SNORCLE Report No. 69, p. 153-162.

Symons, D.T.A., Harris, M.J., Hart, C.J.R. and Blackburn, W.H., 1999. Geotectonics of the northern Intermontane Belt of the Canadian Cordillera from paleomagnetic and geobarometric studies of Mesozoic-Cenozoic plutons. *In:* Terrane Accretion Along the Western Cordilleran Margin: Constraints on Timing and Displacement, Penrose Abstract Volume, Winthrop, Washington.

Thompson, R.I., Nelson, J.L., Paradis, S., Roots, C.F., Murphy, D.C., Gordey, S.P. and Jackson, L.E., 2000. The Ancient Pacific Margin NATMAP project: Year one. *In:* Current Research 2000A, Geological Survey of Canada.

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Lebarge Environmental Services, 1999. Methods of encouraging natural vegetation succession and sustainable reclamation at Yukon mine and mineral exploration sites; MERG Open File 1999-2.

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Friske, P.W.B., McCurdy, M.W., Day, S.J.A. and Durham, C.C., 1999. Re-analysis of stream sediments from the Little Nahanni River Map Sheet (105I), Yukon and Northwest Territories; Open File D3772.

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Carrière, J.J. and Sangster, D.F., 1999. A multidisciplinary study of carbonate-hosted zinc-lead mineralization in the Mackenzie Platform (a.k.a. Blackwater and Lac de Bois platforms), Yukon and Northwest Territories, Canada. Geological Survey of Canada, Open File 3700, 145 p.

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Lilly, D.R., 1999. Protolith influence on sediment-hosted gold deposition, petrography and microthermometry of the Java property, Yukon Territory, Canada. Unpublished B.Sc. thesis, University of British Columbia, 108 p.

Selby, D., 1999. Fluid characteristics and evolution of porphyry Cu-Au-Mo and Mo systems, Yukon and British Columbia, Canada. Unpublished Ph.D. thesis, University of Alberta, 208 p.

Smuk, K.A., 1998. Metallogeny of epithermal gold and base metal veins of the southern Dawson Range, Yukon. Unpublished MSc thesis, McGill University, 155 p.

Weston, L.H., 1999. Sedimentology and stratigraphy of placer gold deposits of Haggart Creek, central Yukon Territory. Unpublished MSc thesis, University of Calgary, Alberta, 201 p.

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Baker, T. and Lang, J.R., 1999. Geochemistry of hydrothermal fluids associated with intrusion-hosted gold mineralization, Yukon Territory. *In:* Mineral Deposits: Processes to Processing, Volume 1, Proceedings of the fifth biennial SGA Meeting and the tenth quadrennial IAGOD symposium, London, England, August 1999. p. 17-20.

Beierle, B. and Cockburn, J., 1999. Revisiting late Pleistocene glaciation in the central Yukon Territory, Canada. American Geophysical Union Abstracts with Program, Fall Meeting, San Francisco, California.

Carey, S. and Woo, M-K., 1999. The role of soil pipes as a slope runoff mechanism, subarctic Yukon. 25th Scientific Meeting of the Canadian Geophysical Union, Banff, Alberta, Program and Abstracts.

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