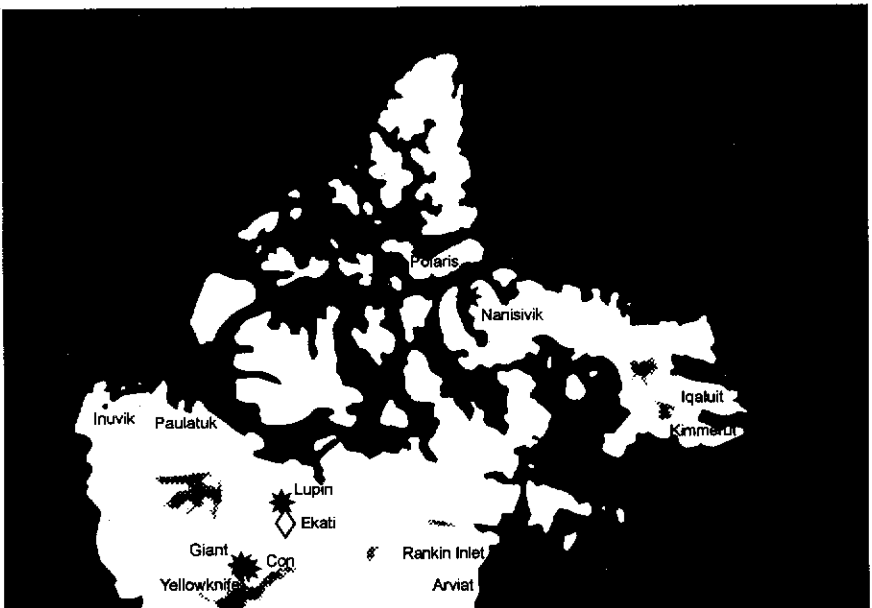
Indian and Northern Affairs Canada

Affaires indiennes et du Nord Canada

NWT Chamber of Mines

NWT Geoscience Forum 25th Anniversary Yellowknife

Program and Abstracts of Talks and Posters



Explorer Hotel
November 26 - 28, 1997

25TH ANNUAL GEOSCIENCE FORUM
Explorer Hotel, Yellowknife, NWT: November 26-28, 1997

Pre Conference Short Course Monday November 24 - Tuesday, November 25
Mineral Economics of Exploration in the NWT
presented by Michael Doggett
of Queen's University

Tuesday November 25 , 1997

17:00 Commercial and Poster Display set up at the Explorer Hotel. Core Display set up.

19:00 Charles Camsell Geological Society Presents Guest Speaker Dr. Buck Sharpton of NASA's Lunar and Planetary Institute on the Haughton Astrobleme, Devon Island. At the Katimavik Room of the Explorer Hotel.

20:30 CIMM Icebreaker Reception and Oyster Shucking Reception at the Black Knight Pub. Sponsered by Explosives Ltd.

Wednesday November 26, 1997

Chair: Kate Hearn

* speaker

8:10 Introduction: Mike Vaydik, Chamber of Mines opening remarks; Bob Overvold, Regional Director General, Department of Indian and Northern Development; Steven Kakfwi, Minister of Renewable Resources, Wildlife and Economic Development, Government of the Northwest Territories

8:30 Karen Gochnauer and Beth Sage, "NORMIN.DB: DIAND's Comprehensive Relational Database of Mineral Showings in the Northwest Territories, with Integrated GIS Components"

<u>Slave Session</u>

8:45 Wouter Bleeker* and J. Ketchum, "The Central Slave Basement Complex: Its Autochthonous Cover, Décollement, and Structural Topology"

9:00 Val A. Jackson, "Geology of the Lower Supracrustal Succession in the Bell Lake Area, Northern Yellowknife Volcanic Belt"

9:20 Kellie Emon* and G. D. Dunning, "U/Pb Geochronology of Granitoid Gneissic and Plutonic Rocks of the Eokuk Uplift, Slave Structural Province, NWT"

9:40- 10:10 COFFEE

10:10 Wulf Mueller*, E. H. Chown, and P. L. Corcoran, "Unconformities in the Slave Structural Province: Examples from the Point and Beniah Lake Areas"

10:30 Patricia L. Corcoran* and J. Dostal, "The Peltier Formation: An Extensive Subaqueous Basalt Plain Emplaced on Continental Crust"

10:50 Mike Stubley, "The Leith Alkaline Complex and Other Features of the Leith-Fishing Lake Area, Southern Slave Province"

11:10 Natalie M. Ham* and K. Benn, "Structural Studies of the Prosperous Granite Suite: Syn-D2 Laccoliths in the Southern Yellowknife Domain"

11:30 Bill J. Davis* and W. Bleeker, "Timing of Plutonism and Regional Deformation in the Yellowknife-Sleepy Dragon Area, Southern Slave Province."

11:50 First seating for lunch buffet in the Factor's Dining Lounge
12:40 Second seating for lunch buffet in the Factor's Dining Lounge

Join us down in the Eastcoaster's Newfie Pub for refreshments and Relaxation.

Chair: Karen Gochnauer

13:30 Mike Stubley*, J. Siddle and W. Bleeker, "The Ormsby Break: Crustal-Scale Control on Gold Mineralization on the Discovery Property, Southern Slave Province"

14:00 Peter J. Hawley, "Unravelling the True Potential of the Discovery Gold Mine Project"

14:20 Ross McElroy, Boston Gold project, Hope Bay Belt

14:40 Ron Parent, "George Lake Gold Project Update"

15:10 Lara Woodhouse, "Ulu Gold Occurrence - Underground Exploration Project"

15:30 - 17:00 Poster session (cash bar); Core Display
22:00 - 24:00 Hockey Night in Yellowknife, Gerry Murphy Arena - CBA sponsored

Thursday November 27, 1997

Regulatory Session

Chair: Carolyn Relf

8:15 Kate Hearn, "Proposed Amendments to the Canada Mining Regulations: Review of the Discussion Paper"
8:30 Joseph Lazarovitch, Diamonds in the Nortwest Territories
8:45 MVRMA: Mackenzie Valley Resource Management Act
9:00 John McCullum, West Kitikmeot Study
9:15 Robin Riley, "Protected Area Strategy Update"
9:30 Bill Braden, Power Corporation
9:45 Barb Brown, Community Mobilization

10:00-10:20 COFFEE

GIS and Remote Sensing Session

10:20 Gerry Mitchell, "Mapping Structural and Surficial Geology Using Combined Winter and Summer Landsat TM North of the Treeline"
10:40 Lori Wilkinson, J. Harris, J. Broome, and P. Budkewitsch, "Western Churchill and Slave NATMAP Projects - GIS Progress Report"

Keewatin Session

11:00 Allan Armitage, "The Victory Lake Volcanic-Associated Base Metal Prospect, Kivalliq District, Nunavut Region, N.W.T.: A Project Summary"
11:20 Simon Hanmer, "New Fieldwork in the Heninga-Kaminak-Quartzite Lakes Area, Kivalliq Region, Northwest Territories"
11:40 Rob Rainbird, "Intra-arc Basin Sedimentation in the Neoarchean
Kaminak Group, Quartzite Lake Area, Kivalliq Region"

12:00- 13:30 NWT Chamber of Mines AGM Luncheon - Yellowknife Inn Copper Room. Advance tickets only.

Chair: Scott Cairns

13:30 Subhas Tella*, W. Davis, R. G. Berman, R. Stern, A. N.

LeCheminant, M. Sanborne-Barrie, and K. E. Venance, "Geological Investigations in the MacQuoid Lake Supracrustal Belt, District of Keewatin, Northwest Territories - Progress Report"

13:50 Doug Irwin, Carolyn Relf*, and Andrea Mills, "Geology and Mineral Potential of the Southeast Yathkyed Lake Area (Parts of NTS 65 I/3, 4,5, 6,7, 10 & 11), Western Churchill Province" Western Churchill NATMAP

14:10 Eva Zaleski*, W. J. Davis, and J. A. Kerswill, "Preliminary Results of Mapping, Structural Studies and Geochronology in the Archean Woodburn Lake Group, Western Churchill Province"

14:30 John A. Kerswill*, Steve Goff, Lori Wilkinson, George Jenner, Bruce Kjarsgaard, Bob Bretzlaff, and Costa Samaras, "Metallogeny of the Woodburn Lake Group: an Update"

14:50 Brian Cousens*, Lawrence Aspler, and Jeffrey Chairenzelli, "Geochemistry and Nd Isotopic Composition of Archean Aged Rocks from the Angikuni Lake Area"

15:10 Lawrence B. Aspler, Jeffrey R. Chiarenzelli, and Brian L. Cousens, "Progress Report: Precambrian Geology, Angikuni Lake Area, District of Keewatin, Northwest Territories"

15:30- 17:00 POSTER SESSION (cash bar), Core Display

19:00 NWT Chamber of Mines 30th Anniversary Banquet - Con Rec Hall

20:00 Cave Club Scotch and Cigar Night. $10.00 advance. Tel: 867 920-7011 for more information

Friday November 28, 1997

<u>Bear/ Cordillera/ Baffin Island Session</u>

Chair: Steve Goff

8:10 Sunil S. Gandhi, "Exploration Status of the Longtom Property, District of Mackenzie"

8:30 Nawojka M. Wachowiak*, P. K. Gummer, M. Pope, and J. P. Grotzinger, "Stratabound Zn-Pb Mineralization of the Esker Horizon, Paleoproterozoic Rocknest Formation, Wopmay Orogen"

8:50 Andrew Conly* and Peter Gummer, "Preliminary Exploration Results from the Harley Cu-Ag Project, Dumas Group, Wopmay Orogen, NWT"

9:10 Jim K. Mortensen*, J. R. Lang, and T. Baker, "Age and Gold Potential of the Tungsten Plutonic Suite in the Macmillan Pass Area, Western NWT"

9:30 T. Scott Ercit and Lee A. Groat*, "The O'Grady Aplite-Pegmatite Complex, Canada's First Gem Elbaite Deposit"

9:50 - 10:10 COFFEE

10:10 Maurice Colpron, "Initial Results from the Ravens Throat Project - Geology of Mt. Kraft (95L/15) and Part of Dal Lake (95M/2) Map Areas, Mackenzie Mountains"

10:30 Steven B. Lucas, "An Overview of the New Geoscience Compilation and Digital Knowledge Base Project on North Baffin Island and Melville Peninsula, Geoscience Compilation and Digital Geoscience Knowledge Base Project"

10:50 M. R. St-Onge, Dave J. Scott*, N. Wodicka, and S. B. Lucas, "Geology of Southern Baffin Island (Kimmirut-Iqaluit area): Paleoproterozoic Tectonic Evolution and Implications for Mineral Exploration"

11:10 M. Vande Guchte, "The Incognita Ni-Cu-PGE Exploration Project, Southwest Baffin Island"

Diamond Session

11:30 Winspear Resources Ltd., Camsell Lake Project

11:50 First seating for lunch buffet in the Factor's Dining Lounge
12:40 Second seating for lunch buffet in the Factor's Dining Lounge

Chair: Velma Sterenberg

13:30 Tom Hoeffer, "DIAVIK Diamonds Project - Lac de Gras, NWT"-overview

13:50 DIAVIK Diamonds Project - Environmental

14:10 DIAVIK Diamonds Project - Engineering

14:30 George Read, "GMD Resource Corp.: Diamond Exploration of the Royce Group"

14:50 Harrison Cookenboo, "Discovery and Evaluation of the Jericho Kimberlite Pipe in the Central Slave Craton, Northern Canada"

15:10 Maya G. Kopylova*, J. K. Russell, and H. Cookenboo, "Upper

Mantle Stratigraphy and Thermal Regime of the Central Slave Craton"

15:30 TAKE DOWN DISPLAYS

19:00 After 8 Pool Tournament and Wind-down. Tel: 867 669-9983 to book.

Saturday, November 29

9:00 Giant and Con Mine Tours - bus to pick up delegates at Explorer Hotel

POSTER DISPLAYS, November 26-28

D. Archibald & A. Jones, "Overview of the Mineral Development Areas Program"

M. Colpron, "Initial Results from the Ravens Throat Project - Geology of Mt. Kraft (95L/15) and Part of Dal Lake (95M/2) Map Areas, Mackenzie Mountains"

D. Cook & B.C. Maclean, "Salt-cored Pre-Cretaceous Structures in the Fort Norman Area, NWT"

L. Currie, et al, "Geology of the Babiche Mountain and Chinkeh Creek Map Areas, Southeastern Yukon and Southwestern Northwest Territories (Map Areas 95C/8 and 9)"

W. J. Davis & T. D. Peterson, "New Geochronological Results for the Tavani Area, Eastern Kaminak Greenstone Belt, District of Keewatin."

R. Dumont, F. Kiss, J. Tod, "Aeromagnetic Survey Program of the Geological Survey of Canada, 1997-1998"

L. Flowers, "The Leith Lake Alkaline Complex, A Preliminary Study"

K. Gochnauer & B. Sage, "NORMIN.DB: DIAND's Comprehensive Relational Database of Mineral Showings in the Northwest Territories, with Integrated GIS Components"

S. Hanmer & H. A. Sandeman, "Structure and Alteration History of the Turquetil Gold Prospect, Kivalliq Region, Northwest Territories"

C. J. Harrison, T. de Freitas, & T. A. Brent, "Bedrock Geology & Resource Potential of Bathurst Island, (Nunavut) NWT"

D. Irwin, C. Relf, & A. Mills, "Geology and Mineral Potential of the Southeast Yathkyed Lake Area, Parts of NTS 65I/3, 4, 5, 6, 7, 10 & 11), Western Churchill Province"

V. A. Jackson, "Geology of the Lower Supracrustal Succession in the Bell Lake Area, Northern Yellowknife Volcanic Belt"

D. E. Kerr & R. D. Knight, "Surficial Geology and Implications for Drift Prospecting, Hope Bay Volcanic Belt Area, NWT"

J. A. Kerswill, et al, "Metallogeny of the Woodburn Lake Group: An Update"

M. G. Kopylova & H. Cookenboo, "Upper Mantle Stratigraphy and Thermal Regime of the Central Slave Craton, Canada"

D. Lindsay, UBC - "A Spinifex-Textured Komatiite from the Hope Bay Volcanic Belt, Slave Province, Northwest Territories, Canada"

S. B. Lucas & the North Baffin Partnership Project Working Group, "An Overview of the North Baffin/Melville Peninsula Geoscience Compilation and Digital Geoscience Knowledge Base Project"

M. W. McCurdy et al, "Mineral and Energy Resource Assessment of Bathurst and Adjacent Small Islands, Arctic Canada: Preliminary Stream Sediment Geochemical Survey Results"

I. McMartin, S. Khan, & P. J. Henderson, "Ice Flow Indicator Mapping in the Kaminak Lake (NTS 55L) and Ferguson Lake (NTS 65I) Areas: Results from the NATMAP Western Churchill Project"

J. K. Mortensen, "Geochronological and Geochemical Studies of the Coates Lake Diatreme, Southern Mackenzie Mountains, Western N.W.T."

D. Nickerson, "Large Gossan Zones and Their Gold Potential, Desperado

Claims, Brown Water Lake, NWT (86-B-12)"

A. V. Okulitch & S. Tella, "Geological Atlas, Maguse River, (Map NP-15/16-G), District of Keewatin, Northwest Territories, Scale 1:1 000 000"

C. Relf, et al, "Speculations on the Geological Evolution of the Yathkyed Lake Greenstone Belt, Western Churchill Province, NWT"

V. Sterenberg & M. Fisher, "Deposits and Mineral Showings in the Cordilleran Orogen, Northwest Territories: A Preliminary Compilation"

S. Tella et al, "Geological Investigations in the MacQuoid Lake Supracrustal Belt, District of Keewatin, Northwest Territories, Canada - A Progress Report"

L. Wilkinson, et al, "Western Churchill and Slave NATMAP Projects - GIS Progress Report" L. Wilkinson, S. Hanmer, C. Relf, "Western Churchill NATMAP: An Overview"

E. Zaleski, W. J. Davis, & J. A. Kerswill, "Preliminary Results of Mapping, Structural Studies and Geochronology in the Archean Woodburn Lake Group, Western Churchill Province"

CORE SHACK

November 26-28

Noranda/Rhonda Mining Joint Venture - Esker Lake Pb-Zn-Ag Project
Rhonda Mining - Harley Cu-Ag Project
BHP - Boston Gold Property
BHP - Diamond Exploration Projects
Covello, Bryan and Associates - Sunrise Base Metal Project
Treminco Resources - Sito Lake, Moose Massive Sulphide Zone
Quest International - Damoti Lake Gold Project

COMMERCIAL DISPLAYS

A & A Technical
Acres International Ltd.
Amerok Geosciences
Braden Burry Expediting
Buffalo Air
Byers Transport
Canadian Helicopters
Cansel Survey Equipment
CasCom
City of Yellowknife
Coneco Equipment
Connors Drilling
Custom Helicopters
Danmax Communications
Deakin Equipment
Diavik Diamond Mines Inc
Discovery Mining Services
EBA Engineering
Environment Canada - Resources
Environment Canada - Water
Explosives Ltd.
First Air
Focus Surveys
Gartner Lee Consulting
Great Slave Helicopters
Golder Associates
InfoSat Communications
Joint Secretariat
Kitikmeot Geosciences
Layfield
Margo Supplies
Midnight Sun and Energy
Mine Safety
NAPEGG
NeXplore
Northern Communications and Navigation Systems
Nunavut Tunngavik Inc
Nunavut Water Board
NWT Air
Office Compliments
Polar Explosives
PTI Camp Services
Renewable Resources
RTL Robinson
Sub-Arctic Surveys
Surpac Software
Taiga Environmental
TGIT
Tor Geoscience
TSL
West Kitikmeot Slave Study

Please note the Explorer's Factor's Club will only be open to delegates at meal times. For beverages and relaxation, please use the Eastcoaster's Newfie Pub.

OVERVIEW OF THE MINERAL DEVELOPMENT AREAS PROGRAM

Deb Archibald and Adrienne Jones

Minerals Oil and Gas Division; Resources, Wildlife and Economic Development; Gevernmint of the Northwest Territories; Yellowknife

In 1996, the Department of Resources, Wildlife and Economic Development (RWED) was created, in part, to develop and implement strategies to meet the Government of the Northwest Territories (GNWT) priority of sustainable development and job creation. There were three broad objectives laid out for the new department: firstly, to establish an efficient operation reflective of the times; secondly, to establish a department that could provide a comprehensive and coordinated approach to sustainable development; and, thirdly, to provide a balance between resources management, the environment, and economic development.

Mineral Development Areas (MDA) is a new program, initiated by the Minerals, Oil and Gas Division of RWED, reflective of the Department's commitment to community-based economic development. In the NWT, the greatest need for economic growth is the smaller communities where unemployment rates are the highest. Mineral development can be a major contribution to community wellness. It is recognized that the mineral extraction industry provides opportunities, at the community level for employment. Historically, the mining industry has provided long-term, high quality jobs for Northerners, averaging over 2000 jobs annually over the past ten years.

The MDA program is part of RWED's continued commitment to working with resource companies, communities, northern interest groups, and northern business to ensure that Northerners benefit from resource development. However, while the growth of the economy is a priority, RWED's approach is a balance between the environment and development.

The main objective of the MDA program is to facilitate the development of new mines in areas of the NWT which have known mineral deposits, specifically those which have undergone advanced mineral exploration. The target audience for this program includes mine developers, aboriginal organizations, mineral exploration companies with claims/leases in selected areas, land use planning agencies, political and regulatory bodies, community economic organizations, and mineral development review boards.

Each project will consist of a data compilation phase and a data analysis phase. The data compilation phase will consist of amalgamating a variety of data from the chosen area (e.g. bedrock and surficial geology maps, geophysical survey maps, existing and proposed infrastructure, vegetation maps, wildlife surveys, and other environmental data). The compilation of data for MDA is recognized to be an on-going, incremental process and may have multiple stages. Assistance and involvement of aboriginal organizations, municipalities, and the mining industry will help to improve the projects.

The second part of the process will consist of an evaluation of the mineral economics of the deposits within the context of current and/or proposed infrastructure (economic modelling). This analytical phase will also help to identify impediments to mineral development within these areas. Recognition of development obstacles and methods to reduce or remove these impediments will be addressed.

General guidelines for the selection of Mineral Development Areas include: regional support from aboriginal organizations, government, and industry for mineral development activity; sufficient level of current or historic industry activity; favorable geology/high mineral potential; sufficient amount of existing geological data; existing or proposed infrastructure for the transportation of a mined commodity; settled land claims/ownership stability, and guaranteed land access. It is recognized that not all these criteria can be equally applied to all areas under consideration.

Areas currently under study are the Coronation Gulf area of the Kitikmeot, a region with a number of advanced projects; and the Rankin Inlet area in the Keewatin, also a site of considerable activity. Data from the Northern Baffin Island/Melville Peninsula area is also being compiled in order to stimulate mineral exploration in that region.

THE VICTORY LAKE VOLCANIC-ASSOCIATED BASE METAL PROSPECT, KIVALLIQ DISTRICT, NUNAVUT REGION, N.W.T.: A PROJECT SUMMARY

Allan Armitage, Comaplex Minerals Corp.

The Victory Lake Property is located 175 km east of Rankin Inlet, 185 km south of Baker Lake, and 190 km northwest of Arviat. The property comprises seven claims, VIC 1-7, totalling 15,152 acres, and extends in an east-west direction from Victory Lake (55L/12) to Townsend Lake (55L/11) for a distance of 16.5 km. The claims are currently 100% owned and operated by Comaplex Minerals Corp.

The 1997 exploration program on the Victory Lake Property was conducted in the summer (July 17-August 27) by Comaplex Minerals Corp. to define prospective base metal sulphide horizons previously outlined on the property. The work included geological mapping, gridding, and magnetic, horizontal loop electromagnetic, induced polarisation and gravity surveys.

The Victory Lake Property was discovered in July, 1996 during a reconnaissance prospecting and mapping program by Marcelle Hauseux and Shawn Surmacz of Comaplex Minerals Corp. Their work identified significant base metal sulphide mineralization hosted in metavolcanic rocks. A follow-up exploration program in the late summer of 1996 included limited geological mapping and surface geophysics, and an extensive geophysical airborne survey. This program outlined significant horizons of mineralization in the Main and West zones, and outlined on-strike mineralization in the Far West, the East, and Far East zones.

The geology of the Victory Lake property forms part of the Kaminak Greenstone Belt, a polydeformed and metamorphosed Archean (ca. 2.69 Ga) greenstone belt in the Churchill Structural Province of the Canadian Shield. This greenstone belt is the largest and most continuous greenstone belt in the Churchill Province and extends for approximately 450 km from the Hudson Bay coast southwestward. The belt is characterised predominantly by bimodal sequences of tholeiitic to calc-alkaline mafic to felsic volcanic rocks and lesser intercalated clastic and chemical sediments which are intruded by cogenetic gabbro/diorite, tonalite and granodiorite rocks of the Heninga, Turquetil and Kaminak batholiths.

The Kaminak Belt has proven to be a favourable environment for volcanic-associated sulphide deposits. Existing deposits include the Heninga Lake Zn-Cu-Ag deposit, located 125 km south of the Victory Lake Property, and the Carr Lake Zn-Cu-Pb-Ag deposit, located 85 km south of the Victory Lake Property. Numerous other base metal showings occur throughout the Kaminak Belt.

The Victory Lake base metal sulphide mineralization is hosted within an east-trending north-dipping sequence of lower amphibolite grade, calc-alkaline felsic to intermediate metavolcaniclastic rocks (quartzofeldspathic schist) and tholeiitic mafic metavolcanic flows (amphibolite), all of the Kaminak Group. The volcanic sequence is bounded to the north by Archean foliated granitoid rocks (diorite to granodiorite), and to the south by a package of metasedimentary rocks (MacKenzie Lake metasediments?) comprising of a sequence of greywacke (biotite ± garnet schist), quartzite to quartz-arenite, oxide IF, tremolite schist and conglomerate. Flattened pillow structures in a mafic volcanic horizon indicates the stratigraphy youngs to the south.

The West zone is the most extensive and significant sulphide zone on the property, and is hosted by the northern mafic metavolcanic horizon. The West zone has a strike length of at least 425 m (indicated by geology and geophysics) and is comprises of a massive sulphide lens and associated proximal and distal stringer sulphide mineralization. Stringer chalcopyrite + sphalerite mineralization, hosted by silicified and quartz-veined (± gahnite) volcanic rocks characterises the structural hanging wall of the West zone. Representative chip samples from this stringer zone assayed up to 3.4 % Cu and 5.7 % Zn; Au and Ag assayed up to 6.21 g/t (0.181 oz/ton) and 333 g/t (9.74 oz/ton), respectively. Structurally below the stringer horizon is a moderately layered massive sulphide lens containing pyrite + sphalerite with minor chalcopyrite and galena. A trench across the massive sulphide lens indicates it is at least 4 meters thick in plan view. Three chip samples from the trench averaged 6.77 % Zn, 0.2 % Cu, 0.2 %

Pb, 24 g/t Ag and 0.054 g/t Au over a 3.5 m interval. Zn values increase in a north to south direction indicating a more sphalerite-rich structural base and a more pyrite-rich top. The sulphide lens and stringer horizons are hosted within a silicified and quartz-veined amphibolite schist (metamorphosed chloritic and silicic hydrothermal alteration). Down dip (north) and plunge (north-east) extension of the massive and stringer mineralization is indicated by the surface gravity and HLEM geophysical surveys. Extension of the stringer chalcopyrite mineralization is indicated by surface samples, which assayed as high as 1.22% Cu and 36 g/t Ag, and extends discontinuously for an additional 1000 m to the east.

The Main zone mineralization is hosted by the felsic-intermediate metavolcaniclastic unit, consisting of lapilli and crystal tuffs and fine-grained ash tuffs. Sulphide mineralization comprises a lens of massive sulphide, and sporadically distributed stringer sulphides. The sulphide minerals are composed predominantly of pyrite, sphalerite and galena. Samples representing massive sulphide mineralization assayed up to 19.1% Zn, 3.5% Pb and 240 g/t Ag. Samples representing stringer sulphide mineralization assayed up to 0.92% Zn, 0.35% Pb and 64 g/t Ag.

The Main zone mineralization is immediately enclosed within meter-scale horizons of strongly pyritic muscovite quartz ± andalusite ± staurolite ± gahnite schist (metamorphosed sericite hydrothermal alteration). These alteration horizons extend for a strike length of approximately 1000 meters and are enclosed within a much broader alteration halo of weakly to moderately pyritic quartz-muscovite-biotite-plagioclase schist.

Structurally below the felsic-intermediate unit is a rhyolitic volcaniclastic unit consisting primarily of crystal tuffs with minor coarse-grained felsic volcanic breccias. The volcanic breccias occur in contact with the felsic-intermediate unit. The felsic volcaniclastic unit hosts a linear, apparently continuous, variably oxide-, sulphide- and silicate-bearing banded iron formation. Assay values from several samples representing the sulphide facies iron formation (composed predominantly of pyrite) were generally low, however, one sample assayed 0.4 % Zn.

Geological, geochemical and geophysical investigations on the Victory Lake Property indicate excellent potential for extensive massive sulphide mineralization in the two zones. The West zone is a 425 meter strike length horizon of massive and disseminated Zn-Cu-Ag-Au mineralization. The Main zone is a 1000 meter long alteration zone with discontinuous massive and stringer Zn-Pb-Ag mineralization. Extension of both zones along strike is suggested by sporadic surface mineralization in the East, Far East and West Zones.

PROGRESS REPORT: PRECAMBRIAN GEOLOGY, ANGIKUNI LAKE AREA, DISTRICT OF KEEWATIN, NORTHWEST TERRITORIES

Lawrence B. Aspler and Jeffrey R. Chiarenzelli (Consultants) and Brian L. Cousens (Department of Earth Sciences, Carleton University)

Modern integrated study is needed to test provisional paleogeographic and tectonic models for the western Churchill Province and to evaluate if the Rae and Hearne provinces were parts of a Neoarchean supercontinent. Herein we report preliminary geologic, geochemical, isotopic and geochronologic results from a multi-year project based on 1:50,000-scale mapping near the western flank of the Hearne Province, in the Angikuni Lake area. This project is a component of the Western Churchill NATMAP Programme and compliments contributions from other parts of the Ennadai-Rankin greenstone belt near Kaminak Lake (Hanmer et al., this volume) and Yathkyed Lake (Relf et al., this volume). Below we describe Neoarchean supracrustal, plutonic and metamorphic rocks in the Angikuni Lake area in terms of five lithostructural domains. Paleoproterozoic continental siliciclastic and volcanogenic rocks, and related lamprophyre dykes and syenitic stocks, of the Baker Lake Group (Dubawnt Supergroup) are exposed in small outliers across these domains and in two northeast-trending sub-basins in the northern part of the area.

On the eastern side of Angikuni Lake, Domain I is characterized by extensive areas of greenschist grade supracrustal rocks, including shallow water mafic volcanic flows and biotite muscovite ± garnet psammite, both of which are cut by large granitic bodies. To the west, Domain II is an upper amphibolite grade granite, gabbro, orthogneiss and paragneiss complex containing only isolated slivers of readily recognizable supracrustal rocks. Domains I and II are separated by a northeast-trending, near-vertical, strike-lineated, upper amphibolite grade dextral mylonitic shear zone. A suite of intrusive bodies, with a full range of composition, from gabbro to granite, occurs within the shear zone. These bodies are syntectionic because they contain the mylonitic fabric and are locally transposed along the shear zone, but are also locally discordant. A syntectonic granite from near the shear zone has yielded an initial U-Pb age of ca. 2.61 Ga (W.M. Davis, unpublished data).The shear zone also displays evidence of a post-ductile brittle history in the form of local breccia zones and quartz stockwork veins. Two unconformity-bounded (?) sequences are exposed in Domain III. The lower sequence consists of three subunits: 1) intermediate to felsic volcanic rocks; 2) interbedded microbial laminates (locally stromatolitic), pelites and carbonate-rich, intermediate to felsic volcanic rocks; and 3) carbonate altered mafic (in part ultramafic ?) volcanic rocks. Interfingering of component rock types indicates that these subunits are conformable, but we remain uncertain of their stratigraphic order. Top indicators in the middle carbonate-pelite unit suggest that it overlies the intermediate to felsic volcanic unit and underlies the mafic volcanic unit. Loveridge et al. (1988, GSC Paper 88-18) reported U-Pb zircon ages from the felsic unit of 2680+29/-25 Ma (containing ca. 3.04 Ga xenocrystic zircon; Eade, 1986, GSC Paper 84-11) and ca. 2.61 Ga (minimum age; originally reported as 2643 Ma in Eade, 1986). At the base of the upper sequence is a subunit of interlayered subarkose and framework-intact quartz pebble conglomerate. The conglomerate contains clasts derived from reworking of older quartz-rich sandstones. Basal beds of quartz pebble conglomerate are pyritic and yield high Ni, Cr, and V, and detectable Pt and Pd values signifying erosion of an ultramafic source. Sm-Nd isotopic study of a mudrock interbed yields an initial ϵNd value of -2.0 ± 0.8 (assuming a mantle ϵNd value of +3 at 2680 Ma), suggesting that it includes detritus derived from significantly older (100's of Ma) crust. Tentatively, we interpret that the lower contact of this subunit is an unconformity because: 1) the abrupt appearance of quartz pebble conglomerate above mafic and felsic volcanic rocks requires a period of intense weathering; 2) the unit appears to cut out lower sequence stratigraphy ; and 3) the unit appears to be distributed as outliers (paleolow-infills ?). Overlying this siliciclastic subunit are felsic volcanic rocks with abundant pyroclastic breccia, crystal tuff, graded ash beds, dolomite-cemented sandstone and pelite. In contrast to the straight mylonite zone separating Domains I and II, the boundary between amphibolite grade rocks of Domain II and greenschist grade supracrustal rocks of Domain III is irregular and marked by short faults (several km) with north, northwest and northeast trends. Some of these faults define near-vertical, narrow (to 300 m) zones of greenschist facies, granitic cataclasite in which granitic and mylonitic granite are cut by mm-scale chloritic veinlets. Domain IV consists of granites and granitic gneisses that are separated from supracrustal rocks of Domain III by a northeast-trending faulted/intrusive contact similar to the zones of granitic breccia that separate domains II and III. In the northwest corner of the map area, both lithologies and northwest-trending fabrics in Domain IV continue across the putative northeast trace of the Snowbird tectonic zone, without truncation or deflection. Domain V consists of well-foliated magnetite leucogranite and granitic gneiss with rare slivers of mafic volcanic rock. Foliation trajectories define a gently northeast-plunging domal structure. The northern margin of Domain V is a northwest-trending, shallowly north dipping, dip-lineated, north side down upper amphibolite grade shear zone. It truncates the southern extent of domains II and III and appears to merge with the dextral ductile shear zone that separates domains I and II, consistent with kinematic linkage between the two. The shear zone consists of interleaved porphyroclastic granitic gneiss, mylonitic amphibolite gneiss and magnetite leucogranite, apparently derived from protoliths in domains II and V. In addition, discontinuous ribbons of granitic cataclasite occur along the length of the shear zone; some were originally mapped as fragmental felsic volcanic rocks.

Abundant intrusive relationships mapped during this year's work, and the difference in age between the supracrustal (ca. 2.68 Ga) and granitic (ca. 2.61 Ga) rocks indicate that supracrustal remnants in Domain II were likely derived from plutonic and structural disruption of volcano-sedimentary units better preserved in domains I and III. Although Mesoarchean basement has not been documented in the area, sedimentologic data indicate that the Neoarchean supracrustal rocks were deposited in shallow water on transitional if not continental basement. At least two alternative models for Rae-Hearne tectonic evolution are possible: collapsed back arc basin and merging island arcs. Nine samples from Domain I and six samples from Domain III plot within the tholeiitic field and define a tholeiitic Ti-enrichment trend, inconsistent with subduction. Positive initial ϵNd values from the lower sequence in Domain III (felsic volcanic: $+2.7 \pm 0.8$; mafic dyke $+3.8 \pm 0.8$; assuming mantle ϵNd value of +3 at 2680 Ma) indicate mantle derivation consistent with a back arc setting. The Snowbird zone, at the latitude of the present mapping, appears to form a distributed branching network, rather than being confined to a single linear element. It extends across the Angikuni Lake area, at least to the western edge of Domain I. Studies of the Snowbird tectonic zone near the Saskatchewan - NWT border indicate high grade metamorphism, plutonism and ductile strain at ca. 2.62-2.60 Ga. Deformation in other parts of the Ennadai-Rankin belt appears to have started 10's of millions of years earlier. Thus the Snowbird zone appears to have been active late in the evolution of the Ennadai-Rankin greenstone belt, in an intracontinental setting. This is supported by preliminary geochemistry from gabbroic plutonic rocks in Domain II that are tholeiitic and display Ti-enrichment trends, consistent with partial melting of the mantle due to late-stage extensional collapse, rather than subduction.

Paleoproterozoic (ca. 1.85 Ga) rocks of Baker Lake Basin (Dubawnt

Supergroup) define two NE-trending sub-basins in northern Angikuni Lake. In the northern sub-basin, the Angikuni and South Channel formations form local wedges beneath extensive Christopher Island Formation deposits; in the southern sub-basin, only the Christopher Island Formation is exposed. The Angikuni Formation consists of arkosic redbeds and mudcracked pelites, and probably represents fluvial and lacustrine sedimentation. The South Channel Formation comprises framework-intact, polymictic (basement-derived) conglomerate, granulestone, pebbly sandstone and arkose and is likely a fluvial deposit. These units are onlapped by the Christopher Island Formation, which consists of minette flows, volcanic breccias, and local interbeds of framework-intact conglomerate and cross stratified arkose. In central and southern Angikuni Lake, small (several tens of metres) outliers of Christopher Island Formation and polymictic open-framework conglomerate and redbed arkose of the Kunwak Formation are scattered across the Archean domains described above. The outliers form surface veneers, and fill paleolows in the sub-Baker Lake paleotopography. Paleojoints in subjacent basement, up to 1 metre wide and infilled by Baker Lake Group rocks, are locally exposed. Lamprophyre dykes, likely feeders to the Christopher island flows, occur throughout the region, and display strong northeast trends. Small Martell Syenite stocks are also common. Thick sections of volcanogenic and fanglomerate rocks in Baker Lake Basin require active faulting at ca. 1.85 Ga. Contacts between Baker Lake Group rocks and basement mapped this summer failed to reveal evidence of syn- or post -depositional faulting even though the shear zone separating domains I and II is close to, and parallels, the western boundary of the eastern Baker Lake sub-basin. Testing for a genetic relationship (if any) between the shear zone, particularly its brittle history, and subsidence of the Baker Lake sub-basins will continue to be an important focus of future work. However, it could be that these sub-basins, similar to isolated pockets of Baker Lake Group farther to south, represent thermal subsidence beyond the limits of active faulting, and that the syn-depositional faults remain buried.

None of the 18 gossans mapped yielded significant gold. Two gossans, from chalcopyrite-pyrite-bearing quartz veins that are part of late, post ductile deformation, brittle stockworks yielded high Cu (12,267 and 54,301 ppm); one had elevated gold (45 ppb); one elevated silver (18.3 ppm). Quartz pebble conglomerates at the base of the sandstone-conglomerate sequence in Domain III locally have abundant matrix pyrite (presumably paleoplacer) and display slightly elevated Au values (14, 8, 5) and detectable Pt and Pd.

THE CENTRAL SLAVE BASEMENT COMPLEX: ITS AUTOCHTHONOUS COVER, DÉCOLLEMENT, AND STRUCTURAL TOPOLOGY

Wouter Bleeker, Geological Survey of Canada,

Continental Geoscience Division,

John Ketchum, Department of Earth Sciences, Memorial University of

Newfoundland

A comprehensive and testable model is presented for basement/cover relationships in the south-central Slave Province. Pre-Yellowknife Supergroup basement rocks throughout the south-central Slave can be combined into a single basement block, which we propose to call the **Central Slave Basement Complex** or **CSBC**. The CSBC encompasses the previously named Sleepy Dragon, Jolly Lake and Anton basement complexes, which merely represent different parts of the multiply folded CSBC. Furthermore, the CSBC reappears to the east of Sleepy Dragon Complex as basement below the southeastern flank of the Beaulieu River greenstone belt, the southern flank of the Beniah Lake greenstone belt, and the Camsell Lake greenstone belt. It is proposed that this complex be named the Step'nduck Complex after a dyke complex described by Lambert et al. (1992). Although this basement complex locally includes migmatitic diorite-tonalite gneisses, the full extent of old basement rocks in this complex, relative to younger intrusive granitoid intrusions, is poorly known. The eastern and southern limits of this complex are poorly constrained. In general, at least 50 percent of the CSBC appears to be intruded or reworked by younger granitoids.

Basement rock types consisting of foliated tonalites and heterogeneous diorite-tonalite gneisses can be followed discontinuously from the southern end of the Sleepy Dragon Complex, to below the northern end of the Beaulieu River greenstone belt, into the Jolly Lake Complex, and further northeast into the footwall of the Courageous Lake greenstone belt. U-Pb zircon data from a first sample of a regional sample suite, which is designed to test the proposed CSBC topology, confirm a ca. 3.2-3.4 Ga basement age for a diorite-tonalite migmatitic gneisses. The dated sample was collected along the western shore of MacKay Lake within eyesight of the overlying Courageous Lake greenstone belt.

Although we stress the preliminary nature of the U-Pb results, they define a minimum age of 3218 Ma. The gneiss could be as old as ca. 3323 Ma, an upper intercept age defined by a discordia line through three colinear data points. Morphologically distinct, equant, colourless zircon grains of low U content define a zircon growth event at ca. 2723 Ma that is attributed to a cryptic metamorphic event.

Supporting evidence for the new CSBC topology is provided by the Bouguer gravity field of the Slave Province, which shows a broad negative anomaly over much of the CSBC. It is suggested that the broad negative Bouguer anomaly tracks the older sialic crust. The proposed outline of the CSBC is also in agreement with the regional variation in Pb-isotopic data for syngenetic ore leads (Thorpe et al., 1992; and R. Thorpe, unpubl. data).

All presently known and some new occurrences of a distinctive quartzite and banded iron formation assemblage occur in the immediate hanging wall of the CSBC and are included in a new stratigraphic entity, the **Central Slave Cover Group** or **CSCG**, which represents the autochthonous cover of the CSBC. Evidence for a metamorphosed weathering mantle below the CSCG and a basal quartz cobble conglomerate have been found at Brown Lake. Elsewhere, the CSCG includes ultramafic flows and sills, detritus of which is represented as detrital chromite in the overlying quartzites.

A regional décollement marks the contact between CSBC basement and its autochthonous cover on the one hand and the overlying parautochthonous to allochthonous tholeiitic break-up sequence on the other hand. Mutually consistent lineation data and kinematic indicators, at five widely spaced localities, suggest significant northeast-to-southwest transport of the tholeiitic sequence. General arguments suggest a displacement of >>10 km over a basal décollement with a preserved width of at least 300 km (i.e., from Courageous Lake to Yellowknife).

The new structural-stratigraphic model allows a number of important predictions. If the Winter Lake greenstone belt represents a syncline of the tectonostratigraphy, as is strongly suggested by the overall topology, then the Point Lake basement complex will be part of the CSBC. The high strain zone at Point Lake could then prove to be just another segment of the same regional décollement as at Sleepy Dragon. The present topology of the CSBC is greatly simplified by restoring a significant sinistral strike-slip displacement on the Beaulieu River Fault Zone. Such a restoration suggests that the first order F1 anticlines of the Sleepy Dragon and Jolly Lake complexes represent the same fold that was transected by late-stage strike deformation. The same restoration enhances an along-strike correlation of the Cameron River greenstone belt with the eastern flank of the Winter Lake greenstone belt.

REFERENCES:

Lambert, M.B., Ernst, R.E., and Dudás, F.Ö.,1992: Archean mafic dyke swarms near the Cameron River and Beaulieu River volcanic belts and their implications for tectonic modelling of the Slave Province, Northwest Territories; Canadian Journal of Earth Sciences, v. 29, p. 2226-2248.

Thorpe, R.I., Cumming, G.L., and Mortensen, J.K., 1992: A significant Pb-isotope boundary in the Slave province and its probable relation to ancient basement in the western Slave province; in Project Summaries, Canada-Northwest Territories Mineral Development Subsidiary Agreement 1987-1991, edited by Richardson, D.G., and Irving, M., Geological Survey of Canada, Open File 2484, p. 179-184.

INITIAL RESULTS FROM THE RAVENS THROAT PROJECT - GEOLOGY OF MT. KRAFT (95L/15) AND PART OF DAL LAKE (95M/2) MAP AREAS, MACKENZIE MOUNTAINS

Maurice Colpron
Resources, Wildlife and Economic Development, GNWT

Regional (1:50,000-scale) mapping of the Ravens Throat area was initiated in 1997 as part of a two-year mapping project in the Mackenzie Mountains region of the western Northwest Territories. A primary objective of this project is to delineate the stratigraphy which hosts Cu and Zn-Pb concentrations. Numerous Cu and Zn-Pb showings are located within the map area, which lies to the immediate north of the Redstone Copper deposit at Coates Lake (37 million tonnes, averaging 3.9% Cu, 11.3 g/t Ag). Specific objectives for the 1997 field season included: 1) completing the detailed mapping of the Neoproterozoic stratigraphy in the Mount Kraft (95L/15) map area (initiated by C.W. Jefferson in 1976, 1977 and 1984) and extending this mapping into the Dal Lake (95M/2) map area to the north; 2) tracing the Paleozoic sequences; and 3) re-evaluating the nature of the faults in the area.

The lithostratigraphy of the area is best decribed in terms of three assemblages which reflect distinct tectonic/depositional settings. The oldest assemblage, the Mackenzie Mountains Supergroup (1.08-0.78 Ga), records stable platformal deposition, possibly in an intracratonic basin. The overlying Windermere Supergroup (0.78-0.54 Ga) records the Neoproterozoic rifting of northwestern Laurentia and the subsequent development of a passive margin. The basal part of the Windermere Supergroup was deposited, in part, in restricted, fault-bounded basins developed upon a "basement" of Mackenzie Mountains Supergroup strata. The youngest assemblage comprises the Paleozoic rocks that define the Mackenzie Platform. These Lower Cambrian to Devonian siliciclastic and carbonate rocks overlie the Neoproterozoic sequences along a series of overstepping unconformities. Together, these lithostratigraphic assemblages comprise up to 28 distinct map units, a third of which were not identified during previous reconnaissance mapping of the area (Gabrielse et al., 1973, GSC Mem. 366).

The structural style of the Ravens Throat area is the result of the interplay between Neoproterozoic-Early Paleozoic extension faulting and Mesozoic folding and thrust faulting. Neoproterozoic transtension faults developed during rift tectonism, accompanied by deposition of the basal rift-clastics of the Windermere Supergroup (Coates Lake and Rapitan Groups). The majority of extension faults in the study area cut older Neoproterozoic units of the Mackenzie Mountains Supergroup but are onlapped by the basal units of the Rapitan Group. Basal-Rapitan fanglomerates were locally deposited adjacent to extension faults.

The Mt. Kraft Thrust, the most significant Mesozoic contractional structure in the study area, is a shallow to moderately, westerly-dipping thrust fault, which juxtaposes Neoproterozoic rocks, in its hangingwall, over Paleozoic strata, in its footwall. The Mt. Kraft Thrust is arcuate and broadly follows the trend of Neoproterozoic extension faults preserved in its hangingwall. It is truncated by the North Extension Fault, a moderately east-dipping, west-verging thrust fault which marks the western limit of exposure of the Coates Lake Group in the area. The North Extension Fault is thus interpreted to follow the trace of an older southeast-dipping extension fault which delimited the western margin of a rift-related depositional embayment.

Structural relationships along Hayhook Fault suggest that right-lateral transcurrent displacement occurred along the fault. The Hayhook Fault is steeply dipping and, in the northeast part of Mt. Kraft map area, it juxtaposes a south-dipping sequence of Paleozoic rocks, on the west, and a north-dipping panel comprising the same stratigraphic interval, on the east. The fold pattern west of Hayhook Fault shows a complex interplay between folding associated with thrusting (along Mt. Kraft and North Extension faults) and strike-slip displacement along Hayhook Fault. In the north-central part of Mt. Kraft area, a northeast-verging syncline, which developed in Paleozoic strata in the footwall of the Mt. Kraft Thrust, is rotated counterclockwise by as much as 90° near the northern termination of the North Extension Fault. In the immediate vicinity of Hayhook Fault, the folds are tight, upright and congruent with the trend of the fault. This pattern of folding suggests that transcurrent displacement along Hayhook Fault occurred, at least in part, during the Mesozoic. Hayhook Fault probably follows the locus of an older extension fault as suggested by distinct facies in the Neoproterozoic rocks on either side of the fault.

The South Redstone Fault is another structure which is interpreted to follow an older basement discontinuity. In the Mt. Kraft map area, the South Redstone Fault has an apparent down-to-the-northwest displacement. On a regional scale the South Redstone Fault shows as much as 10-12 km of right-lateral strike-slip displacement. The South Redstone Fault truncates Mesozoic thrust structures and, therefore, part of its displacement postdates the development of compressional structures in the area.

Disseminated copper sulphides occur locally within the transition zone between the Redstone River and Coppercap Formations (Coates Lake Group). In the study area, the favorable stratigraphy is limited to the hangingwall of the North Extension Fault and to the east side of Hayhook Fault; the latter occurrence of Coates Lake strata was previously unrecognized. Copper sulphides are disseminated within a 2 metre-thick carbonate bed which extends approximately 300 metres along strike. One assay from this horizon yielded 0.38% Cu. Additional copper sulphides are disseminated along fracture zones closely associated with Neoproterozoic extension faults. These occurrences are typically hosted within strata of the Little Dal Group (Mackenzie Mountains Supergroup) and are of little economic interest. Zinc concentrations in the Ravens Throat area are spatially associated with the Manetoe dolomite facies. The Manetoe facies is a hydrothermal, sparry dolomite facies which, in the study area, locally replaces the basal Landry Formation (Middle Devonian). The Manetoe dolomite is not widely developed in the Mt. Kraft area and no zinc sulphides were observed; although a sample of Manetoe dolomite yielded anomalous Zn values (0.88%). Anomalous Zn values (0.25%) were also obtained from a gossanous regolith at the sub-Whittaker (Late Ordovician) unconformity.

PRELIMINARY EXPLORATION RESULTS FROM THE HARELY Cu-Ag PROJECT, DUMAS GROUP, WOPMAY OROGEN, N.W.T.

Andrew Conly[1,2] and Peter Gummer[1]
[1]Rhonda Mining Corporation,
[2]Department of Geology, University of Toronto

The Harley property, located 60 kilometres south of Kugluktuk (Coppermine), is 100% owned by Rhonda Mining Corporation. The Harley showing is a stratiform Cu-Ag deposit hosted within the volcanocastic sedimentary rocks of the Dumas Group along the northeastern edge of the Great Bear Magmatic Zone, Wopmay Orogen. Previous exploration by others focussed on the discovery of Port Radium-type uranium deposits. Although no significant uranium mineralization was identified, trenching did reveal promising discoveries of sediment-hosted copper and silver. In particular, assays from two trenches, approximately one kilometre apart, yielded significant grades of 2.8% Cu and 4.64 oz/ton Ag over three metres and 1.49% Cu, with no silver, over two metres, respectively. With the occurrence of several Cu-Ag showings in the area, Rhonda commenced preliminary exploration during 1996 and in 1997 completed two short diamond drill holes, H97-1 and H97-2. The holes were drilled proximal to the higher grading trench, in order to confirm the sediment-hosted style of mineralization and to extend the zone at depth. Both drill holes yielded favourable intersections, with average grades of 2.55% Cu and 1.79 oz/ton Ag over 3.60 metres for H97-1 and 2.40% Cu and 2.89 oz/ton Ag over 4.10 metres for H97-2.

The Harley horizon is a distinct package of volcanoclastic-sedimentary rocks that can be traced laterally for approximately one kilometre, before it disappears under vegetation cover. Lithologically, the mineralized zone consists of granule to pebble paraconglomerate to medium- to coarse-grained lithic wacke, arranged in a series of fining-upward sequences. Clasts and framework grains consist of hornblende-fluorite-bearing pink rhyodacite. The top of the horizon is defined by a thin (<1 metre) imbricated conglomerate. Disseminated sulphide mineralization occurs throughout the matrix of the conglomerates and sandstones, infilling primary and secondary porosity with only minor replacement of detrital/authigenic phases. Primary copper sulphides include chalcopyrite and bornite, with variable amounts of pyrite. The horizon can be subdivide into an upper and lower copper zone. The upper copper zone is the thickest and yields the highest grades (see above) due to the presence of both chalcopyrite and bornite. Although the lower zone does contain a higher abundance of chalcopyrite, grades are slightly lower (1-1.5% Cu over 2-3 metres) due to only trace amounts of bornite being present. A diffuse pyrite zone separates the two copper zones and marks the base of the mineralized horizon. Associated alteration includes small, but variable, amounts of chlorite. The mineralized zone is cross-cut by several post-ore quartz-fluorite veins which have remobilized some of the ore minerals.

Hangingwall and footwall units consist of multiple fining-upward cycles of maroon lithic sandstone to grey fissile siltstone and green to black mudstone, interpreted as multipulse turbidites. Turbidites within the hanging wall are typically shale dominant, with thin discontinuous black mudstone partings and rare sandstone interbeds. The footwall sequence shows a gradual upward increase in the sandstone content of the turbidites. Sulphide mineralization is only present in the sandstone dominant part of the footwall and consists of finely disseminated pyrite (<5%) within the sandstone matrix.

Within the Harley area several other copper and copper-silver showings have been identified at different stratigraphic levels. Other showings contain chalcopyrite-bornite and native copper-calcocite mineralization. Therefore, the Harley area appears to represent an ancient regional-scale metalliferous hydrothermal system, and is an attractive exploration target for the discovery of several new large deposits of copper and other metals.

SALT-CORED PRE-CRETACEOUS STRUCTURES IN THE FORT NORMAN AREA, NWT

Cook D.G., and Maclean, B.C., Geological Survey of Canada (Calgary)

Four northerly trending, pre-Cretaceous structures including the oil-bearing East MacKay structure, are found in the Fort Norman region, NWT. Each has been affected by subsequent Laramide displacements.

Police Island Anticline is well-imaged on seismic and is seen to be detached in the Saline River Formation and cored by salt. The sub-Cretaceous unconformity truncates a greatly thinned Franklin Mountain Formation on the crest of the anticline, but is itself arched in the fold. Strata at depth under the other three structures are poorly imaged, but by using Police Island as a model, they may all be interpreted as detached in the Saline River Formation and having tectonically thickened salt in their cores. Each, however, has unique characteristics. Salt flow appears not to have been purely diapiric, but was caused, in part at least, by compressive deformation. The pre-Cretaceous deformation is best illustrated by restoring the sub-Cretaceous unconformity to horizontal. Our restoration, however, is not palinspastic and is thus largely schematic.

The East MacKay structure (which has no surface expression) is estimated by National Energy Board to contain 500,000 bbl (80,000 m3) of 20o A.P.I. (929 kg/m3) oil. The CanDel et al. East MacKay B-45 discovery well in the uplifted block encountered Cretaceous bituminous shale source rocks unconformably overlying Ordovician Franklin Mountain Formation cherty dolomite reservoir rocks. By contrast, Conoco et al. East MacKay I-55, only 1.5 km to the northwest, in the structurally lower block, found basal Cretaceous overlying Upper Devonian Imperial Formation. The uplifted block is interpreted by us to be a thrust-plate for which uplift was accentuated by salt flow. The footwall block has a gently synclinal (rather than half-graben) morphology, is underlain by thin salt, and appears to be an evacuation syncline. Pre-Cretaceous compressional tectonics are confirmed by small scale thrust faults which, in both blocks, offset the Middle Devonian Hume Formation but do not affect the Sub-Cretaceous unconformity.

The MacKay Range is a Laramide faulted anticline which we interpret to be cored by salt. An ancestral Pre-Cretaceous structure is apparent because the sub-Cretaceous unconformity truncates the Imperial Formation on both flanks and overlies Canol Formation on the crest of the anticline. If palinspastically restored, the ancestral structure would probably be a broad low-amplitude anticline. Most of the shortening and uplift of MacKay Range was accomplished later during Laramide thrust faulting which was localized by the ancestral anticline.

The westernmost structure is the northeastward, subsurface extension of the Gambill Fault. Of the four pre-Cretaceous structures the Gambill fault zone is the least-well imaged, yet from available seismic information it can be seen to have the most complex geologic history. A portion of the zone coincides with a Cambrian feature marked by truncation of Lower Cambrian strata by an intra-Saline River Formation surface. This feature may represent a broad Cambrian valley cut into the Lower Cambrian beds which would have permitted an anomalously thick accumulation of salt during the Late Cambrian evaporitic stage. This thick, and potentially mobile, salt would have contributed to the complexity of the subsequent structural development. In any case, pre-Cretaceous thrusting is marked by sharp angular truncation by the sub-Cretaceous unconformity of all units from Imperial Formation to Franklin

Mountain Formation. This phase, also, is best illustrated by flattening the sub-Cretaceous unconformity.

Although some salt flow must have occurred at this time, particularly into the MacKay and East MacKay structures, salt diapirism was greatest during the Laramide deformation as marked by the remarkable depression of the originally horizontal sub-Cretaceous unconformity on both sides of the structure, a result of salt evacuation. The zone may be, at least in part, a right-lateral transfer fault linking the surface Gambill fault with the southern termination of the Norman Range. Lower Cambrian strata are offset across the Gambill zone (east-side-down in the north, west-side-down in the southern part). Because similar offsets are not evident in the flattened, pre-Cretaceous, section the offsets appear to have occurred very late (syn- or post-Laramide). The inconsistent sense of offset along strike supports the notion of strike-slip.

DISCOVERY AND EVALUATION OF THE JERICHO KIMBERLITE PIPE IN THE CENTRAL SLAVE CRATON, NORTHERN CANADA

Harrison Cookenboo, Canamera Geological Ltd.

The Jericho kimberlite is located 400 kms northeast of Yellowknife near the northern end of Contwoyto Lake (Fig. 1). The pipe was discovered by Canamera Geological Ltd. (project managers for Lytton Minerals Ltd. and New Indigo Resources Inc.) in February of 1995 by drilling at the up-ice end of an indicator mineral train. The discovery hole intersected 81 m of kimberlite, and kimberlite was intersected in 44 subsequent delineation holes. Drilling has defined the main Jericho kimberlite as an elongate body with a straight and near vertical eastern wall, from which 3 lobes with steeply dipping walls emerge to the west. This main kimberlite (JD-1) is connected by a 1 m thick kimberlite dike to a smaller satellite pipe (JD-2) located 250 m to the northwest. Both pipes are located on land, where they are covered by 10 to 30 m of glacial till, and are in contact on all sides with Archean granitoids of the Slave craton. A third kimberlite pipe is located 7 km to the southwest of JD-1 and JD-2 was discovered in August of 1996. Exploration continues on adjacent claims, searching for the sources of additional indicator mineral trains.

Caustic fusion tests of the discovery and subsequent delineation holes from JD-1 (also known as the Jericho South pipe) were sufficiently encouraging to warrant collection of a 100 tonne bulk sample. The 100 tonne sample was collected by drilling 42 PQ holes with an inside diameter of 85 mm to a maximum depth of 350 m. Initial results from this 100 tonne sample resulted in a decision to begin the next level of testing, leading to extraction of a 15,000 tonne underground bulk sample.

The decline for the underground sample commenced in the summer of 1996, and reached kimberlite in October, 1996. The kimberlite portion of the decline comprises a 4.2 m wide by 4.2 m high tunnel that extends 300 m through the kimberlite. As reported in a press release by Lytton Minerals Ltd. and New Indigo Resources, Inc., dated August 8, 1997, an estimated 14,500 tonnes of kimberlite was extracted, of which 9401 tonnes have been processed to date by Lytton Minerals at the Lupin mine site. From the processed sample, 10,539 carats of diamonds have been recovered for an average grade of 1.18 carats per tonne (for the processed kimberlite), and a value of $61.71 per carat has been assigned. Notably, the largest stone recovered weighs just over 40 carats, and 67 stones weigh 5 carats or more.

Three successive emplacement events have been recognized at Jericho (JD-1) based on correlation of differing kimberlite types between drill holes. The first intrusive event was the emplacement of a precursor kimberlite dike that extends from the south end of the Jericho South pipe more than 450 m north to the satellite pipe. The second intrusive event formed a pipe shaped lobe at the north end of Jericho South, with inward sloped walls dipping at roughly 85°, and a broad, less steeply-dipping, lobe in the southern part of the pipe. The third intrusive event formed the central steep-walled pipe filled with light to medium blue-green kimberlite. Based on contact relationships and autoliths of older phases carried within it, this third phase apparently intruded the older phases. Apparently, the intrusive events were closely spaced in time, with no ages differing measurably from the emplacement age of the pipe at 172.3 ±2 Ma derived from Rb/Sr in phlogopite megacrysts (Heaman *et al.*, 1997).

Incorporated in the kimberlite are well-preserved xenoliths of various mantle rock types including peridotite, eclogite, and pyroxenite (Kopylova *et al.*, 1997). In addition, the kimberlite has entrained crustal xenoliths including Archean granitoids and turbidites, as well as Paleozoic limestone xenoliths that are unlike any rocks exposed within 400 km. These limestones are commonly fossiliferous and contain Middle Devonian (late Eilfelian and Givetian) conodonts (Cookenboo *et al.*, 1997). The limestones comprise the last remnants of the Paleozoic limestone platform that covered the central Slave craton.

Following emplacement of the Jericho kimberlite at 172 Ma (Middle Jurassic), the Devonian limestone cover was completely eroded away, along with an uncertain thickness of Archean granitoids and turbidites, leaving the pipe sub-cropping at its current level, which is interpreted to be the lower part of the

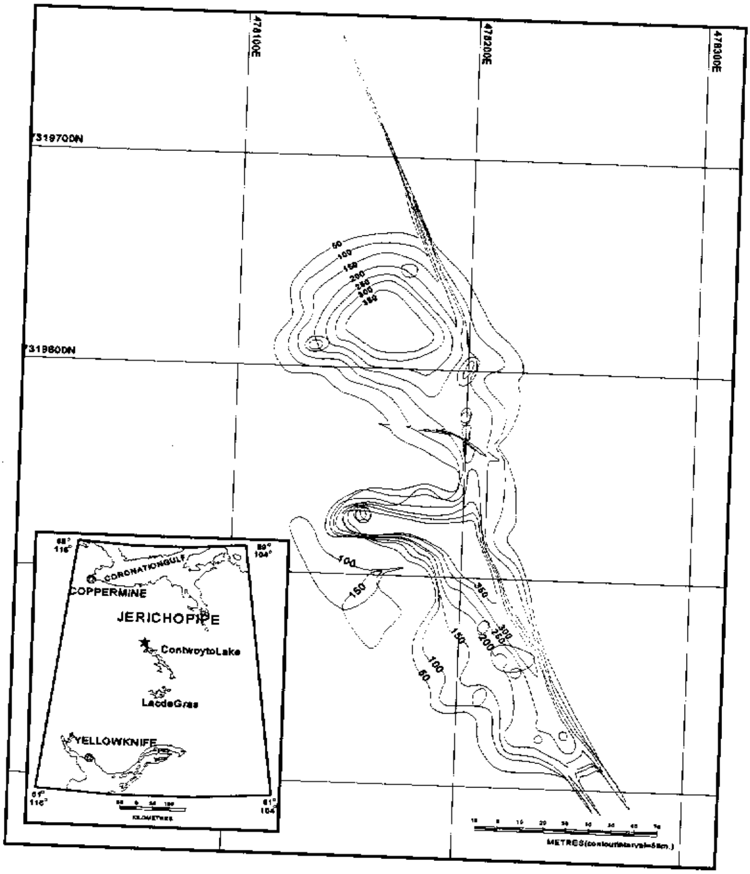


Figure 1: Subsurface contours of the Jericho kimberlite contact with surrounding granite. Depths are metres below surface and the location of the pipe is shown in inset.

diatreme zone.

REFERENCES:

Cookenboo, H. (1997) Emplacement history of the Jericho kimberlite northwest of Contwoyto Lake, NWT; in Exploration Overview 1996, Northwest Territories Mining, Exploration and Geological Investigations, NWT Geology Division, DIAND, p. 3-10.

Heaman, L.M., Kjarsgaard, B., Creaser, R.A., Cookenboo, H.O. and Kretschmar, U. (1997) Multiple episodes of kimberlite magmatism in the Slave Province, North America. *In* Slave-Northern Cordillera Lithospheric Evolution (SNORCLE) Transect and Cordilleran Tectonics Workshop meeting, University of Calgary, Lithoprobe Report 56, p. 14-17.

Kopylova, M., Russell, J.K. and Cookenboo, H. (1997) Mantle xenoliths from the Jericho kimberlite, NWT: Constraints on the thermal state of the underlying mantle; in Exploration Overview 1996, Northwest Territories Mining, Exploration and Geological Investigations, NWT Geology Division, DIAND, pp. 3-25 - 3-26.

THE PELTIER FORMATION: AN EXTENSIVE SUBAQUEOUS BASALT PLAIN EMPLACED ON CONTINENTAL CRUST

Corcoran, P. L. Department of Earth Sciences, Dalhousie University; Dostal, J. Geology Department, St. Mary's University

The 2.7 Ga Peltier Formation in the Point Lake area of the Slave Province, is an extensive mafic-dominated volcanic sequence that is inferred to unconformably overlie the 3.15 Ga Augustus Granite, an Archean basement complex. The formation is characterized by distinct morphological flow forms which include mafic massive and pillowed flows, local pillow breccia and hyaloclastite. Mafic dykes which crosscut the granitic basement complex and sills intruding the various mafic flows are common. Massive flows, collectively up to 100 m thick, display vesicular and amygdaloidal (up to 30%) margins. Pillowed flow units which are locally vesicular, range from 2-220 m thick with individual pillows between 20 cm and 1 m in size. Thermally-spalled hyaloclastite occurs in interstices between pillows. 10-40 m-thick units of pillow breccia with abundant hyaloclastite are composed of angular fragments 0.5-60 cm in size and 30-40 cm-large amoeboid fragments. Vesicularity is variable from 5-25%. The morphological flow forms are intruded by 20-45 m-thick mafic sills and 2-15 m-thick mafic dykes. The sills are coarse- to very coarse-grained with subophitic to ophitic textures in contrast to the fine- to coarse-grained dykes which display aphanitic to subophitic textures. Recurrent 10-75 cm-thick dyke-parallel injections exhibit distinct mm-thick chilled margins that can be traced for 2-11 m. The volcanic rocks are mainly hornblende-feldspar-phyric with minor pyroxene. Magnetite precipitated between pillows and replaces the hyaloclastite matrix whereas sulfide horizons are developed below sills which acted as cap rocks. Both types of mineralization are indicative of hydrothermal seafloor activity. Felsic flows and/or dykes recognized at one locality, have been sampled for age determination.

The extensive basalt-dominated sequence was emplaced under subaqueous conditions based on the prevalence of pillowed flows, pillow breccia and hyaloclastite. Numerous dykes and sills found throughout the study area, suggestive of extension, are typical of volcanoes or seamounts that develop on subaqueous basalt plains. Thick units of pillow breccia commensurate with emplacement of pillow lavas forming on slopes of seamounts. Dykes with multiple injections are common to feeder conduits and lend further support for subaqueous volcanic construction.

The SiO_2 content of lava flows, dikes and sills ranges from 49-53% (LOI-free) and the Mg# values vary between 65 and 35. The rocks have tholeiitic differentiation trends, including an enrichment of Fe and Ti with a decreasing Mg#. They can be subdivided into two groups based on their REE patterns. Most of the REE patterns are similar to modern normal (N)-MORB with chondrite-normalized $(La/Sm)_n < 1$ (group 1) but other patterns display $(La/Sm)_n \sim 1.5$ (group 2). Group 1 rocks generally give positive initial ϵNd-values. Group 2 rocks have higher contents of incompatible trace elements and their mantle-normalized patterns display a negative Nb anomaly. The basalts may have originated from a heterogenous mantle source through melting in the spinel stability field followed by fractional crystallization. The volcanic sequence was derived from a subcontinental lithospheric mantle which exhibits the imprint of older subduction-related processes. The physical volcanology and geochemistry suggests that the Peltier Formation was probably emplaced in an arc-back-arc environment on a pre-existing sialic crust.

GEOLOGY OF THE BABICHE MOUNTAIN AND CHINKEH CREEK MAP AREAS, SOUTHEASTERN YUKON AND SOUTHWESTERN NORTHWEST TERRITORIES (MAP AREAS 95C/8 AND 9)

Lisel D. Currie (Geological Survey of Canada, Calgary), Thomas Kubli (TEK Consulting, Ltd.), Michael R. McDonough (Apu Consulting Ltd.), and Denise N. Hodder (Department of Geology and Geophysics, University of Calgary, Calgary)

The Kotaneelee and La Biche ranges lie within the southern Franklin Mountains (in part also referred to as the Liard Plateau), in a geographic position comparable to that of the Rocky Mountain Front Ranges. Like the Front Ranges this foreland fold and thrust belt is underlain by Paleozoic and Mesozoic strata, and contains economically viable gas fields, including the Beaver River, Kotaneelee, Pointed Mountain, and La Biche fields. However, in contrast to the stacked thrusts of the Front Ranges, the Kotaneelee and La Biche ranges are characterized by broad folds at the surface.

To provide a regional context for more detailed mapping, parts of the Kotaneelee and La Biche ranges were mapped at 1:50 000 scale during the summer of 1997. This work builds on mapping by M.R. McDonough (1995 and 1996), generously donated by Husky Oil Operations Ltd; mapping by T. Kubli (1996) that was kindly made available by Norcen Resources Ltd.; and a 1:250 000 scale compilation map by Douglas (1974; see also Douglas and Norris; 1959). This research is also the first part of the Central Foreland Project, a multidisciplinary, multipartner geologic study of parts of northeastern British Columbia, southeastern Yukon, and southwestern Northwest Territories. Fieldwork in map areas 95B and 95C is expected to continue during the years 2000, 2001 and 2002. The stratigraphy and structural style of this and surrounding areas in the Fort Liard - La Biche map areas (95B, 95C) will be compared with those of Trutch map area (94G) during future years.

The map pattern of the Babiche Mountain and Chinkeh Creek map areas is controlled by broad, west-verging detachment box-folds of the Kotaneelee and La Biche anticline-syncline pairs. Many previously inferred faults do not exist.

Two structural styles contribute to the sinuous nature of the axial traces of the Kotaneelee and La Biche anticline-syncline pairs. First, the axial planes are curved, and second, shortening is transferred by left-handed en echelon steps from southeast to northwest. North-northwest to north-west striking transverse faults generally have little displacement, but may be genetically linked to the sinuous traces of the Kotaneelee and La Biche anticlines and synclines.

Numerous possible explanations of the sinuous trace of the Kotaneelee and La Biche anticline and syncline traces have been proposed. Interpretations for surface structures in the northern Franklin Mountains and the Colville Hills suggest a shallow response to deep seated wrench faults (Cook, 1983). A similar interpretation could be applied to the southern Franklin Mountains. Gabrielse (1966) suggested that in the Mackenzie Mountains, a pre-existing pattern of northeast and northwest (?) trending strike-slip faults, overprinted by one prolonged phase of shortening could have been sufficient to cause the warping of axial planes. Richards (1989) proposed that the sinuous fold geometries could be the result of two phases of deformation, the latter under a transpressional tectonic regime. Alternatively, the folds could have nucleated as separate fold structures with overlapping axial traces that grew into larger amalgamated structures. None of these interpretations can be confirmed or refuted in this study; the primary cause of the sinuous axial traces must be investigated on a more regional scale.

Anticlines are primarily cored by shale and minor siltstone and sandstone of the Devonian to Lower Carboniferous Besa River Formation, and shale, quartzarenite and limestone of the Lower Carboniferous Mattson Formation. We propose that the strata dominated by Permian silty limestones and dolostones, previously considered part of the uppermost Mattson Formation (Douglas; 1974), be referred to as the "Tika map unit", and considered an informal mappable unit, until a type-section is found and documented. We have chosen not to refer to the Tika map unit as Kindle Formation because conodont biostratigraphy has demonstrated that the type section of the Kindle Formation, and one additional Kindle Formation location, comprise Serpukhovian to Bashkirian (Carboniferous) and possibly Moscovian (upper Carboniferous) strata (Chung, 1993).

Chert belonging to the Permian Fantasque Formation overlies the Tika map unit and forms the flanks of the mountain ranges. The Fantasque Formation is unconformably overlain by the Cretaceous Fort St. John Group shale and minor sandstone, preserved in the cores of the La Biche and Kotaneelee synclines.

Chung, P. 1993. Conodont biostratigraphy of the Carboniferous to Permian Kindle, Fantasque, an unnamed, and Beloy formations, western Canada. M.Sc. Thesis, University of Calgary, Calgary, Alberta, 189p.

Cook, D.G. 1983. The northern Franklin Mountains, Northwest Territories, Canada - a scale model of the Wyoming province. In Rocky Mountain Foreland Basins and Uplifts, J.D. Lowell (ed.) Field Conference - Rocky Mountain Association of Geologists, p. 314-338.

Douglas, R.J.W. (comp.) 1974. La Biche River. Geological Survey of Canada Map 1380A; 1:250 000 scale.

Douglas, R.J.W. and Norris, D.K. 1959. Fort Liard and La Biche map-areas, Northwest Territories and Yukon. Geological Survey of Canada Paper 59-6, 23p.

Gabrielse H. 1966. Tectonic evolution of the northern Canadian Cordillera. Canadian Journal of Earth Sciences, v. 4, p. 271-298.

Richards, B.C. 1989. Uppermost Devonian and lower Carboniferous stratigraphy, sedimentation, and diagenesis, southwestern District of Mackenzie and southeastern Yukon Territory. Geological Survey of Canada Bulletin 390, 135p.

NEW GEOCHRONOLOGICAL RESULTS FOR THE TAVANI AREA, EASTERN KAMINAK GREENSTONE BELT, DISTRICT OF KEEWATIN.

W.J. Davis and T.D. Peterson,

Geological Survey of Canada

We report new U-Pb zircon ages for volcanic, plutonic and sedimentary rocks from the Tavani area, in the eastern Kaminak greenstone belt (southwest corner of 55K). The objectives of the study are to: 1) establish the age of volcanic units for local stratigraphic, as well as regional correlations; 2) determine the age of intrusive rocks that bracket deformational events; and 3) provide maximum age estimates and provenance of polymictic conglomerate within the volcanic tectono-stratigraphy.

The eastern portion of the Kaminak belt is dominated by pillowed mafic volcanic rocks, with subordinate breccias and felsic flows and tuffs, all intruded by syn- to post-tectonic granitoids. A preliminary tectono-stratigraphic model for the area recognizes an older(?) series of greenschist to lower amphibolite facies mafic pillowed flows, which lacks intercalated felsic units (broadly similar to the Atungag formation of Park and Ralser, 1992), and a second volcanic unit, containing mafic pillowed flows, dacite to rhyolite flows and tuff (Akliqnaktuk formation). The Archean rocks are overlain by Proterozoic epicontinental clastic rocks (lower Hurwitz group), exposed in NE-SW oriented synclines that parallel the dominant fabric in adjacent Archean rocks.

U-Pb zircon ages were determined for two volcanic rocks from the Akliqnaktuk formation. A weakly quartz-phyric, massive felsic volcanic rock exposed north of the Whiterock syncline yielded an age of 2700±1 Ma. Zircons are euhedral and prismatic and yield concordant results with no evidence of inheritance of older grains. A younger age of 2695±2 was obtained for a 80 cm thick, flinty, buff to pale orange-weathering felsic tuff layer within mafic volcanic rocks. Several felsic horizons, ranging in width from 10 cm to 1 m, occur in the outcrop, along with graded, pebbly to silty beds that may be epiclastic rocks. A single age population of zircons was recovered from the felsic layer, consistent with a primary volcanic origin. The zircon ages document a span of at least 6 m.y. for volcanism, and are similar to volcanic ages within the Kaminak Lake greenstone belt further west at Spi Lake (2698 Ma) and Kaminak Lake (2692 Ma; Mortensen and Thorpe, 1987). Although the dataset is small (n=5), felsic volcanic units along the strike length of the Kaminak greenstone belt apparently formed in a short interval between 2700 and 2690 Ma. An exception to this is the 2681 Ma age for a felsic volcanic rock at Quartzite Lake (Patterson and Heaman, 1990).

The Last Lake pluton, a weakly foliated, biotite±hornblende granite intrudes the volcanic rocks. Metre to km-scale mafic volcanic rafts within the pluton contain a strong bedding-parallel E-W foliation, parallel to that in the country rock, but not developed in the pluton. The 2684±3 Ma age determined for the pluton provides a minimum age for development of the E-W fabric in the volcanic rocks. Feldspar and quartz phyric dykes are common within the volcanic rocks near the pluton margin. These also cut this fabric in the volcanic rocks. One of the dykes is broadly folded, and contains a post-D_1 axial planar foliation. An age of 2686±3 Ma was determined for the dyke, within error of the intrusion of the Last Lake pluton, and a maximum age for its deformation.

Park and Ralser (1992) included a distinctive, polymictic conglomerate and arkose sedimentary unit within the Akliqnaktuk formation. A sample of an arkose from near the Wilson River yielded a range of detrital zircon ages from 2657 to 2702 Ma. The older grains overlap the ages of volcanic rocks in the area, but the younger grains are significantly younger, and similar to the age of local syn- to post-tectonic plutonic rocks (2677-2666 Ma; Park and Ralser, 1992). The youngest grain provides a maximum depositional age of 2657±3 Ma for this unit, at least 30 m.y. younger than the volcanic rocks. The nature of the contact with the volcanic rocks (unconformity/ fault) is not determined. Deposition post-dates early deformation (pre-2685 Ma) of the belt. The characteristics of this conglomerate, along with its age relationships are similar to Temiskaming-type deposits of the southern Abitibi belt, and it may have a similar tectonic origin.

REFERENCES

Mortensen, J.K, and Thorpe, R.I. 1987: U-Pb zircon ages of felsic volcanic rocks in the Kaminak Lake area, District of Keewatin; in Radiogenic Age and Isotope Studies: Report 1, Geological Survey of Canada Paper 87-2, p. 123-128

Park, A.F., and Ralser, S. 1992: Precambrian geology of the southwestern part of the Tavani map area, District of Keewatin, Northwest Territories. Geological Survey of Canada Bulletin 416.

Patterson J., Heaman L. 1990: Geochronological constraints on the depositional age of the Hurwitz Group, N.W.T.. Geological association of Canada, Program with Abstracts, 15, p. A102.

TIMING OF PLUTONISM AND REGIONAL DEFORMATION IN THE YELLOWKNIFE-SLEEPY DRAGON AREA, SOUTHERN SLAVE PROVINCE.

W.J. Davis and W. Bleeker
Geological Survey of Canada

We report new U-Pb ages for five plutonic rocks from the Yellowknife-Hearne Lake area, east of Yellowknife. These include the Wool Bay, upper Watta Lake, Hidden Lake, Sparrow Lake and Morose Lake plutons. The objective of the study is to refine the established range of intrusive ages in the Yellowknife area to: 1) provide a chronological framework for structural interpretations; 2) to establish the age range for the observed compositional spectrum of plutonic rocks; and 3) evaluate the Yellowknife plutonic history within the broader context of the Slave Province. The plutonic rocks studied all intrude and post-date deposition of the Burwash formation (ca. 2661 Ma; Bleeker and Villeneuve, 1995), with the exception of the Morose granite, which intrudes plutonic rocks of the Sleepy Dragon Complex (ca. 2.68-2.95 Ga).

All the dated plutons cross-cut regional F1 folds, core metamorphic isograds, and are folded and deformed by the regional D2 deformation in the area (Bleeker and Beaumont-Smith, 1995). The oldest plutonic rocks are hornblende diorite to biotite tonalites of the Defeat Plutonic Suite (ca.2.62 Ga; Henderson et al., 1987). Relatively younger plutons have more evolved compositions, ranging from granodiorite to granite (s.s.). These include biotite granodiorite of the Hidden Lake pluton and biotite and/or muscovite granodiorite to granite of the Prosperous Suite (Sparrow Lake), and K-feldspar porphyritic granite (Morose Lake). The Prosperous Suite is characterized by abundant pegmatite.

The Wool Bay diorite forms the core to a composite hornblende diorite to hornblende + biotite tonalite (Defeat Suite) southeast of Yellowknife. Zircons from the sample yielded a precise crystallization age of 2628+3 Ma, with no evidence of inheritance. A second Defeat Suite pluton, the upper Watta Lake biotite tonalite stock, forms a small pluton within the Burwash Formation southwest of the Sleepy Dragon Complex. Determination of a precise U-Pb zircon age for this pluton is complicated by the combined effects of inheritance and Pb-loss. Many of the zircons contain cores with magmatic overgrowths indicating extensive inheritance of older zircon. Ages of inherited grains are ca. 2.68 Ga, an age well represented in detrital grains within the Burwash Formation. Attempts to date the overgrowths were frustrated by Pb-loss. A single grain analysis yielded an imprecise, concordant age of 2628+10 Ma. A minimum age for the pluton of 2624+5 Ma, is given by analyses of two abraded fractions of titanite. This age is within error of the single zircon age. The new ages for these Defeat Suite plutons are older, but within error of the 2618 +7/-20 Ma and 2620+8 Ma ages previously reported by Henderson et al. (1987), and are the oldest yet determined for this type of plutonic rock in the Slave Province.

Samples of the Hidden Lake, Sparrow Lake (Prosperous suite), and the Morose Lake plutons all yielded poor quality zircons that contained inherited cores. For this reason these plutons were dated using monazite. In all cases the measured ages are interpreted as crystallization ages. Three single grain monazite fractions from the Hidden Lake pluton yielded reproducible, concordant ages of 2608 Ma. Two single grain analyses of monazite from the Sparrow Lake pluton yielded an age of 2696 Ma. The Morose pluton yielded the youngest age with three concordant monazite ages of 2586 Ma.

The new data expand the known age range of plutonism in the area and demonstrate that diorite to tonalite magmatism started at least by 2628 Ma. This plutonism post-dates F1 folding in the area, which is therefore bracketed between 2661 and 2628 Ma. The Defeat plutons and the Hidden Lake pluton are folded and deformed by the regional D2 deformation, providing a maximum age of 2608 Ma for D2. Interpretation of the Sparrow Lake pluton as a syn-D2intrusion (Bleeker and Beaumont-Smith, 1995; Ham et al., 1997) requires D2 folding to be in progress at 2596 Ma. However, initiation and duration of the D2 event is not yet known. The minimum age for D1 east of Yellowknife is older than reported depositional ages of some turbidite sequences elsewhere in the Slave Province (e.g. Wheeler Lake, Hood River, Indin Lake Lake, Pehrsson and Chacko, 1997), suggesting: 1) D1 in the Yellowknife Domain was complete and post-D1 Defeat plutons were being unroofed during sedimentation elsewhere in the Slave; or 2) D1 was diachronous across the Slave Province.

Two additional points can be highlighted with the new data within the broader context of the Slave Province. Firstly, the age of diorite-tonalite plutonism in the Yellowknife area is significantly older (10-20 m.y.) than ages of similar plutonic rocks elsewhere in the province, with the possible exception of those of the Healy Lakes area, eastern Slave Province (van Breemen et al., 1987; 1992). This is the first confirmation of systematic regional age differences for Defeat-type suites in the Slave Province (van Breemen et al., 1992). Further work is required in the southeastern Slave Province to confirm the older, but imprecise ages reported for that area. Secondly, in contrast to the older tonalites, the two-mica granites and K-feldspar porphyritic granites have similar intrusive ages throughout the Slave Province. There is no indication of diachroneity at the province scale in the younger granite plutonism.

REFERENCES

Bleeker, W. and Beaumont-Smith. C., 1995. in Current Research, 1995-C, Geological Survey of Canada, p. 87-96.

Bleeker, W. and Villeneuve, M., 1995. Lithoprobe Report No. 44, p. 8-13.

Ham, N. Benn, K. and Bleeker, W. 1997, GAC/MAC Abstract volume 22, A-61.

Henderson, J.B., van Breemen, O., and Loveridge, D., 1987, Geological Survey of Canada, Paper 87-2, 111-121.

Pehrsson, S.J., and Chacko, T., 1997, in Current Research, 1997-C, Geological Survey of Canada, 15-25

van Breemen, O., Davis, W.J., and King, J.E, 1992, Canadian Journal of Earth Sciences, 26, 2186-2199.

van Breemen, O., Henderson, J.B., Sullivan, R.W., and Thompson, P.H., 1987, Geological Survey of Canada, Paper 87-2, 101-110

DIAVIK DIAMONDS PROJECT – LAC DE GRAS, NWT

INTRODUCTION

Diavik Diamond Mines Inc. is a Canadian company that has established its corporate office in Yellowknife, Northwest Territories. Diavik was created late in 1996 to develop a diamond prospect originally discovered in 1993 by the Kennecott Canada / Aber Resources joint venture, 318 km northeast of Yellowknife at Lac de Gras. Diavik holds 60% of the deposit and Aber Resources Ltd. of Vancouver holds 40%.

To this end, Diavik has made a concerted effort to listen to, and to understand the interests of local communities, government and special interest groups. The company has encouraged community participation in the development of baseline studies and impact assessment methods and continues to welcome community input into all phases of the project.

PROJECT DESIGN

The diamond-bearing kimberlite pipes Diavik has found lie beneath the waters of Lac de Gras. To assess the viability of mining these deposits, Diavik developed a preliminary project design and conducted studies to identify and assess possible environmental and socio-economic impacts. These studies were combined with input received during many meetings and community visits to create a preliminary engineering design which includes:

dikes to isolate the kimberlite pipes from Lac de Gras during mining;
a diamond processing facility and associated infrastructure;
a processed kimberlite containment area;
a mined rock pile(s); and
a wildlife corridor(s).

One of Diavik's prime objectives in developing a mine design is to minimize the project's footprint. The current design confines development to a 16 sq. km. island along the north shoreline of Lac de Gras known to local people as Ekadi (see map).

To maximize the benefits available from these pipes, they must be mined efficiently. This will require that dikes are built around the pipes and the water drained from within. Water depth over the four pipes and the mining area contained within them averages less than 15 metres. Plans are to construct the initial dike from granite rock, and possibly glacial till, removed from Ekadi. The remaining dikes would be constructed from granite and till from the first pipe mined. The use of mined material for dike construction will be key in maximizing the project's resource value and minimizing environmental effects.

The diamonds will be recovered on site using a relatively simple process. In the plant, a mechanical crushing process will free the diamonds from the surrounding kimberlite rock. A recoverable magnetic media called ferro-silicon will assist in separating and recovering the diamonds, which will be transported from the site by air. The crushed kimberlite remaining after diamond recovery will be placed safely and permanently in a processed kimberlite containment area on Ekadi.

Mine site reclamation will be ongoing. The additional tonnes of predominantly granite rock that must be removed to mine the kimberlite will be placed on Ekadi in a geotechnically stable manner and at a slope that will minimize erosion. As mining of pipes is completed, some material will be returned to the pit areas to be placed, contoured and textured into gentle, smooth slopes. This will provide productive fish habitat when the dikes are breached and the waters of Lac de Gras re-enter the pit areas. When mining is complete, the plant site and infrastructure will be decommissioned.

Power to the Diavik mine site will be supplied by diesel generators, which will also supply heat to the facility. Supplies and fuel required to maintain the site will be delivered by air and by winter ice road which presently passes within a few kilometres.

ENVIRONMENTAL BASELINE STUDIES

In 1994, extensive studies were begun to gather a variety of information on topics including wildlife, fisheries/aquatics, water quality, hydrology, vegetation/soils & terrain, air quality, geochemistry, heritage resources, and socio-economics. Consultation with communities continues to provide important community and traditional information, perspectives and recommendations. Consultation with regulatory agencies is ongoing. Information gathered from all sources is being used in the design and impact analysis process for the project.

SECURING TIMELY APPROVALS

Before diamond mining can proceed, Diavik must satisfy the requirements of the regulatory authorities to secure the necessary approvals and agreements. Although this approval process is complex, Diavik recognizes that it has been developed to help ensure that the interests of people who may benefit from, or be affected by the project, are appropriately addressed.

Through early consultations on the project, Diavik has worked hard to demonstrate its commitment to an open and inclusive approach to the development of its diamond-mining project. It is hoped that by working cooperatively and proactively with local communities, government authorities, and special interest groups, Diavik will be able to address their interests and proceed through the approvals process in a manner that benefits all parties.

PROJECT SCHEDULE

It is anticipated that Diavik will be able to complete its Project Description and be ready to submit applications for the required permits in the fourth quarter of 1997. Diavik recognizes that the project will be regulated by several pieces of federal and territorial legislation including the Territorial Lands Act, the Northwest Territories Water Act, the federal Fisheries Act and the Canadian Environmental Assessment Act. It is Diavik's hope to have the required approvals, licenses and agreements secured by the fall of 1999, to allow construction to begin shortly thereafter. This would allow production to begin in 2001.

CONCLUSION

Diavik's proposed diamond mining project will play an important role in the future of Canada's North by providing much-needed jobs, revenues, and other socio-economic benefits for northern people. To that end, Diavik has benefited from the consultations that have taken place to date, and has used the information gathered to shape its development proposal. Diavik remains committed to developing the mine in a way that contributes to the health of the northern community and protects the environment.

U-PB GEOCHRONOLOGY OF GRANITOID GNEISSIC AND PLUTONIC ROCKS OF THE EOKUK UPLIFT, SLAVE STRUCTURAL PROVINCE, NWT.

Emon, K. E. and Dunning G. D., Dept. of Earth Science, Memorial University of Newfoundland

Jackson, V. A., Indian and Northen Affairs Canada

The Eokuk Uplift is a 1300 km2 inlier of Archean rocks exposed to the west of the main body of the Slave Structural Province. It is surrounded to the southeast and west by the sedimentary rocks of the Proterozoic Coronation Supergroup. It is partly overlain in the north by Mesoproterozoic Rae Group sedimentary rocks and Franklin diabase sills. Rocks of the Uplift consist of granitoid gneisses, granitoid plutons and supracrustal rocks.

U-Pb ages from 10 rocks from the Coronation Gulf coast of the Eokuk Uplift provide new insight into the magmatic and tectonic evolution of the northern Slave Province. The rocks can be grouped on the basis of metamorphic grade and degree of deformation: (1) older, highly deformed gneissic and supracrustal rocks with relict granulite grade mineral assemblages and, (2) younger megacystic granites and three suites of mafic to felsic dikes which are moderately deformed but show no evidence of granulite grade metamorphism. Of the older succession, a biotite/hornblende tonalitic to granodioritic orthogneiss has a zircon age of 3255 +25/-8 Ma, while zircons from a biotite granite gneiss unit give an age of 3217 +14/-13 Ma. A monzogranite gneiss unit has a zircon age of 3042 +/-3 Ma. Two undated units of supracrustal rocks, a mafic gneiss and a migmatitic paragneiss, also show evidence of granulite grade metamorphism.

The granulite grade rocks are intruded by two weakly to moderately deformed megacrystic granite units with zircon ages of 2887 +/- 2 Ma and 2882 +/- 2 Ma respectively. These granite units contain boudinaged, foliated diorite dikes, one of which yields a zircon age of

2877 +/- 3 Ma. Weakly deformed granodiorite dikes cross-cut the diorite dikes and one of these gives a zircon age of 2865 +3/-9 Ma. Undeformed syenogranite pegmatites cross-cut both diorite and granodiorite dikes and have a combined zircon/monazite age of 2852 +/- 3 Ma. Finally, the area is intruded by a biotite granite with a combined zircon/titanite age of 2595 +3/-2 Ma, consistent with post-Yellowknife Supergroup granitic intrusions.

This study documents an extensive pre-2.8 Ga history for the Eokuk Uplift, involving repeated intermediate to granitic intrusive events and deposition of volcanic and sedimentary supracrustal rocks. The granulite grade metamorphic event took place prior to 2.88 Ga and may have generated the 2.8 Ga megacrystic granites. The undeformed nature of the 2852 Ma syenogranite pegmatite indicates that significant deformation in this area had ceased by that time.

THE O'GRADY APLITE-PEGMATITE COMPLEX: CANADA'S FIRST GEM ELBAITE DEPOSIT

T. Scott Ercit, Research Division, Canadian Museum of Nature,

Lee A. Groat, Department of Earth and Ocean Sciences,

University of British Columbia

The O'Grady batholith is located in the western Northwest Territories, approximately 100 km NNW of Tungsten, in the Sapper Ranges. It is a 270 km^2 alkali-feldspar-rich composite intrusion with mixed S- and I-type granitoid characteristics. It consists of a megacrystic hornblende quartz syenite core, a marginal, massive, equigranular hornblende-biotite granodiorite, and a foliated transitional phase between the core and margin. In addition, the batholith hosts a marginal, 5 km^2 aplite-pegmatite belt of mixed NYF (*N*b, *Y*, *F*)-LCT (*L*i, *C*s, *T*a) geochemical character. Aplite predominates over pegmatite in the belt, and occurrences of pegmatite without associated aplite are uncommon. Preliminary geochemical modelling implies that the aplite-pegmatite complex is directly derived from a melt corresponding in chemistry to the host syenite.

The aplite-pegmatite complex achieves relatively high degrees of fractionation in a small (< 0.5 km^2) region of the belt. In this region, the complex occurs as subhorizontal dykes to 50 m in thickness. Individual pegmatites or pegmatoid lenses show high levels of alkali fractionation: K-feldspars and micas are enriched in Li, Rb and Cs relative to K, and Li and Cs species are present (Li- and Cs-micas and pollucite). The pegmatites are commonly miarolitic, indicative of melt saturation in water. The pockets host a variety of exotic and well-crystallized minerals. In addition to microcline (occasionally var. *amazonite*), quartz and plagioclase (var. *cleavelandite*), the following can be found: abundant gem tourmaline (elbaite vars. *rubellite, verdellite* and *indicolite*), less-common danburite, polylithionite-lepidolite, hambergite, titanite, ilmenite and possible boromuscovite, and rare scheelite, nanpingite and pollucite. The abundance of boron-bearing species during all stages of crystallization (magmatic to subsolidus), local evidence of tourmalinized K-feldspar, and the absence of phosphate minerals and incompatible-element-bearing oxide species indicate that boron activity (a_B) was extremely high relative to a_P, a_{Nb} and a_{Ta} during consolidation, even a_{Si} and a_{Al} during the latest stages of consolidation. All of the above features coupled with the high alkalinity of the inferred parent (melt of quartz syenite composition) imply that the aplite-pegmatite complex is of the new elbaite subtype of the rare-element class of granitic pegmatite.

THE LEITH LAKE ALKALINE COMPLEX: A PRELIMINARY STUDY

Lucas Flowers, University of Alberta

The Leith Lake Alkaline Complex is an intrusive complex located approximately 100 km north of Yellowknife at N 63°17', E 113° 58'. The complex is about 500m across and bounded on three sides by migmatized Burwash turbidites grading into mixed granites and on the south side by a major east-west lineament, interpreted to be a south dipping normal fault. The complex was initially discovered in 1996 and the work done on the area consisted of a single REE and whole rock analysis providing compositional data compatible with those of a carbonatite. A preliminary study of the area during the 1997 field season under the auspices of a DIAND mapping project was carried out. A week of field work was allotted to set up a fifty meter grid and perform detailed mapping, sampling for petrography and geochemistry and a radiometric survey with a Geiger counter. Present results have identified the complex to be a roughly ring shaped structure with multiple intrusive phases of alkali granitoids, syenite and carbonatite dykes. The radiometric survey identified several anomalous peaks above background, all of which appeared to be associated with the carbonatite dyke phase. Further work to be carried out on the alkaline complex involves a detailed petrographic analysis of the collected samples and whole rock and REE analysis of the various phases. The main aims of further work would be to classify the complex, in particular the carbonatite, according to present petrologic standards. Determining the detailed mineralogy of the suite along with intrusive cross-cutting relationships and origin of structures as primary intrusive or tectonic are also major goals. Other issues are the implications on magma formation, and gaining more insight into evolution of the regional geology.

EXPLORATION STATUS OF THE LONGTOM PROPERTY, DISTRICT OF MACKENZIE

Sunil S. Gandhi
Consulting Geologist

The Longtom Lake property is located 350 km north-northwest of Yellowknife, and comprises a group of contiguous claims covering an area of 14531.55 hectares on the east side of Longtom and Zebulon lakes, which are situated in the southwest corner of the Calder River topo sheet (NTS 86F4). It covers a part of the early Proterozoic Wopmay orogen in the northwest Canadian Shield, and more specifically, of the Great Bear magmatic zone, which forms the westernmost, and the youngest, tectonic zone of the orogen. The magmatic zone is characterized by continental volcanic assemblages, subvolcanic intrusions and large granitic batholiths, all emplaced 1870 to 1840 million years ago.

The area of Longtom Lake property is underlain by a folded assemblage of basalt and andesite flows, rhyodacite ignimbrites and associated tuffaceous and sedimentary beds, which are intruded by quartz monzonite and granite plutons. The most important mineralized zone found to date on the property is the Damp polymetallic prospect, which is located near the shore of northeastern arm of Longtom Lake. It was discovered in 1985 by an exploration team of Central Electricity Generating Board Exploration (Canada) Limited (CEGB) during a search for classical vein-type U-Ag-Cu-Co-Ni-As deposits of the Echo Bay-Camsell River mining district, situated 50 km to the north-northwest of the Longtom Lake property, on the east shore of Great Bear Lake. This district has a long mining history, starting with production in 1933, first for radium and then for uranium from 1942-1960, followed by silver production from 1966-1985. It produced 5200 tonnes of uranium and some 40 million ounces of silver. Exploration by CEGB in mid-1980s was based on a concept developed from observations on the geological setting of the vein-type deposits in this mining district. The veins are localized at the margins of quartz monzonite intrusions in the volcanic rocks, and the intrusions are characterized by strong albitic alteration and magnetite-apatite-actinolite veins along their margins, and by high magnetic signatures on aeromagnetic maps published by the Geological Survey of Canada. Application of these exploration guides beyond the Echo Bay-Camsell River mining district led to the discovery of the Damp prospect in the volcanic rocks near a quartz monzonite intrusion.

The mineralized zone of the Damp prospect, however, differs from the fault-controlled veins of the mining district fundamentally in that it is a breccia with fragments of rhyodacite ignimbrite and a matrix of hematite and magnetite that contains unevenly distributed chalcopyrite, bornite, uraninite, nickel-cobalt sulpharsenides and traces of gold. Trenching and drilling totalling 1200 m in 10 holes, carried out by CEGB during 1986-'87, outlined a steeply dipping breccia zone 200 m long, up to 30 m wide and extending to a depth of 60 m. The average contents of metals in the breccia zone are subeconomic, although locally some high grade metal concentrations are encountered. The primary objective of CEGB exploration was to find a secure supply of uranium for their reactors in Great Britain, and although some high grade veins of uraninite were found in the Damp breccia zone and in the area to the east, the decline of uranium price in late 1980s curtailed further exploration by the company.

Metallogenic significance of the Damp prospect became apparent only after the researches conducted by the writer for the Geological Survey of Canada in the southern part of the Great Bear magmatic zone during 1987-'96. This work revealed that the breccia zones of the Sue-Dianne, Mar and Fab prospects in the south and the Damp prospect in the north, are comparable in terms of textural and mineralogical features and tectonic setting with the breccias of giant Olympic Dam polymetallic deposits and other prospects, e.g. Acropolis, Oak Dam and Wirdda Well deposits, in the 1600 Ma old Gawler Range magmatic zone of South Australia. In contrast, the classical vein-type deposits of the Echo Bay-Camsell River district are some 500 million years younger than the host rocks, based on their field relations and isotopic data, and contain relatively little iron oxide.

The new metallogenic insights were enhanced by an airborne spectrometric, magnetic and VLF-EM survey of a selected part of the southern Great Bear magmatic zone, released by the Geological Survey of Canada in 1994. This work prompted intensive exploration that led to the discovery of the Lou Lake Au-Cu-Co-Bi-As deposit. It has drill indicated resources of more than 50 million tonnes that are amenable to open pit mining. It is located at the unconformity of the Great Bear volcanic rocks with the underlying magnetite-rich metasedimentary rocks. This system is related to the Great Bear magmatic activity, and it has been interpreted by the writer as a variant of the Olympic Dam-type mineralizing system.

The Damp prospect is an unequivocal example of the Olympic Damp-type breccia zone in the northern part of the Great Bear magmatic zone, and provides a sound basis to explore for larger deposits of this type in the region. It is for this reason the Longtom property, including the Damp prospect, was acquired by Mongolia Gold Resources Ltd. (MGRL) in 1996. The project area is favourable for a variety of other mineral deposits as well. The company carried out a detailed airborne magnetic, EM and spectrometer survey over the property, and also mapping, prospecting and resampling of trenches at the Damp mineralized breccia zone, and some diamond drilling totalling 946.6 m in 4 holes. The airborne survey has defined strong magnetic anomalies in addition to the one at the Damp prospect, at or near the boundary of volcanic rocks and quartz monzonite intrusions. These are excellent exploration targets. The drilling extended the Damp mineralized zone to 150 m level. The zone is open at depth. Prospecting and trenching in area 10 km south of the Damp prospect enhanced the potential of the previously known magnetite-arsenopyrite veins that carry notable amounts of gold and copper.

Exploration by CEGB and MGRL has provided a sound database and several excellent targets, which call for an aggressive exploration program. An initial program recommended includes ground follow-up of the airborne geophysical anomalies, coupled with prospecting, line cutting and detailed mapping of the volcanic belt in the area 10 km south of the Damp prospect, and trenching and diamond drilling of selected targets. The estimated cost of the proposed program is $ 240,000. This should be followed by induced polarization survey of the Damp grid and the new grid in the south, and also gravity survey of selected parts of the property, and additional drilling.

UNRAVELLING THE TRUE POTENTIAL OF THE DISCOVERY GOLD MINE PROJECT GMD RESOURCE CORP.

The Discovery Gold Mine Project is located in the northern part of the highly productive Yellowknife goldbelt approximately 90 kilometers north of Yellowknife, Northwest Territories. The original Discovery Mine was discovered in 1944 along the western shore of Giauque Lake. The mine is at the northern end of the Yellowknife greenstone belt and is part of a string of mines that represent the Yellowknife mining camp. By 1965 a 4,060 foot shaft had been sunk and mill capacity reached 250 tons per day. The mine operated for 20 years and produced 1.02 million ounces of gold from 1 million tons of ore.

In 1995, the mine was estimated to host a probably reserve of 224,909 tons grading 1.31 ounces of gold per ton (uncut) a figure based on original mine plans combined with drilling by GMD. Further possible reserves were estimated at 1.3 million tons grading 0.8 ounce of gold per ton (Goad/Webb 1995).

Over 10 million dollars has been expended on the property over the past two years resulting in 170,000 feet of definition and exploration diamond drilling and 450 feet of underground and subdrifting within the Ormsby Zone.

As a result of this work, a zone extending southward from the past producing Discovery Mine site for a distance of 8,600 feet and approximately 200 feet in width. Within this trend of mineralization two zones have been defined called the Discovery and Ormsby Zones.

The majority of the 1997 work has been confined to the southern part of the Ormsby Zone where approximately 70,000 feet of infill and definition drilling has been concentrated over an area 3,000 feet in length, 300 feet in width and to a depth of 1,500 feet.

The 1996 drilling within this area defined a resource of 26 million tons grading 0.17 ounces per ton gold (Webb, D.R. 1996).

The 1997 detailed drilling over this zone has resulted in a new reserve-resource figure estimate (to be announced). Also as part of GMD's due diligence, underground development has confirmed drill indicated grades and widths and established continuity between the two.

At present the company's management has set a mandate to evaluate the potential of the Ormsby area and look at the overall potential of the 8,600 foot mineralized trend. The ultimate goal as with all companies, is to bring the property into production.

DIAMOND EXPLORATION OF THE ROYCE GROUP

GMD Resource Corp.

GMD Resource Corp. has control over a contiguous group of claims known as the Royce Group. These claims are located some 130 km northwest of Yellowknife, NWT . The claims fall within NTS map sheet 85-O and cover ground on NTS 1:50 000 sheets 85-O/2,3,5,6,7,10,11,12,13 and 14. The Royce Group of claims is situated within the tectonically stable, Archaean Slave Structural Province. In-house glacial studies of the area have indicated multiple ice flow directions with the final phase of ice movement being from the northeast to the southwest.

In an attempt to assess the diamond potential of these claims and define possible kimberlite drill targets, sediment sampling programs have been carried out in the summers of 1995, 1996 and 1997. An airborne geophysical survey of the area was flown in May 1995. The interpretation of the geophysical data resulted in the definition of 19 potential kimberlite targets.

The 1995 sampling program yielded significant numbers of kimberlitic indicators, particularly peridotitic garnet. Electron microprobe analysis of the kimberlitic indicators showed that a number of high interest subcalcic (G-10) garnets were present in the samples. The presence of these subcalcic garnets indicates that, not only is there the possibility of finding kimberlites in this area, but that the kimberlites have the potential to be diamondiferous. These positive 1995 results prompted the acquisition of additional claims in the area and regional follow-up sampling in the summer of 1996. The 1996 results have confirmed and augmented the significant kimberlitic indicator mineral recoveries of 1995. The 1996 results suggest that there may be a number of high interest, indicator mineral dispersion trains which terminate within the Royce Group of claims.

The 1085 samples, collected during the 1997 sampling program, have been dispatched to Overburden Drilling Management Ltd. for concentrate production and kimberlitic indicator mineral recovery. Processing of backlogged 1996 samples has been completed and interim 1996 results received from Overburden Drilling have highlighted an area of significantly high indicator mineral counts. Twelve samples from this area have each produced in excess of 10 kimberlitic indicators, of which three samples have produced 28, 21 and 20 indicators, respectively. These samples represent the finest indicator recoveries received to date and are located in close proximity to a magnetic low defined from an airborne geophysical survey. These results were received in time to carry out close-interval, follow-up till sampling of this significant area as part of the 1997 sampling program. Priority processing has enabled Overburden Drilling to complete the treatment of many of these 1997 follow-up samples. Initial results just received suggest that this high interest glacial dispersion train terminates within the Royce Group of claims.

Detailed helicopter-borne and ground geophysical surveys will be carried out over geophysical and mineral targets in preparation for drilling before the end of the year.

NORMIN.DB: DIAND'S COMPREHENSIVE RELATIONAL DATABASE OF MINERAL SHOWINGS IN THE NORTHWEST TERRITORIES, WITH INTEGRATED GIS COMPONENTS

Gochnauer, K., and Sage, B., DIAND NWT Geology Division

NORMIN.DB was developed through collaborative efforts of DIAND NWT Geology Division and GDS & Associates Systems Ltd. It evolved from the data model, code tables and data of the unreleased NT MINFILE system, developed under the 1992-1996 Mineral Initiatives Agreement between DIAND NWT Geology Division and GNWT Resources Wildlife and Economic Development.

NORMIN development began in April, 1997 when GDS & Associates Systems Ltd. were awarded the contract by DIAND. At this time, GDS initiated a consultation process for rapid application development based on DIAND's business rules. As a result, a working system was generated within six months. Frequent consultation between the NORMIN and GDS teams ensured that problems which arose from this process were identified and solved. Redesign of portions of the data model to improve functionality required code table restructuring and new table development. The final system comprises:

- the NORMIN database, a data entry system, a code table maintenance utility, a query tool, and a reporting utility, developed in Oracle;
- an ArcView GIS application which allows querying of all of DIAND's spatial data including NORMIN, and allows graphical presentation and analysis of the data as well as map output; and
- a Web application which allows querying of NORMIN and basic GIS manipulation of DIAND's spatial data, created using PowerBuilder and MapObjects.

Data warehouses hold subsets of NORMIN's data for quicker access via ArcView and the Web application.

NORMIN stores and displays geological information about mineral showings, as well as exploration and research data. References can be linked to one or many showings; additionally, specific information within a reference (for example a sample result) can be linked to a specific showing. With the development of NORMIN, DIAND NWT continues to move rapidly toward complete digitization and integration of all their spatial datasets which include geology maps (EGS Open Files), topographic data (SIDS), land use and mineral claims data (LIMS) and environmental data (CALYX).

NORMIN and other spatial data on DIAND servers can be accessed through a client computer in the Geology Archives, and through DIAND's Home Page on an Extranet site currently under development. Users will be able to query attribute or spatial data and download or print summary reports. Geology Division staff can provide Master reports, which contain detailed data for a showing, and design customized searches of the database for clients. DIAND will be able to use the ArcView component to compile maps from any or all of their datasets; a simple example is a map of colour-coded mineral showings overlying a geological base.

Data conversion procedures allowed most of the data from NT MINFILE's 2800 showings to be re-captured in NORMIN. However, it became apparent during data checking that there were some errors in this data, possibly due to previous NT MINFILE data conversions. Data cleansing will be concurrent with data entry. The latter will focus on diamond showings and significant deposits. Further entries will likely be prioritized by area. A concentrated effort is required to enter the 15,000 showings conservatively estimated to exist in the Northwest Territories, within a reasonable timespan. It is understood that database value will increase in proportion to the completeness of its coverage.

NORMIN is a dynamic application, and continues to evolve. Even now, a system is in place to record desired changes and improvements for Release 2. Additional programming, enhanced code tables, and fixes to unexpected ORACLE limitations will also be dealt with then. Further development of NORMIN will include more sophisticated queries, hierarchical lists of mineral and rock varieties and groups to improve searching on those fields, and tables of lithotectonic units linked to geological province to enable capture of more complete tectonic setting data. Rapid improvements in technology will allow Web users to access more data and perform more complex spatial analyses.

We encourage you to visit our display to see NORMIN.DB, and invite your comments.

STRUCTURAL STUDIES OF THE PROSPEROUS GRANITE SUITE: SYN-D2 LACCOLITHS IN THE SOUTHERN YELLOWKNIFE DOMAIN

Ham, N.M. and Benn, K., Ottawa-Carleton Geoscience Centre and Department of Geology, University of Ottawa,
Bleeker, W., Geological Survey of Canada

The Prosperous Suite of granites is a regionally extensive plutonic assemblage outcropping within cordierite- and andalusite-bearing metasedimentary rocks of the Yellowknife Domain. The Prosperous Suite is a key element in the regional Late Archean tectono-magmatic evolution of the Yellowknife Domain. It has been suggested that emplacement of the voluminous granites occurred during large-scale dextral transpressional deformation (D2) following or late during the accretion of arc terranes, microplates of sialic crust and their cover sequences at ca. 2600 Ma (Bleeker and Beaumont-Smith, 1995). Bleeker et al. (1997) suggested that the widespread D2 event reflects the far-field effects of a collision at the periphery of the growing Slave craton. A two year project involving structural and fabric analyses of Prosperous suite granites was undertaken as part of a wide ranging study designed to establish the precise relationships between plutonism and tectonics in the Yellowknife Domain.

The work focused mainly on mapping the pervasive magmatic structures in the Sparrow and Prosperous plutons (ca. 2596 Ma) using measurements of the low-field magnetic susceptibility (K) and the anisotropy of magnetic susceptibility (AMS, Borradaile and Henry, 1997; Bouchez, 1997). K and the AMS are dominated by biotite, with contributions from chlorite (pseudomorphically replacing biotite), and locally from tourmaline and secondary magnetite. K is a function of the abundance of iron, concentrated in the Fe-silicates, and can be used to map petrological variations (Gleizes et al., 1993). The orientations of the principal axes of the AMS ellipsoid are controlled mainly by the lattice (and therefore the shape) preferred orientations of the biotite and chlorite crystals. In the Prosperous Suite, the degree of anisotropy (P'=K1/K3) can be used to roughly estimate of the relative strength of the petrofabric. The homogeneous composition and fabrics of the granites at the outcrop scale as well as the tight sampling grid (68 sites in the Sparrow Pluton, 81 sites in the Propserous Pluton) allow definition of consistent magmatic structural patterns that can be related to D2 transpression. Microstructural analysis shows that only a very minor subsolidus deformation was superimposed on the magmatic fabrics.

The northern part of the Sparrow Pluton has a roughly rectangular shape, and the southern part is an elongate "tail" that has apparently been deflected during D2. The magnetic foliation strikes NNW-SSE in the north, and swings to NW-SE in the tail, consistent with S2 trajectories in the country rocks and with the pluton shape. The foliation poles define a girdle in the northern part, and steeply to moderately NE-dipping foliations predominate in the tail. The magnetic lineations plunge shallowly showing the same progressive deflection from NNW-SSE to NW-SE in the tail. The map of K magnitudes reveals a petrological layering corresponding to variations in the abundance Fe concentrated in the phyllosilicates. The layering defines a fold pattern consistent with the regional D2 strain field. Stronger magnetic anisotropies occur along the central axis of the pluton, suggesting that tectonic strain was concentrated in the magma that crystallized latest. The magnetic fabric data and microstructures are consistent with the Sparrow Pluton having undergone a pervasive tectonic deformation as it crystallized during the main D2 regional event.

The Prosperous Pluton has an elongate NNW-SSE rectangular shape, with a smaller lobe at its SE corner. Field observations of the exposed floor and roof contacts of the pluton suggest it has a tabular shape, approximately 2 km thick and dipping shallowly eastward. The magnetic foliations strike NNW-SSE, parallel to the regional fabrics, though shallowly dipping foliations are common and strike more E-W. This suggests D2 deformation of an initially horizontal foliation that formed during pluton emplacement. The magnetic lineations are consistently NNW-SSE trending and generally shallowly plunging. In contrast to the Sparrow Pluton, the map of K values does not show a clear pattern of petrological layering, possibly due to the map section being parallel to the shallowly dipping tabular pluton. However, magmatic layering has been observed at the outcrop scale. The highest anistropies tend to be concentrated along the central axis, like in the Sparrow Pluton, though P' values are in commonly higher in the Properous Pluton.

The results are of interest from both the regional tectonic and thematic standpoints. They show that the magmatic structural patterns in the Sparrow and Prosperous Plutons are an integral part of the regional strain field, and demonstrate syn-D2 emplacement. Hence, new isotopic dates of the Prosperous Suite may be used to establish the precise age of this tectonic event in the southern Slave Province (Davis and Bleeker, this volume). The fabrics documented using the AMS are compatible with transpressional syn-emplacement tectonics, with both the X and Z axes of the bulk regional D2 finite strain ellipsoid lying in the horizontal plane.

The horizontal maximum principal stretch is inferred from the magnetic lineations in the plutons, and, in the absence of regional extension lineations, they provide the best indicators of the strong horizontal stretching during transpression. The magmatic structural patterns inferred from the magnetic data are consistent with a laccolithic emplacement model, suggesting the presence of horizontal crustal discontinuties that might be imaged on Lithoprobe seismic-reflection profiles. The value of the AMS method is highlighted since little of the magmatic structure in the plutons could be mapped by conventional techniques.

Bleeker, W. and Beaumont-Smith, C. (1995) Thematic structural studies in the Slave Province: preliminary results and implications for the Yellowknife Domain, Northwest Territories. In: Current Research 1995-C, pp. 87-96.

Bleeker, W., Villeneuve, M. and Bethune, K. (1997) Thematic structural studies in the Slave Province, Northwest Territories: contrasting basement/cover relationships on the western and southwestern flanks of the Sleepy Dragon Complex. In: Current Research 1996-C, , pp. 27-37.

Borradaile, G. J. and Henry, B. (1997) Tectonic applications of magnetic susceptibility and its anisotropy. Earth-Science Reviews 42, 49-93.

Bouchez, J. L. (1997) Granite is never isotropic: an introduction to AMS studies of granitic rocks. In: Granite: from segregation of melt to emplacement fabrics, eds Bouchez, J. L., Hutton, D. H. W. and Stephens, W. E., pp. 95-112. Kluwer Academic Publishers, Dordrecht.

Gleizes, G., Nédélec, A., Bouchez, J. L., Autran, A. and Rochette, P. (1993) Magnetic susceptibility of the Mont-Louis Andorra ilmenite-type granite (Pyrenees): a new tool for the petrographic characterization and regional mapping of zoned granite plutons. Journal of Geophysical Research 98, 4317-4331.

NEW FIELDWORK IN THE HENINGA-KAMINAK-QUARTZITE LAKES AREA, KIVALLIQ REGION, NORTHWEST TERRITORIES

S. Hanmer, T.D. Peterson, R.H. Rainbird, H.A. Sandeman, and J.J. Ryan
Geological Survey of Canada

The Geological Survey of Canada is a participant in the Western Churchill NATMAP program. A new fieldwork program was initiated in 1997 to better understand the tectonostratigraphy and evolution of the late Archean Kaminak Group rocks of the Kaminak greenstone belt, paying particular attention to the potential for Paleoproterozoic reworking. Fieldwork was divided between new mapping to the south and west of Kaminak Lake, and upgrading the geoscience knowledge base in the recently mapped Kaminak-Quartzite Lakes area, as well as the Mackenzie Lake area. The Kaminak Group comprises mafic to intermediate pillow lavas, massive flows and volcaniclastic rocks, associated with volumetrically subordinate dacites and rhyolites. Between Kaminak and Quartzite Lakes, voluminous quartz porphyry acted as the source of clasts shed into proximal volcanic breccias, which are then cut, apparently by the same quartz porphyry. Unfortunately, such clear field relationships are not widespread. Rather, the discontinuous nature of map units in the Kaminak Group does not allow elaboration of a robust stratigraphy based upon field observation alone. Evaluation of previously published stratigraphic models, and discrimination between single and multiple volcanic cycles, must therefore await petrological and geochronological studies currently underway. Nevertheless, we note the abundance of intermediate to felsic lithologies, and the high proportion of volcaniclastic rocks, much of which may represent subaqueous reworking of material eroded from a volcanic edifice.

Very coarse volcanic breccias and conglomerates, likely debris flows, are widespread and voluminous, occurring from Heninga to Quartzite Lakes. These observations suggest that parts of the Kaminak Group contains the remnants of a magmatic arc, rather than an oceanic plateau as previously proposed.

North of Kaminak Lake, an intact unconformity and possible regolith are found at the base of the Paleoproterozoic Hurwitz Group. By extrapolation, the unconformity truncates the map-scale form surfaces representing the vertical, layer-parallel, regional foliation and its steeply pitching extension lineation which characterise the Archean basement. Within the volcanic rocks of the Kaminak Group, structurally controlled, localised mineralised zones, associated with dextral shear, carry similar foliations and lineations; there is no evidence that they represent Paleoproterozoic structures. However, chlorite alteration and narrow (cm-scale) shear zones are developed in plutonic rocks just north of the Hurwitz Group at Kaminak Lake, and similar alteration associated with extensive quartz veining adjacent to the Hurwitz Group at Kinga Lake. These features represent Paleoproterozoic reworking of the Archean basement.

The enigmatic Mackenzie Lake sediments, ca. 30 km northwest of Kaminak Lake, comprise two distinct lithological associations. Quartzites, quartz pebble conglomerates, arkosic arenites and granitoid pebble conglomerates are deformed by upright first phase folds. However, these folds deform homogeneous semipelites with minor pelite, quartz arenite and quartzite, as well as their layer-parallel schistosity. Prior to folding, bedding and cleavage were subhorizontal. These latter rocks were included as part of the Mackenzie Lake sediments in previous mapping, but we suggest that the "Mackenzie Lake sediments" may comprise a basement and its cover sequence. The older semipelite-quartzite association is similar to the clastic sediments of the Kaminak Group nearer to Kaminak Lake and is potentially Archean in age. It also resembles garnet-staurolite-kyanite metasediments north of Happotiyik Lake, whose age has been variously identified as Archean, Paleoproterozoic, or uncertain, by earlier workers. The younger quartzite-conglomerate association may be correlative with the Hurwitz Group, or with the potentially late Archean (or earliest Paleoproterozoic) Spi Lake Group. In either case, the upright folding would be Paleoproterozoic in age. These possibilities will be evaluated by U-Pb geochronology.

NATMAP
STRUCTURE AND ALTERATION HISTORY OF THE TURQUETIL GOLD PROSPECT, KIVALLIQ REGION, NORTHWEST TERRITORIES.

S. Hanmer and H.A. Sandeman, Geological Survey of Canada

The Turquetil gold prospect, exposed west of Turquetil Lake, was identified by Ridler and Shilts (1974) as a stratabound exhalative deposit of "Larder Lake" type developed in the Archean Kaminak Group. New field observations suggest that it is a structurally controlled zone of alteration (carbonatisation and sericitisation), superimposed on silicified volcanic and volcaniclastic rocks.

The ca 500 m wide alteration zone can be traced along the east side of a 3 km thick panel of mafic to intermediate pillow lavas for a distance of at least 12 kilometres. The pillow lavas carry the regionally developed, layer-parallel, vertically dipping S1 cleavage and steeply plunging L1 extension lineation which characterise the Kaminak greenstone belt. Silicification of the pillow lavas is variable adjacent to the main alteration zone, and is spatially associated with heterogeneous folding of S1 cleavage and the emplacement of quartz and quartz-epidote veins.

SILICIFICATION: Silicification is pervasive in volcaniclastic rocks, apparently of intermediate composition. The development of a strong, vertical cleavage with a steeply pitching extension lineation in the silicified rocks indicates that silicification occurred prior to deformation.

CARBONATISATION: Structural control of carbonate replacement in massive volcanic and volcaniclastic rocks began by fluid infiltration along a network of penetrative, macroscopically non-dilated fractures. Progressive replacement can be traced into massive, featureless, fine grained brown carbonate, with a few isolated volcanic relics. Where massive carbonate replaces cleaved volcanic rocks, the alteration is clearly later than most of the cleavage forming event. However, in places, the main mass of carbonate may be cut by folded carbonate veins.

SERICITISATION: Sericitisation is localised in narrow, regularly spaced (5-10 cm), foliation-parallel bands. Progressive sericitisation is inferred to have initiated by fluid infiltration and replacement along macroscopically closed, anastomosing fractures. Replacement of the wallrock adjacent to the fractures produces sericite rich bands, up to 5 mm thick, whose geometry reflects that of the initial fracture array. Within the sericite bands, a penetrative sericite-quartz? foliation is developed. In all cases, the sericite foliation is internal to the bands, and makes a uniform, anticlockwise angle (10-15o) with their boundaries. An extension lineation marked by sericite-quartz? aggregates and elongate chlorite grains is steeply pitching to vertically plunging. These observations imply that the sericite alteration is localised by initial fracturing, and subsequently deformed by dextral shear. However, displacements along both the initial fractures and the evolved sericite bands must be minimal in order to avoid dilation and brecciation in the former, and to preserve the internal obliquity of the foliation in the latter.

QUARTZ VEINS: Carbonate lithons between sericite bands are cut by steeply dipping quartz veinlets (<1 mm thick) which do not themselves cut the sericite bands, suggesting that the two are contemporaneous. Although the horizontal extension implied by the quartz veinlets is perpendicular to the steeply plunging sericite-quartz? extension lineation, late decimetre-scale quartz veins cut across the sericite bands, and are perpendicular to the lineation. These observations suggest that switching of the 'X' and 'Y' principal stretching axes occurred during the later stages of deformation.

BEDROCK GEOLOGY AND RESOURCE POTENTIAL OF BATHURST ISLAND, (NUNAVUT) NORTHWEST TERRITORIES.

Harrison, J.C., de Freitas, T., and Brent, T.A. Geological Survey of Canada

New bedrock geology maps (4 sheets, scale 1:125,000) are presently being completed by the Geological Survey of Canada for the Bathurst Island region, central Arctic Islands. This work was initiated in order to upgrade the old 1:250,000 scale map (GSC Map 1350A) and report of Kerr (1974), and to incorporate data from well and seismic reflection profiles as acquired by the petroleum industry up to the mid-1980's. Results, intended to promote resource exploration, will also be incorporated into a Mineral and Energy Resource Assessment (MERA) for a proposed National Park covering the northern half of the region. Preliminary data, arising from field work undertaken 1992 to 1996, highlight stratigraphic revisions for the exposed Ordovician to Tertiary succession and new insight into the structural style provided by the intersection of the thin-skinned Parry Islands Fold Belt with the shield-involved Boothia Uplift and its mobile cover (de Freitas et al., 1993; Harrison et al, 1993) .

Seismic profiles reveal a sedimentary succession, 8 to 10 kilometres thick, lying above a regional angular unconformity that is assumed to mark the base of the Lower Cambrian. The upper part of this succession, known from wells and surface exposure, includes Lower to Middle Ordovician outer shelf evaporites (highly ductile and locally diapiric) and Middle to Upper Ordovician shallow water carbonates. Equally extensive through the report area are overlying graptolitic shales and basin facies carbonates that include organic-rich facies in the Upper Ordovician and Lower Silurian. Readily mappable shelf to basin transitions are known throughout eastern Bathurst Island in the Lower Devonian. The basinal shales include important petroleum source rock intervals in the Pragian and Emsian. Migrated hydrocarbons occur in age-equivalent carbonate reservoir rocks that underlie the eastern half of the island. At the top of the lower Paleozoic succession on Bathurst Island are five Middle and Upper Devonian formations with numerous locally mappable members which together represent a small part of an extensive foreland clastic wedge, later partly unroofed during the Ellesmerian Orogeny (latest Devonian-Early Carboniferous).

The salt-based Parry Islands Fold Belt, currently expressed in exposed Upper Devonian and older strata, features southwesterly- plunging, evenly spaced synclines and complexly faulted anticlines. Scattered outliers of mid-Carboniferous redbed sandstone and conglomerate are associated with a phase of syndepositional, extension and the development of embryonic Sverdrup Basin half grabens. Each graben is preferentially situated above an older anticline and the bounding normal faults are continuous with underlying anticline-associated thrusts. In addition, modest compressive slip reactivation of some of the mid-Paleozoic normal faults probably occurred in the early Tertiary

The surface expression of Boothia Uplift on eastern Bathurst Island includes northerly-trending thrust folds and other faults of uncertain attitude developed in Ordovician through Upper Devonian and some unconformable Upper Cretaceous strata. Intersection with the Parry Islands Fold Belt has produced numerous interference structures, some yet to be tested. The earlier history of Boothia Uplift on Bathurst Island is provided by a depositional record of source-proximal sedimentation between the mid-Silurian (Ludlow) and the end of the Lower Devonian (Emsian). Highlights of uplift include carbonate megabreccias and olistostromes, chert and carbonate conglomerate alluvial fans, and age-equivalent deep water conglomerates. Structural evidence points to at least one, probably protracted, phase of folding during the Early Devonian, and additional phases in the latest Devonian-Early Carboniferous, and ?Tertiary. Mid-Eocene alkaline igneous activity in the Freemans Cove region of southeastern Bathurst Island features breccia diatremes and numerous sills, dykes and plugs of gabbro, subvolcanic and locally extrusive basanite, nephelinite and phonolite (Mitchell and Platt, 1984). Implied extension at this time is exactly coincident with plate spreading in the Baffin Bay-Labrador Sea region, and compressive deformation associated with the Eurekan Orogeny evident throughout the northern Arctic Islands.

Significant occurrences of carbonate-hosted sphalerite and galena were discovered and reported by Harrison and de Freitas (1996) from Lower Devonian (Emsian) dolostones of the lower Blue Fiord Formation of southeastern Bathurst Island. Bitumen, hydrothermal dolomite, calcite spar and marcasite(?) are important accessory components near and within the showings. Exploration potential for Mississippi Valley-type lead-zinc deposits exists within this interval and at other stratigraphic levels both locally and throughout the central and eastern Arctic Islands (de Freitas et al., 1997). Other potential targets on Bathurst Island include epigenetic vein and sedimentary-exhalative lead-zinc deposits in lower Paleozoic graptolitic shales, redbed-hosted copper in upper Paleozoic strata, and kimberlites.

Exploration potential for hydrocarbons exists within numerous untested anticlinal closures located both onshore within the report area and in the offshore to the south. Good discoveries of petroleum are to be expected in regions of more moderate thermal maturity within Boothia Uplift. Conceptual plays in this area include unconformity-sealed, Upper Silurian and Lower Devonian reservoir sands and carbonates, and spatially associated structural traps. Thin coal beds are known in the Upper Devonian but are not economically significant.

REFERENCES:

de Freitas, T., Harrison, J.C. and Thorsteinsson, R.,

1993: New field observations on the geology of Bathurst Island, Arctic Canada: Part A, stratigraphy and sedimentology of the Phanerozoic succession. Geological Survey of Canada, Paper 93-1B, p. 1-10.

de Freitas, T., Harrison, J.C. and Mayr, U.

1997. Sequence stratigraphic correlation charts of the lower Paleozoic Franklinian succession, Canadian Arctic and parts of North Greenland. Geological Survey of Canada, Open File 3410, 3 charts.

Harrison, J.C., de Freitas, T. and Thorsteinsson, R.

1993: New field observations on the geology of Bathurst Island, Arctic Canada: Part B, structure and tectonic history. Geological Survey of Canada, Paper 93-1B, p. 11-21

Harrison, J.C. and de Freitas,T.

1996: New showings and new settings for mineral exploration in the Arctic Islands. Geological Survey of Canada, Current Research 1996-B, p. 81-91.

Kerr, J.Wm.

1974: Geology of Bathurst Island Group and Byam Martin Island, Arctic Canada. Geological Survey of Canada, Memoir 378, 152 p.

Mitchell, R.H. and Platt, R.G.

1984: The Freemans Cove volcanic suite: field relations, petrochemistry, and tectonic setting of nephelinite-basanite volcanism associated with rifting in the Canadian Arctic Archipelago. Canadian Journal of Earth Sciences, vol.20, p.428-436.

GEOLOGY AND MINERAL POTENTIAL OF THE SOUTHEAST YATHKYED LAKE AREA (PARTS OF NTS 65 I/3, 4, 5, 6, 7, 10 & 11), WESTERN CHURCHILL PROVINCE

Doug Irwin[1], Carolyn Relf[2] and Andrea Mills[1]

1 Resources, Wildlife and Economic Development, GNWT

2 NWT Geology Division, DIAND

During the 1997 field season, 1:50,000-scale mapping was carried out in the northeastern part of the Yathkyed Lake greenstone belt, approximately 300 kilometres west-southwest of Rankin Inlet. The mapping project is part of a multi-year project initiated by Relf et al. (1997; GSC Paper 97-1C) to better understand the geology of the Yathkyed Lake greenstone belt, determine the area's mineral potential, and test whether the rocks comprising the Yathkyed belt are contiguous with those of the western Kaminak greenstone belt. The project is a contribution to the Western Churchill NATMAP Program, and is being supported by collaborative geochemical, geochronological and thermobarometric studies by the Geological Survey of Canada. This abstract describes the geology of the map area and summarizes assay results; some of the geological highlights and their regional tectonic implications are presented in Relf et al. (this volume).

Archean volcanic rocks of the Yathkyed belt consist mainly of massive and pillowed mafic flows, with subordinate intermediate to mafic volcaniclastic beds and rare felsic volcanic rocks. In the northern part of the map area, the volcanic package comprises fragmental volcaniclastic rocks with felsic to intermediate clasts up to 10 cm, thinly bedded mafic volcaniclastic rocks (tuffs?), minor volcanogenic polymictic conglomerate, and fuchsitic felsic tuffs. Younging indicators are restricted to the southeastern part of the map area, at and below the hornblende isograd, and consistently indicate southeastward younging. Sedimentary rocks, consisting of psammites and semipelites to pelites, stratigraphically overlie the volcanic rocks along the southeastern side of the belt.

Several phases of granitoids intrude the study area. They range from tonalitic orthogneiss to two-mica granites, and have been subdivided into five map units. The oldest unit is a strongly foliated to gneissic biotite tonalite to granodiorite which commonly contains enclaves of amphibolite and metasedimentary rocks. The second unit, informally named the Komatik granite, is a pink, massive to moderately foliated biotite monzogranite. In the east part of the map area, it forms discrete plutons, whereas in the west, it intrudes the tonalite and high grade rocks along their foliation, imparting a gneissic appearance to the rock. Post-Komatik granitoids include a leucocratic, two-mica syeno- to monzogranite with accessory garnet and/or tourmaline; and a monzogranite that lacks muscovite and accessory minerals, but is otherwise similar to the two-mica granite. Both units are intimately mixed with the metasedimentary rocks, and the former is interpreted as a product of partial melting of the sediments. Two granitoid plutons postdate the main Archean fabric: a massive to very weakly foliated, K-spar megacrystic biotite granite, and a massive, Kspar-megacrystic to pegmatitic hornblende ± biotite syenite. The latter is cut by a plagioclase porphyritic diabase, tentatively correlated to the ca. 2.19 Ga Tulemalu swarm (LeCheminant and Heaman, 1997; GAC Abstract).

Sedimentary rocks of the Hurwitz Group unconformably overlie Archean rocks in the southern part of the map area. These sediments were correlated with the Watterson and Tavani Formations by Eade (1985; GSC Map 1064A), and include quartz-rich subarkose, calc-silicate schist, minor dolostone and quartz pebble conglomerate.

Rocks in the Yathkyed Lake area preserve evidence for a complex Archean deformation history. Bedding and an early bedding-parallel foliation dip moderately to steeply northwest, and are folded about upright shallowly northeast-plunging folds. The southeastern margin of the greenstone belt is bounded by a zone of mylonites informally named the Tyrrell shear zone. Rotated porphyroblasts, shear bands and C-S fabric preserve evidence for early, reverse displacement, followed by oblique (normal) dextral shearing. In the northern part of the map area, two poorly-exposed faults striking west-northwest truncate bedding and foliation. A displaced contact across the northernmost fault records a component of dextral displacement.

Metamorphic grade ranges from greenschist facies in the southeast to upper amphibolite facies in the west and northwest parts of the map area. Greenschist facies rocks are distinguished by chlorite in mafic volcanic rocks and biotite in sedimentary rocks. Amphibolite grade mafic rocks are characterized by the assemblages hornblende + plagioclase + garnet and hornblende + plagioclase + epidote + garnet. At one locality, the occurrence of orthopyroxene suggests uppermost amphibolite to granulite facies conditions.

In the northwestern part of the study area, metasedimentary rocks contain the assemblages biotite + garnet + cordierite, biotite + garnet + sillimanite, and biotite + garnet + sillimanite + cordierite. They are injected by foliation-parallel veins of biotite tonalite, Komatik granite and/or two-mica granite. The psammites and pelites also occur as metre-scale enclaves within the foliated to gneissic tonalite and Komatik granite.

The mineral potential of the map area is largely unknown, although settings favourable to a range of deposit types (iron formations, volcanic-hosted stratabound gossans, and vuggy, pyrite rich quartz veins) are present. From a total of 75 samples submitted for assay, 25 samples yielded anomalous concentrations of gold (>100ppb), copper (>500ppm), zinc (>500 ppm) and molybdenum (>500 ppm).

The iron formations, typically less than 5 m thick, are common in the southern half of the map area and are readily identified on regional aeromagnetic maps. Locally, individual silicate-rich beds within the iron formation preserve sulphide overgrowths (pyrite, pyrrhotite) on amphibole. An assay sample of one such bed yielded 1379 ppb Au. In the northern part of the area, volcaniclastic rocks with felsic to intermediate bulk compositions contain several stratabound gossans with significant strike lengths (100's of m). Of particular interest is an occurrence of "dalmatianite", a cordierite-rich altered rock associated with rusty intermediate volcanic rocks. The presence of dalmatianite may indicate unrecognized base metal potential in the area. Assay samples collected from stratabound gossans yielded Cu values up to 0.23% and Zn to 0.44%. Rusty quartz veins, commonly with malachite staining, occur throughout the map area in a variety of host rocks. Where they are hosted by the Komatik granite, they are commonly vuggy and contain up to 20% pyrite. Rusty pyrite + chalcopyrite-bearing quartz veins yielded concentrations up to 868 ppb Au and 0.29% Cu.

It is also interesting to note that a sulphide-bearing siliceous bed within garnet-bearing volcanic rocks, contained As in concentrations greater than 10,000 ppm. As well, a fuchsite-carbonate altered mafic volcanic rock, with no observed sulphides, had elevated values of Cr, Mg, Mn and Ni.

GEOLOGY OF THE LOWER SUPRACRUSTAL SUCCESSION IN THE BELL LAKE AREA, NORTHERN YELLOWKNIFE VOLCANIC BELT

V.A. Jackson, NWT Geology Division, DIAND

The Bell Lake map area is about 45 kilometres north of Yellowknife, along the Yellowknife River System. Mapping, at approximately 1:8,000 scale, during 1996, was concentrated within the amphibolitic rocks that lie west of turbidites of the Burwash Group. In 1997, problematic relationships were re-examined, stratigraphic marker units were traced south towards the Yellowknife Volcanic belt (YKVB) and the map area was expanded to include some of the overlying turbidites and bounding granitoids. The results from both field seasons are briefly summarized below. Previous work in the area is described by Jackson (1996).

Two major north-striking sinistral-slip faults transect the area. The Hay-Duck fault, a major shear zone along the western shores of Quyta Lake and Sito Lake, juxtaposes amphibolite facies and greenschist facies rocks. A possible splay of the Hay-Duck fault extends from the south end of Quyta Lake to the north end of Nelson Lake, mainly through granitoids, and is referred to herein as the Quyta-Nelson fault. Between the Hay-Duck and Quyta-Nelson faults lies Sito Lake fold, a major, north-younging, vertically-plunging structure (Helmstaedt et al., 1985).

Jackson (1996) refers to the supracrustal rocks lying to the west of the Burwash Formation as the Bell Lake supracrustals and rationalizes that these underlie the Burwash and can be subdivided into a lower, middle and upper sequence. The lower sequence consists of interbedded fuchsitic quartzite, pelite, felsic volcanic rocks and volcaniclastic rocks which are spatially associated with banded iron formation (BIF). Quartzite is locally in contact with a highly strained sericite-chlorite granite to granodiorite that has been interpreted as a basement phase of the Anton Complex, but the nature of the contact remains equivocal. The lower sequence is found mainly along the eastern shores of Bell Lake and Nelson Lake, east of the Quyta-Nelson fault. Remnants of the sequence found within the granitoids south of Bell Lake and west of the Quyta-Nelson fault demonstrate at least 3 kilometres of sinistral-slip displacement along this fault. The lower sequence forms part of the pre-Yellowknife Supergroup, Bell Lake group, which at Dwyer Lake yields circa 2924 - 3719 Ma detrital zircons (Isachsen and Bowring, 1997).

The middle sequence is mainly mafic volcanic rocks that are pervasively intruded by diabase and gabbro, contain numerous quartz phyric felsic sills or flows and are interlayered with minor amounts of pelite, carbonate, garnetiferous intermediate volcaniclastic rocks and BIF. The mafic volcanic rocks comprise massive, pillowed, brecciated, layered or fragmental rocks. Contacts between the mafic volcanics and underlying Bell Lake group and Anton Complex granite commonly are obscured by mafic intrusions, some of which may be feeders to the volcanic sequence. The middle sequence is continuous from Nelson Lake to near the northern part of Quyta Lake. It is discontinuously exposed from northern Quyta Lake to the north end of YKVB at Dwyer lake, but is interpreted as a continuation of the YKVB Kam Group, and referred to herein as Kam Group.

The upper sequence lies in the hinge zone of Sito Lake fold, between Sito Lake and Nelson Lake. It is well stratified, composed mainly of porphyritic felsic volcanic rocks, finely layered, commonly garnetiferous, mafic to felsic volcaniclastic rocks and pelites, pillowed flows and minor BIF, carbonate and calc-silicate rocks. The upper sequence has been intruded by gabbro sills and by a carbonate-talc-magnetite-serpentine ultramafic unit. The contact with the underlying Kam Group is gradational and locally coincides with a laterally continuous garnetiferous pelitic to intermediate volcanic unit, informally referred to as the Mac Tuff, which locally contains BIF. The contact with the overlying Burwash Formation is also transitional. The upper sequence may correlate with either the YKVB Banting Group or the Clan Lake complex (circa 2660-2665 Ma; Isachsen and Bowring, 1997; Mortensen et al., 1991).

From the south end of Sito Lake to the northwestern shore of Quyta Lake, Kam Group mafic volcanic rocks are interlayered with, and structurally overlain by a package of massive to well-layered, locally carbonate-altered, chloritic and sericitic schistose rocks which contain BIF, quartz porphyry, quartz-plagioclase-magnetite dacitic volcaniclastic rocks, plagioclase-phyric intermediate volcanic flows(?), gabbro and minor pillow basalts. These rocks are distinguished from the Kam Group because of the atypical magnetite ± quartz assemblages, but they may incorporate highly strained equivalents of the Kam Group, as indicated on previous DIAND maps.

The predominantly argillaceous rocks of the Walsh Formation and felsic tuffs of the Prosperous Formation continue west of the Hay-Duck fault, along the western shore of Quyta Lake to near the northern termination of the lake. Rocks of both formations are highly strained and are interpreted to be in faulted contact with the Burwash Formation to the east, and perhaps the underlying Kam Group to the west.

Granitoids of the Anton Complex either form probable basement to, or have intruded, the Bell Lake supracrustals. Suspected Anton basement granite is typically sheared and altered against the supracrustals and is crossed by northeast-striking mafic dikes. Dioritic rocks, extending from south of Bell Lake to the Dwyer Lake area, are cut by granitoids that resemble Anton basement granite, as well as mafic dikes and as such may also form a basement to the Bell Lake supracrustals. Younger granitoids are defined partly on the basis of rarely observed cross-cutting relationships as well as the general paucity of mafic dikes.

The area has been extensively explored and is host to numerous gold prospects. Gold is concentrated near or within favourable stratigraphic horizons such as gabbro-sediment contacts (eg. Mon Mine) or iron-rich volcaniclastic and pelitic rocks (eg. Mac Tuff zone). Many gold showings are either shear-zone hosted or related to brittle faults (eg. along the Hay-Duck fault zone). These are associated with sulfide-bearing (arsenopyrite, pyrite, chalcopyrite, pyrrohtite) quartz veins and with silica, carbonate, chlorite or sericite alteration. Numerous, northeast-striking, predominantly dextral-slip faults transect rocks in the hinge zone of Sito Lake fold and are associated with arsenopyrite ± galena-bearing quartz ± carbonate veins containing anomalous gold concentrations. Hay-Duck fault zone is a complex array of intersecting and anastomosing north-northeasterly and northerly striking shears that transect both the Anton basement granite and the supracrustals. Massive, blocky arsenopyrite-bearing veins within locally sheared granitoids near the south end of Quyta Lake yielded anomalous gold concentrations (1000 to 3000 ppb).

Helmstaedt, H., Bell, R., Ellis, C.E., Howson, S., Jackson, V.A. and Relf, C. (1985): Geology of Sito Lake area, 85J/16; DIAND, Geology Division, Yellowknife, EGS 1985-10, 1:10,000 scale map with marginal notes.

Isachsen, C.E. and Bowring, S.A. (1997): The Bell Lake group and Anton Complex: a basement-cover sequence beneath the Archean Yellowknife greenstone belt revealed and implicated in greenstone belt formation; Can. J. Earth Sci., v. 34, p. 169-189.

Jackson, V.A. (1996): Significant results of mapping the Bell Lake supracrustals; in Exploration Overview 1996; DIAND, NWT Geological Mapping Division; p. 3-19 - 3-20.

Mortensen, J.K., Henderson, J.B., Jackson, V.A. and Padgham, W.A. (1991): U- Pb geochronology of Yellowknife Supergroup felsic volcanic rocks in the Russell Lake and Clan Lake areas, southwestern Slave Province, N.W.T.; in Radiogenic Age and Isotopic Studies: Report 5, Geol. Surv. Can., Paper 91-2, p. 1-7.

SURFICIAL GEOLOGY AND IMPLICATIONS FOR DRIFT PROSPECTING, HOPE BAY VOLCANIC BELT AREA, N.W.T.

D.E. Kerr and R.D. Knight
Terrain Sciences Division, Geological Survey of Canada

INTRODUCTION

As an extension to Slave NATMAP, surficial mapping continued during July 1997, focussing on the Hope Bay volcanic belt area in the north half of the Rideout Island and southwest quadrant of the Elu Inlet map sheets, excluding Kent Peninsula (NTS 76 0 and 77 A). In order to provide regional coverage, the area was mapped by helicopter-assisted traversing following interpretation of 1:60 000 scale airphotos. From a total of 169 stations, 95 till samples of 2 kg were collected for trace element geochemistry and grain size determinations. At these 95 sites, 50 pebbles (2 to 6 cm in diameter) were also collected for provenance and glacial transport investigations. Till was collected from hand-dug pits in mudboils at depths of 0.3 to 0.7 m. Where bedrock was exposed, striae were measured and rock type noted.

PRINCIPAL SURFICIAL SEDIMENTS

Till is an important surficial sediment in the map area but it is not easily recognized due to the effects of marine submergence during and following deglaciation, i.e., being covered by marine sediments and/or reworked by marine processes. It consists of a silty to fine sandy matrix-supported diamicton and exhibits low to high compaction. Clasts range in size from small pebbles to large boulders, although medium to large pebbles predominate. Till veneers, generally <2 m thick, are common in rocky, more elevated areas containing extensive bedrock outcrops such as the Buchan and Naujaat Hills. Till veneer is generally loosely compact with high concentrations of cobbles and boulders at the surface. In some areas, much of the fine grained sediment in the matrix was removed by meltwater and wave action, resulting in isolated lag deposits consisting of pebble to boulder-sized clasts <2 m in diameter. Till blankets are generally >2 m thick, forming low to moderate-relief drumlinoid and crag-and-tail features in the west-central and southeast regions.

Glaciofluvial deposits consist of eskers, kames and proglacial outwash. Eskers have a sinuous to linear form and generally trend northwest in the western regions and north northwest to north in the eastern regions. They are rare to absent in the northern half of the map area. Eskers range from small, sinuous ridges a few tens of metres long, to large, more linear features up to 15 km long. Composition ranges from fine sand to cobbles, and may change rapidly over short distances. Glaciofluvial deposits are potential resources for large volumes of granular materials, but some are likely cored by massive ice, and geotechnical investigations should be conducted prior to any development.

Marine sediments are the dominant surficial sediment in the map area. They are extensive along the coastal lowlands of Melville Sound, extending up to 75 km inland in the Koignuk River valley, and commonly occupy low areas in the bedrock topography along the coast of Bathurst Inlet. These sediments occur below marine limit and consist primarily of three types: (1) undifferentiated, massive to well stratified clay and silt which may be overlain by a thin sand layer forming a blanket >2 m and up to 20 m or more thick; (2) a veneer ranging in composition from clay to sand and gravel <2 m in thickness covering extensive regions below marine limit; and (3) coarse sand, pebbles and cobbles of littoral origin (raised beaches) found at various elevations from near marine limit (approximately 220 m) to present sea level.

GLACIAL HISTORY

All glacial features in the study area relate to the Late Wisconsin glaciation. This region became ice-free by about 9000 BP. The oldest reported striae may represent a northwestward ice advance prior to the establishment of the dominant regional patterns, possibly during ice build-up. The succeeding ice movement across the map area may relate to full glacial conditions, as striae on the summit of the Buchan and Naujaat Hills also trend northwestward. The youngest and most prominent westward to north northwestward ice flow indicators likely relate to the last phases prior to and during deglaciation, as shown by the distribution of eskers which generally parallel this ice flow. During deglaciation, the area experienced rapid ice retreat which was simultaneous with the marine incursion across isostatically-depressed terrain. Little evidence exists in this region which can be used to precisely define marine limit elevation, but regional data suggests approximately 220 m, and was formed by 9 ka BP. As sea level dropped to successively lower elevations, numerous beaches were formed. It is believed the region is still experiencing uplift at present.

IMPLICATIONS FOR DRIFT PROSPECTING

Surficial geology mapping and till sampling in the map area provide regional baseline data for drift prospecting and integrated environmental assessment planning. For the purposes of drift prospecting, the surficial geology mapping of marine and till veneers is particularly difficult due to the close physical resemblance which may exist between these two units. Both can take on a wave-washed stony diamicton appearance, and existing sediments may be an end product which retains a geochemical signature indicative of underlying bedrock. The presence of thick fine-grained marine sediments masks much of the underlying till and bedrock. However, as noted by BHP geologists working in the area and by this study, it is possible in some cases to successfully sample till from these areas. Where bedrock protrudes through the marine blankets, a discontinous ring of till can be preserved on the stoss and lee side of some outcrops. Dominant glacial flow directions, corresponding to the last ice movement, range clockwise from west southwestward to north northwestward across the map area, and locally, westward in certain coastal regions. Lithologic studies illustrate that the dominant north northwestward flow over the Hope Bay volcanic belt transported clasts northwestward onto granitic terrain to the west. The highest concentrations (up to 90%) of volcanic clasts are found in areas underlain by volcanic bedrock. However, their numbers remain generally low (20-40%) even over the volcanic belt itself. Concentrations decrease rapidly to <20% to 0% approximately 10 km down-ice from the nearest source outcrops. Granitic clasts are the dominant pebble lithology throught most of the study area, with the majority of sites containing almost 90-100% granite. They mask much of the volcanic belt and dilute the volcanic clast count. Only in the area underlain by sedimentary rocks do the granite clasts show any significant decrease, even though they are present as erratic boulders. Glacial transport distances appear to be generally less than 5 km, with the exception of far-travelled erratics (tens of kilometres).

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METALLOGENY OF THE WOODBURN LAKE GROUP: AN UPDATE

J.A. Kerswill[1], Steve Goff[2], Lori Wilkinson[3], George Jenner[4], Bruce Kjarsgaard[1], Bob Bretzlaff[1] and Costa Samaras[4]

[1] Mineral Resources Division, Geological Survey of Canada

[2] NWT Geology Division, DIAND, Yellowknife

[3] Continental Geoscience Division, Geological Survey of Canada

[4] Department of Earth Sciences, Memorial University

This talk/poster is a contribution to the mineral deposits/metallogenic component of the Western Churchill NATMAP program and is based on our work in the Third Portage and Pipedream Lake areas. It presents highlights of petrographic and lithogeochemical investigations on rock samples collected during the 1996 field season, additional information from field and laboratory work in 1997, and a mineral occurrence map based on a compilation of mineral occurrence data for NTS sheets 56E/4 and 66H/1. The overall objectives of this work are: a) to identify metallogenic domains most favourable for the discovery of economic deposits within the Woodburn Lake Group, b) to develop better empirical exploration guides for these deposit types, through documentation of critical features of occurrences and their host environments, c) to help develop better genetic models for specific deposit types, e.g. BIF-hosted gold deposits, and, d) help construct regional tectonostratigraphic models.

The geological and field context for the mineral deposit studies has been in part presented by Kjarsgaard et al. (1997) and Zaleski et al. (1997a and b). Previous detailed studies on BIF-hosted gold prospects in the Third Portage area were undertaken by Armitage et al. (1996) and by Miller and Armitage (1994).

HIGHLIGHTS OF THE MINERAL OCCURRENCE COMPILATION

More than 80 occurrences lie within 56E/4 and 66H/1. Three classes of mineral deposits have been identified by commodity: 1) gold occurrences containing 2 ppm or more gold, but lacking anomalous concentrations of base metals, 2) base metal occurrences containing about 1000 ppm or more Cu and/or Zn and/or Pb and/or Ni, but lacking in gold, and, 3) polymetallic vein occurrences containing significant Au, Pb and/or Zn. The gold occurrences are widespread, and include structurally controlled vein-type gold in a variety of host rocks, as well as those hosted by sulphide-rich iron-formation. The base metal occurrences are fewest in number and include the volcanic-associated pyrrhotite-rich massive sulphide accumulations discovered in the Pipedream Lake area in 1996 (Kjarsgaard et al., 1997) and 1997. These are mostly stratiform accumulations in interlayered felsic and komatiitic volcanic rocks and associated volcaniclastic sedimentary rocks. Polymetallic veins (Sheba, Horace, Tern Lake, Cricket, Wally World and Long Root) are more widely distributed than the massive sulphide occurrences and occur principally within felsic volcanic rocks or quartz feldspar porphyry bodies of probable intrusive character.

HIGHLIGHTS OF FIELD AND PETROGRAPHIC INVESTIGATIONS

Several varieties of sulphide-bearing iron-formation were recognized during field work in 1996 and 1997. These include: a) cherty pyrrhotite-rich BIF in which laterally extensive pyrrhotite is spatially associated with Fe-silicate-rich bands (i.e., Drizzle Bay, South Sheba, West BIF and Farside Lake areas, b) pyrrhotite-rich oxide-BIF in which pyrrhotite is dominantly intergrown with magnetite in well-laminated cherty oxide-BIF (i.e., Third Portage, Goose Island and North Portage prospects), and, c) cherty pyrite-rich oxide-BIF in which pyrite dominantly replaces magnetite adjacent to both discordant quartz veins and bedding-parallel quartz veins and/or cherty layers (i.e., Pipedream Lake area). In addition, pyritic exhalite (well-laminated, thin, but laterally continuous units containing alternating layers of quartz and pyrite) was identified in the Pipedream Lake area. For the pyrrhotite-rich occurrences (a & b) the distribution of pyrrhotite is not controlled in any consistent way by veins or late structures. In the pyrite-rich occurrences the discordant veins are commonly tightly folded.

Quartz-sericite schist, with disseminated to fracture-filling pyrite, either hosts or occurs in the immediate vicinity of polymetallic veins at the Sheba, Horace and Long Root occurrences. Similar rocks were noted in the vicinity of arsenopyrite-bearing quartz veins on the Donna property. Several small patches of rusty quartz-sericite schist show tight folds on the Donna property and sericite is intensely crenulated in samples from Sheba and Donna. Examination of slabs of drill core and surface samples from the Sheba occurrence indicates some of the veins and fractures which contain galena and/or sphalerite are tightly folded.

Reconnaissance studies of polished thin sections from all locations sampled in 1996 confirm that grunerite/cummingtonite is present in silicate-rich bands associated with pyrrhotite-rich BIF at South Sheba, Drizzle Bay, Farside Lake and the West BIF. A green amphibole, tentatively identified as hornblende, was observed to be intergrown with, or to rim grunerite/cummingtonite in these samples. No correlation was apparent between the distribution of gold and the distribution of grunerite/cummingtonite/hornblende.

HIGHLIGHTS OF LITHOGEOCHEMICAL INVESTIGATIONS

Visual inspection of whole-rock data for 28 elements obtained by ICP-MS on 135 samples collected in 1996 indicates significant lithogeochemical differences and similarities among the principal sulphide-bearing rock types of the study area. The massive sulphide occurrences are gold-poor, but contain anomalous concentrations of Ni, Co, Mn, Cu and Zn. Pyrrhotite-rich sulphide-BIF from the South Sheba and Drizzle Bay locales are also gold-poor and enriched in Ni, Co, Cu and Mn. In contrast, three samples collected from the pyrrhotite-rich oxide-BIF at the Third Portage prospect are gold-rich, but poor in Ni, Co, Cr, Mn, Cu, Zn and V. Several samples of pyritic exhalite from the Pipedream Lake area contained anomalous concentrations of one or more of Au, Pb, Ag and Zn. Samples of a finely banded cherty pyrrhotite-rich rock that were collected from the western boundary of the West BIF, about 1 km west of the Goose Island prospect, contain less than 5 ppb gold, low contents of Ni, Co, Mn and Cr, anomalous concentrations of Zn, Pb, Ag, Cu and V, and sufficient iron to qualify as iron-formation.

Samples collected from already known BIF-hosted gold showings returned assays equal to or greater than previously reported values. Gold contents in pyritic and locally arsenopyrite-bearing oxide-BIF from just west of Moraine Lake ranged from 27 to 43800 ppb and included values of 32, 288, 307, 313, 333, 349, 552, 1170, 1260, 1420, 2140, 2280, 3080, 5520 and 5790 ppb Au. A pyrite-rich quartz vein assayed 3440 ppb. Pyritic oxide-BIF near Herb Lake returned values of 17, 19, 321, 367, 1090 and 3020 ppb Au.

HIGHLIGHTS OF GIS-RELATED WORK

Superimposed mineral occurrences and bedrock geology on GSC regional total field magnetic data reveal a number of interesting features. For example, the polymetallic occurrences in both NE-trending belts of occurrences lie within domains of low magnetic response that correspond dominantly with rocks mapped as intermediate or felsic to intermediate tuffs, crystal tuffs, lapilli tuffs and breccias that are locally bedded and transitional to reworked volcaniclastic deposits. Furthermore, the domain that hosts the polymetallic occurrences northeast of the gold-rich BIF in the Third Portage area appears to extend to the Third Portage area.

Shaded relief maps of high resolution data, in which differences in magnetic values are exaggerated, reveal the presence of a sigmoidal geometry within the southern magnetic anomaly in the Pipedream Lake area and suggest the presence of complex fold-like patterns in the Third Portage area.

METALLOGENIC IMPLICATIONS

The two mineralized belts contain a spectrum of deposit types as well as numerous occurrences of sulphide-BIF. The different deposit types are commonly found within the same geographical area; this co-regionality (Hutchinson, 1993) suggests the possibility of genetic links between the different styles of mineralization.

The widespread distribution of grunerite/cummingtonite in gold-poor BIF suggests that at least some grunerite/cummingtonite is related to metamorphism rather than gold-related metasomatism. Armitage et al. (1996) interpreted all the grunerite/cummingtonite in the Third Portage area as a product of late structurally-controlled sulphidation of oxide-BIF.

Ongoing work on the Meadowbank prospects indicates that the deposits have features typical of both stratiform and non-stratiform BIF-hosted gold deposits as described by Kerswill (1993, 1996). The laterally extensive pyrrhotite-rich BIF and the absence of late structural control on the distributions of sulphur and gold are characteristic of Lupin-like stratiform ores. However, the abundance of oxide-BIF and the ubiquitous textural evidence of magnetite replaced by pyrrhotite are essential features of non-stratiform ores. Our favoured model for the Meadowbank deposits includes synsedimentary/diagenetic sulphidation of permeable oxide-rich chemical sediments accompanied by deposition of significant gold on or near the seafloor. Our observations thus far do not support widespread direct precipitation of continuous layers of gold-rich, pyrrhotite-rich sulphide-BIF onto the seafloor and do not preclude several stages of gold introduction. Contrary to the suggestion of Armitage et al. (1996), no evidence has been seen to suggest that all the gold and sulphur at Meadowbank are spatially or genetically linked to Proterozoic shear zones. The early sulphidation model may also be appropriate for the gold-bearing pyritic oxide-BIF and pyritic exhalite occurrences in the study area.

EXPLORATION GUIDELINES

The relatively high gold contents of some pyritic oxide-BIF samples indicates that exploration for BIF-hosted gold deposits need not be restricted to the search for pyrrhotite-rich Meadowbank-like targets.

The anomalous concentrations of zinc, lead, silver and gold in some pyritic exhalites in the vicinity of known massive sulphide accumulations, polymetallic veins and BIF-hosted gold occurrences suggests that exhalites may be useful guides to mineralization.

Total field magnetic maps, particularly those based on relatively closely spaced flight lines, are useful in identifying and tracing units that are favourable hosts for various styles of mineralization. Shaded relief maps can enhance complex structures as indicated in the area of Third Portage Lake.

The co-regionality of different styles of mineralization suggests that the presence of one type may be a useful exploration guide for another type. For example, massive sulphide and polymetallic vein occurrences may indicate potential for BIF-hosted gold deposits. The presence of gold-rich pyritic oxide-BIF may be a favourable indicator for Meadowbank-like occurrences and vice versa.

In view of the probable involvement of synsedimentary/diagenetic processes in the deposition of at least some BIF-hosted gold occurrences, explorationists should consider documenting critical features of the sedimentary environment, including the distribution of sulphide-BIF, in their search for ore.

ACKNOWLEDGMENTS

We would like to thank McChip Resources and Cumberland Resources for their support of our work. Both companies provided high resolution total field magnetic data that was merged with GSC data from more widely spaced flight lines. We also acknowledge the access to much other information and the participation of company personnel in fruitful discussions.

REFERENCES

Armitage, A.E., James, R.S., and Goff, S.P.

1996: Gold mineralization in Archean banded iron-formation, Third Portage Lake area, Northwest Territories, Canada; Exploration and Mining Geology, v. 5, no. 1, p. 1-15.

Hutchinson, R.W.,

1993: A multi-stage, multi-process genetic hypothesis for greenstone-hosted gold lodes; Ore Geology Reviews, v. 8, p. 349-382.

Kerswill, J.A.

1993: Models for iron-formation-hosted gold deposits; in Mineral Deposit Modeling, (ed.) Kirkham, R.V., Sinclair, W.D., Thorpe, R.I., Duke, J.M.; Geological Association of Canada, Special Paper 40, p. 171-199.

1996: Iron-formation-hosted stratabound gold; in Geology of Canadian Mineral Deposit Types, (ed.) O.R. Eckstrand, W.D. Sinclair, and R.I. Thorpe, Geological Survey of Canada, no. 8, p. 367-382.

Kjarsgaard, B.A., Kerswill, J.A., and Jenner, G. A.,

1997: Lithostratigraphy and metallogenic implications of komatiite-BIF-felsic volcanic rocks of the Archean Woodburn Lake group, Pipedream lake, central Churchill Province, Northwest Territories; in Current Research 1997-C, Geological Survey of Canada, p. 101-110.

Miller, A.R. and Armitage, A.

1992: Comparison of iron-formation-hosted gold mineralization at the Meliadine (Discovery Zone) and Meadowbank projects, District of Keewatin, NWT; in Exploration Overview 1992, Northwest Territories, NWT Geology Division, Department of Indian Affairs and Northern Development, Yellowknife, p. 35-36.

Zaleski, E., Corrigan, D., Kjarsgaard, B.A., Jenner, G., Kerswill, J.A., and Henderson, J.R.

1997: Preliminary results of mapping and structural interpretation from the Woodburn Project, western Churchill Province, Northwest Territories; in Current Research 1997-C, Geological Survey of Canada, p. 91-100.

Zaleski, E., Corrigan, D., Kjarsgaard, B.A., Kerswill, J.A., Jenner, G.A. and Henderson, J.R.,

1997: Geology, Woodburn Lake Group, Meadowbank River to Tehek Lake (66H/1, 56E/4), District of Keewatin (Nunavut), Northwest Territories; Geological Survey of Canada, Open file 3461, scale 1:50000.

GEORGE LAKE GOLD PROJECT - UPDATE

KIT RESOURCES - Ron Parent

The Back River gold project is located approximately 500 km northeast of Yellowknife and about 160 km east of Echo Bay's Lupin Mine. Kit Resources Ltd. acquired a 100% interest in the George Lake and Back River Joint Venture properties from Homestake Mineral Development Company. This transaction was completed in February of this year.

The gold is hosted in iron formation and occurs largely in native form, often visible, in chloritic, sulfidized and silicified alteration zones generally associated with quartz veins. A total of 128,469 metres in 737 drillholes were completed on the properties between 1983 and 1994. This drilling outlined diluted geological resources of 3.8 million tonnes grading 10.34 gpt Au from 5 deposits on the George Lake Property and 1.4 million tonnes grading 11.19 gpt Au from the Goose Lake Deposit.

Upon acquisition of the property, Kit Resources Ltd. and Nuna Logistics personnel engaged in the preparation of a prefeasibility study. The study was based on a mineable resource of 5,294,438 tonnes at a grade of 10.6 grams gold per tonne, mined using open pit and underground techniques, at a rate of 1,500 tonnes per day. This study showed that gold could be produced at a cost of US$242 per ounce.

A 5 million dollar exploration drilling program commenced in early May of this year. There were two aims of the program: infill drilling of the known deposits and exploration for additional gold resources. The infill program was designed to improve definition of the mineralized zones, allowing for a mining decision to be made at the end of the season. A total of 157 holes totaling 17,900 meters were completed, with the majority of these (143) completed on the five main deposits at George Lake. 27 holes totaling 3,200 meters were drilled on seven exploration targets.

One of the largest jobs involved in the acquisition of this project was the integration of drillhole data in various formats into one coherent database. In order to maintain the integrity of the data, all drillhole data was imported from its original data files into a customized database created using Microsoft Access®. This format will allow us to incorporate new drilling data into the new database in preparation for feasability study work.

Two of the program's biggest problems which needed to be overcome were establishing accurate survey control for drilling, and determining the positioning of the drillhole at depth. Focus Surveys Ltd. of Edmonton were contracted to perform GPS surveys for locating and re-establishing the local grids as well as tying them into UTM coordinates. Sperry Sun single shot measurements were chosen as the method of downhole survey for the program. The azimuth readings for these surveys use a magnetic compass, and as such, are prone to large errors when measurements are taken in the iron formation. Furthermore, where readings were taken within the surrounding sediments, the degree of accuracy was a relatively poor (+/-) six degrees.

Smee and Associates Consulting Ltd. was contracted to set up a quality control program to monitor sampling and analytical variables. This quality control program is essential for the due diligence process which this project will undergo should a positive decision to proceed to production be forthcoming.

H.A. Simons Ltd. will be conducting a feasibility study early next year based upon the compiled results of this year's program and previous information. Included in the scope of work will be trade-off studies to identify the preferred location for the milling of ores from these deposits.

Other programs ongoing this year directing the project toward production include charting the waters of the Bathurst Inlet for a possible northern port location as well as environmental baseline studies and metallurgical testing.

UPPER MANTLE STRATIGRAPHY AND THERMAL REGIME OF THE CENTRAL SLAVE CRATON, CANADA.

M.G. Kopylova, J. K. Russell (Dept. of Earth and Ocean Sciences, The University of British Columbia)
H. Cookenboo (Canamera Geological Ltd.)

Mantle xenoliths carried by kimberlite magma provide the only hard evidence of the rock types that constitute cratonic roots. They also provide direct evidence for the conditions under which they formed. Here, we present such data for the Archean Slave Craton derived from mantle xenoliths in a Middle Jurassic kimberlite (Jericho pipe), situated in the central Slave craton 400 km northwest of Yellowknife, Northwest Territories. Our study is based on more than 80 xenoliths sampled from 33 drill holes and a large-tonnage underground sample.

The xenoliths are assigned to one of five groups on the basis of mineralogy and texture: i) coarse peridotite, ii) porphyroclastic peridotite, iii) eclogite, iv) megacrystalline pyroxenite, and v) ilmenite-garnet wehrlite and clinopyroxenite. Coarse peridotite and eclogite are dominated by equilibrium metamorphic textures, whereas porphyroclastic peridotite, pyroxenite and ilmenite-bearing rocks show mainly unequilibrated, deformed and/or magmatic textures.

A P-T array reflecting the ambient paleo-geothermal regime was derived from compositions of coexisting garnet-clinopyroxene-orthopyroxene. Beneath the Jericho pipe, coarse peridotite equilibrated at overall depths of 50 and 190 km and at temperatures of 500° to 1100°C. Spinel-garnet peridotite is distributed between 45-150 km, and garnet-only peridotite occurs at 120 to 180 km. The overlapping distribution (120 - 150 km) of spinel-garnet and garnet peridotite is consistent with the spinel-garnet transformation curve calculated for the average Jericho mineral chemistry by the O'Neill (1981) equation. For the deep lithosphere (110-190 km) the

P-T array can be approximated by a model conductive paleo-geotherm with an implied surface heat flow (q_o) of 38 mW/m^2. Other North American kimberlite magmas, including occurrences from Somerset Island, Kirkland Lake, Montana, Colorado/Wyoming, and Kentucky derive from slightly hotter lithospheric mantle and suggest surface heat flow values of 40 mW/m^2 or greater. For depths greater than 190 km the P-T array established for Jericho xenoliths deviates from a 38 mW/m^2 model conductive geotherm towards higher temperatures and shows substantially higher geothermal gradients. This deflection in the geotherm is commonly thought to be a transient, kimberlite-related phenomena ascribed to convection processes in the magma-bearing zone at the lithosphere/asthenosphere transition.

For orthopyroxene-free rocks (eclogite, wehrlite and clinopyroxenite), equilibrium temperatures were calculated by a clinopyroxene-garnet thermometer; an estimate of equilibrium pressure was obtained by finding the point of intersection between the garnet-clinopyroxene univariant curve for each sample and a best-fit curve to the "peridotite geotherm". Eclogite samples record temperatures between 850° and 1060°C and project onto the peridotite P-T array between 125 and 190 km. Most samples of porphyroclastic peridotite derive from below 180 km (1100° to 1300°C). Samples of pyroxenite, megacrysts, and ilmenite-garnet wehrilte and clinopyroxenite record higher temperatures (1100° - 1250°C) and have apparent source regions between 190 and 210 km.

Our results constrain the nature of the Slave lithosphere in several ways. Firstly, in this portion of the Slave craton, we place the transition between the petrological lithosphere and asthenosphere at a depth of 190 km. This interpretation is based on: i) the disappearance of coarse peridotite, and ii) the pronounced inflection in the calculated P-T array. At the time of kimberlite emplacement (ca. 172 Ma), the base of the lithosphere was at ~1100° C.

Secondly, our results provide a stratigraphy for the lithosphere and asthenosphere underlying the Jericho pipe. The lithosphere itself comprised of recrystallized and texturally equilibrated rocks, namely coarse peridotite with eclogite lenses and layers. In contrast, all rocks from the deeper asthenospheric horizon (porphyroclastic peridotite and magmatic rocks) have unequilibrated textures with respect to the deep mantle and, therefore, are inferred to be relatively young. The textures found in samples of porphyroclastic peridotite attest to deformational events essentially contemporaneous with the intrusion of the kimberlite magma. Preserved magmatic textures in the pyroxenite and ilmenite-bearing suite also have not had time to recrystallize and equilibrate texturally under ambient deep-mantle conditions. The Jericho pyroxenite and ilmenite-garnet wehrlite-clinopyroxenite therefore may represent samples of crystallized melts or cumulates of asthenospheric megacryst magmas. Fertile compositions of the Jericho porphyroclastic peridotite and megacrysts and their close association at depth support a widely accepted hypothesis that porphyroclastic peridotite was metasomatised and deformed by the emplacement of early megacryst magmas. Our observations provide spectacular evidence for a relatively-late pre-kimberlitic period of magmatism and associated short-lived thermal perturbation within the deep mantle of the Slave craton. It is logical to suppose that the Jericho kimberlite derives from this magmatic event.

In summary, we have mapped an important petrological boundary at 190 km beneath the Jericho kimberlite in the North-central Slave. The boundary separates lithosphere from rocks which carry an asthenospheric signature and may have been chemically and texturally modified by pre-kimberlitic magmatism. This boundary represents a substantial change in the petrology, structure and thermal state of the mantle and could account for the major discontinuity at 195 km observed in seismic P-wave velocities and in magnetotelluric data at 200-250 km for the SW Slave craton.

A SPINIFEX-TEXTURED KOMATIITE FROM THE HOPE BAY VOLCANIC BELT, SLAVE PROVINCE, NORTHWEST TERRITORIES, CANADA

Darren W. Lindsay
Department of Earth and Ocean Sciences
University of British Columbia

Ultramafic rocks from the Hope Bay Volcanic Belt, located in the NE Slave Province approximately 650 km northeast of Yellowknife, were first documented peridotitic ultramafic intrusions in the Slave Province (Gibbins and Hogarth, 1986). A komatiite, a spinifex-textured ultramafic rock of extrusive origin, was identified in the same volcanic belt during the 1997 field season. This is the first documented peridotitic komatiite flow in the Hope Bay Belt and in the Slave Province.

Ultramafic rocks, which comprise approximately 1% of the mafic stratigraphy of the Hope Bay Belt, are predominantly of intrusive origin. The small outcrop of komatiite, approximately 30cm by 100cm, is surrounded by overburden and is proximal to tholeitic basalts and magnetic gabbros. This occurrence is located approximately 10km southeast of the peridotitic ultramafic sill described by Gibbins and Hogarth (1986). The komatiite has a 5-15cm band displaying spinifex quench texture, crystals up to 3cm long, overlying a layer exhibiting a fine to medium grained cumulate texture consisting mainly of olivine and pyroxene.

The presence of a true komatiite in the Hope Bay Belt removes one of the factors that had led some workers to suggest that the Slave greenstones were unique. The geology of the Hope Bay Belt can now be compared to other well-documented greenstone belts of the Superior Province (Abitibi Belt, Swayze Belt) and the Yilgarn Block (Murchison Belt).

Gibbins, W.A. and Hogarth, D.D. 1986. High-magnesium or komatiitic peridotite from the Archean Hope Bay Volcanoc Belt, Slave Province, Northwest Territories. Geological Association of Canada, Program with Abstracts. 11:72.

AN OVERVIEW OF THE NORTH BAFFIN/MELVILLE PENINSULA GEOSCIENCE COMPILATION AND DIGITAL GEOSCIENCE KNOWLEDGE BASE PROJECT

S.B. Lucas and the North Baffin Partnership Project Working Group (Working Group: Geological Survey of Canada, NRCan; Qikiqtaaluk Corporation, Qikitaani Region; Resources, Wildlife and Economic Development, GNWT; NWT Geology Division, DIAND)

A one year geoscience partnership project, involving the Qikiqtaaluk Corporation (Qikitaani (Baffin) Region), the Dept. of Resources, Wildlife and Economic Development (RWED/GNWT), DIAND, NWT Geology Division, and the Geological Survey of Canada (GSC) was launched in September 1997 to develop a digital geoscience knowledge base and mineral potential assessment of northern Baffin Island and Melville Peninsula. The project represents a new model for northern geoscience program delivery, and will provide a one-stop-shopping approach to geoscience maps and information for the mineral exploration industry, land use planners, and local communities and governments. The project area spans northern Baffin Island from the Piling Group to the Borden Basin and Brodeur Peninsula and includes that portion of Melville Peninsula that is in Qikitaani (Baffin) Region. This area has one operating mine (Nanisivik Pb-Zn) and potential for gold, base metal (Cu-Zn, Ni-Cu), and diamond deposits, as well as for additional Pb-Zn deposits. Bedrock and surficial geology maps of the area are largely based on helicopter reconnaissance and ground traverse mapping completed over the past 40 years. These maps have never been compiled at a useful small scale with a common, modern legend. The area is the nexus of several Precambrian mountain belts (Archean, Paleoproterozoic), contains rock sequences associated with late Precambrian continental breakup and Phanerozoic continental margin sedimentation, and structures related to both extensional and contractional tectonics.

Previously published and unpublished GSC bedrock maps will be compiled and prepared for digital colour publication at 1:500 000 scale. All existing data and maps will be included in the compilation. The digital knowledge base will include lithologies, key structures, geochronology, lithogeochemistry, geophysics (aeromagnetics, gravity), and tectonic domains. New U-Pb geochronological data, Nd-Sm tracer isotope data, and trace element geochemical data will be acquired to establish the age, origin, and tectonic significance of key Precambrian rock units across the area. GSC surficial geology maps for the project area will be recompiled in digital form at 1:500 000 scale, using all existing data and maps. Other information sets to be included in the digital database includes till geochemistry, locations of gossans on the Melville Peninsula and analytical data for some of the gossans, and kimberlitic indicator mineral data. A database of known mineral occurrences and deposits in the area and their exploration history will be compiled for entry into DIAND's NORMIN.DB and used to define metallogenic domains. A subjective assessment of the mineral potential of each domain will be completed, using expert knowledge of mineral deposits and their genetic models. All of this information will be compiled in a 1:500 000 scale digital map layer, compatible with the digital bedrock and surficial geology data, and will include outlines of the metallogenic domains and locations of known mineral occurrences and deposits, gossans and carving stone locations. The comprehensive digital geoscience database/geographic information system (GIS) will be developed (in ArcInfo format), incorporating all of the data from the bedrock, surficial and mineral deposits components of the project, along with other available data such as LANDSAT and Radarsat images and a comprehensive bibliography of information sources. Two layers of digital topographic information will be provided: a 1:1 000 000 scale base map from the Digital Chart of the World, and a seamless 1:250 000 scale base map from the National Topographic Data Base. The GIS-formatted database will be released on CD-ROM with a user-friendly map browsing tool that allows any user to perform spatial queries and integrate various geoscience information sets.

MINERAL AND ENERGY RESOURCE ASSESSMENT OF BATHURST AND ADJACENT SMALL ISLANDS, ARCTIC CANADA: PRELIMINARY STREAM SEDIMENT GEOCHEMICAL SURVEY RESULTS

McCurdy, M.W., Spirito, W.A., Anglin, C.D. and Friske, P.W.B. Mineral Resources Division, Geological Survey of Canada

In June 1994, Parks Canada, Department of Canadian Heritage, identified the northern part of Bathurst Island as an area of interest for a new national park. This area was chosen to represent Parks Canada's Natural Region 38, the Western High Arctic, which encompasses the Queen Elizabeth Islands north of Viscount Melville Sound, and the Grinnell Peninsula on Devon Island.

The Geological Survey of Canada (GSC) is responsible for providing a Mineral and Energy Resource Assessment (MERA) study of proposed park areas before the boundaries are established. In 1994, phase 1 of the MERA included a literature review, examination of core and underground exposures of mineralization at the Polaris Mine, and lithogeochemistry of grab samples collected during a short reconnaissance field season on eastern Bathurst Island in 1994.

In 1995, an integrated field program including stream sediment sampling, mapping, stratigraphic and sedimentological studies, surficial geology and radar backscatter imaging was initiated. For the stream sediment portion of the program, a National Geochemical Reconnaissance (NGR) regional survey was carried out to cover northern Bathurst Island in a rapid and cost-effective manner. Stream sediment and water samples were collected from 404 sites (parts of NTS 68G, 68H, 69A, 69B) on northern Bathurst, Alexander and Massey Islands. The samples were collected at an average density of one sample per 15.5 km^2 throughout the 6,380 km^2 covered by the survey. Preliminary data showed that anomalous trace element concentrations were associated with the Cape Phillips Formation. Results from this survey were published in GSC Open File 3292, 1997.

In 1996, the GSC completed the majority of the field work related to regional mapping, stratigraphic and surficial studies on Bathurst Island. The stream sediment sampling was continued in1996 to complete the original Parks Canada study area. Additional samples were collected to the west of Erskine Inlet within an expanded study area outlined by Parks Canada. Detailed 'infill' sampling of both stream sediments and heavy minerals was done to follow-up the multi-element anomalies in Zn-Sb-As-Ba identified by the 1995 survey, and to investigate the implications of the discovery of the new sulphide showings in Devonian carbonates near Markham Point.

In 1997, heavy mineral sampling from 54 sites on Vanier Island and in selected coastal areas of northern Bathurst Island was completed. The sites on Bathurst Island were chosen to further investigate the high potential for Pb-Zn mineralization associated with the Blue Fiord Formation within the Cornwallis Fold Belt, particularly where it overlies Disappointment Bay Formation. Detailed stream sediment sampling was carried out upstream and downstream from the Harrison Pb-Zn showing near Markham Point. Detailed site investigation and lithogeochemical sampling was undertaken at 5 sites on eastern Bathurst Island. Sample preparation is complete, and samples have been submitted for chemical analysis. Results are anticipated by early December. The analytical results from the 1996 and 1997 sampling will be published in GSC Open File format in early 1998.

The regional silt samples and the –80 and –250 mesh fractions of the heavy mineral samples have been analyzed by a combination of techniques including atomic absorption spectroscopy (AAS), instrumental neutron activation (INA) analysis, and other specific techniques. Variables determined on the sediment samples include: Ag, As, Au, Ba, Br, Cd, Ce, Co, Cr, Cs, Cu, Eu, F, Fe, Hf, Hg, La, LOI, Lu, Mn, Mo, Na, Ni, Pb, Rb, Sb, Sc, Sm, Sn, Ta, Tb, Th, U, V, W, Yb, Zn. Heavy mineral concentrates from the heavy mineral samples were analyzed by INAA for the following elements: Au, Ag, As, Ba, Br, Ca, Ce, Co, Cr, Cs, Eu, Fe, Hf, Hg, Ir, La, Lu, Mo, Na, Nd, Ni, Rb, Sb, Sc, Se, Sm, Sr, Ta, Tb, Th, U, W, Yb, Zn and by ICP-ES for Ag, Cd, Cu, Mn, Ni, Pb, Zn. Waters were analyzed for U, pH, and F.

A database of field observations and analytical results has been created for water, silt, heavy mineral concentrate and lithogeochemical data. With information from over 1000 stream sediment sites and 100 heavy mineral sites, a valuable source of baseline geochemical data for Northern Bathurst Island will be available for mineral exploration and resource assessment.

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The GSC's field work on Bathurst Island was carried out with excellent logistical support from Polar Continental Shelf Project, Resolute Base. Cominco (Polaris Operation) and Cominco Exploration (Toronto) have also contributed support by providing opportunities to examine underground exposures and core at the Polaris Mine, surface exposures and core on Truro Island, and surface exposures around the new showings in the Markham Point area.

ICE FLOW INDICATOR MAPPING IN THE KAMINAK LAKE (NTS 55L) AND FERGUSON LAKE (NTS 65I) AREAS: RESULTS FROM THE NATMAP WESTERN CHURCHILL PROJECT

I. McMartin, S. Khan, and P.J. Henderson
Terrain Sciences Division, Geological Survey of Canada

One of the main objectives of the Quaternary geology program in the NATMAP Western Churchill Project area is to study the history of the Keewatin Ice Divide, and its positions and timing during the last glaciation. The Keewatin Ice Divide (KID) was the last major centre of the Keewatin Sector of the Laurentide Ice Sheet during the Late Wisconsinan Glaciation. It formed a SW-NE trending axis across the

Keewatin from which ice flowed in all directions. Establishing the ice flow history will impact on bedrock-related mineral exploration and drift prospecting studies across the area. Field investigations in the summer of 1997 consisted of systematic ice flow indicator mapping, specifically seeking multi-directional faceted outcrops over the Kaminak Lake and Ferguson Lake areas. This region is mainly located on the east side of the KID. Two digitally compiled ice flow maps (1:250 000) are presented here, which include ice flow indicators interpreted from the new regional field work and glacial landforms (drumlins, eskers, moraines) compiled from existing surficial maps.

The abundance of multi-faceted outcrops in the study area reflects the migration of the ice divide and the increased complexity of determining the dominant glacial transport direction with decreasing distance from the KID. In the Kaminak Lake map area, the main ice flow direction is towards the SE, parallel to most glacial landforms. The oldest ice flow event in this map area was in a SW-NE direction (no sense defined), as recorded by isolated deep striae found at only 4 sites. A south to south-southeasterly ice flow event was consistently recorded throughout the area, preserved on the protected side of the southeasterly striated surfaces, thus preceding the main SE event. Finally, around Kaminak Lake, east-southeasterly trending striae were recorded at several sites, predating and/or postdating the main SE event. In the Ferguson Lake map area to the west, the sequence of ice flow events is similar to the Kaminak Lake area, except NW of a SW-NE trending line which lies in between Imikula Lake and Ferguson Lake. In this NW part of the map, which include the area around Yathkyed Lake, the oldest ice flow event was towards the north and the north-northeast. Reverse and progressive counter-clockwise ice flow indicators trending from the SE to the ESE postdate the earlier northerly event. Landforms with both SE and NW orientations are found adjacent to each other in this area. This sequence of events suggests that the KID first migrated to the NW before its final position to the west of Yathkyed Lake. This interpretation is a complete reversal from the earlier interpretations.

MAPPING STRUCTURAL AND SURFICIAL GEOLOGY USING COMBINED WINTER AND SUMMER LANDSAT TM NORTH OF THE TREELINE

Gerry Mitchell, RGI

North of the treeline, many structural and surficial geological features can be effectively mapped over large areas using images of shaded relief derived from a combination of winter and summer Landsat TM scenes. In the barrens in winter the snow covered landscape is a nearly perfectly homogeneous reflector. On cloud free days, with low sun inclination angles, most of the variation in the intensity of the reflected light seen by the Landsat detector is due to changes in the inclination of the ground surface towards or away from the sun. The resulting images appear to show features with as little as 3 metres of relief over 200 metres.

In 1994 RGI acquired 14 winter and 14 summer Landsat TM scenes and processed them to produce shaded relief images of the southern 2/3rds of the Slave Craton, an area of generally very low topographic relief. On these images fault zones can be clearly and easily mapped for 100's of kilomatres across the Craton. These shaded relief images have been used for interpretation of glacial transport directions and probable till types and thickness.

In areas of low topographic relief north of the treeline, shaded relief images derived from winter and summer Landsat TM are probably the most cost effective images for mapping geological structure and surficial geology over large areas. They have much more geological information than satellite radar images and, for large areas, are orders of magnitude less costly than elevation models derived from aerophotos.

AGE AND GOLD POTENTIAL OF THE TUNGSTEN PLUTONIC SUITE IN THE MACMILLAN PASS AREA, WESTERN N.W.T.

J.K. Mortensen, J.R. Lang, and T. Baker, Mineral Deposits Research Unit, Earth & Ocean Sciences, University of British Columbia

Granitoids near the N.W.T.-Yukon border in the Macmillan Pass area have previously been subdivided into three distinct plutonic suites, based mainly on mineralogical and geochemical grounds. Subsequent field, petrographic, geochemical, and in particular U-Pb geochronological studies by the authors and other workers have better defined these three suites, and have further lead to the recognition that the suites are also distinct in terms of emplacement age and metallogenic signature. The three suites comprise the Tay River (formerly "transitional"), Tombstone (formerly "hornblende-bearing") and Tungsten (formerly "two-mica") suites. The Tay River and Tombstone suites have U-Pb ages of 97+/-1 Ma and 91.5+/-1 Ma, respectively. The Tay River suite does not appear to be associated with any known mineralization. The Tombstone suite, however, has been the focus of intense exploration interest over the past several years because of the discovery of numerous intrusion-hosted, "Fort Knox-type" gold deposits as well as Au(+/-W,Cu) skarns, Au-As veins and mantos, and the Brewery Creek disseminated/breccia Au deposit, all of which are interpreted to be genetically related to Tombstone suite magmatism.

The Tungsten plutonic suite overlaps with and extends beyond the eastern end of the Tombstone suite. Peraluminous felsic intrusions of the Tungsten suite are compositionally very similar to the latest stage differentiates of the Tombstone suite to the west, and preliminary U-Pb age data for Tungsten suite intrusions indicate that the Tungsten and Tombstone suites were emplaced at exactly the same time, suggesting that the two suites may be comagmatic. Although the Tungsten suite is metallogenetically best known for associated W (+/- base metal) skarn deposits such as Mactung, Cantung, and LENED, the proposed comagmatic nature of the two plutonic suites suggests that the Tungsten suite may be equally prospective for Au as the Tombstone suite to the west. This is supported by two main lines of evidence. First, sheeted quartz veins which are the typical style of mineralization in "Fort Knox-type" gold deposits in Tombstone suite intrusions, are present in several of the Tungsten suite intrusions in the Macmillan Pass area (e.g., MacTung and Mt. Wilson plutons), and these veins are locally arsenopyrite-bearing and carry significant Au values. Secondly, the RGS signature (Au-As-W-Sb+/-Bi) characteristic of Tombstone suite intrusions is also found throughout areas in which only Tungsten suite plutons occur. In the present study we are using U-Pb geochronology and lithogeochemistry to further test the cotemporal and comagmatic nature of the Tungsten and Tombstone suites and are comparing the nature of mineralization (particularly Au) associated with Tungsten suite intrusions with the better studied and documented occurrences associated with Tombstone suite intrusions farther west.

GEOCHRONOLOGICAL AND GEOCHEMICAL STUDIES OF THE COATES LAKE DIATREME, SOUTHERN MACKENZIE MOUNTAINS, WESTERN N.W.T.

James K. Mortensen, Earth & Ocean Sciences, University of British Columbia

The Coates Lake diatreme is a small (~10 m diameter) body that intrudes strata of the Neoproterozoic Redstone River Formation at the southern end of Coppercap Mountain in the southern Mackenzie Mountains. The diatreme is unique in this area because it contains a wide variety of xenoliths, including (in order of decreasing abundance) medium-grained granitoids, quartzite, limestone, actinolite-chlorite-calcite rock, greenstone, metadiorite and metagabbro. Narrow mafic dykes that locally contain smaller crystalline xenoliths occur near the diatreme and in several localities elsewhere on Coppercap, and are apparently comagmatic with the diatreme. The igneous and meta-igneous xenoliths in the Coates Lake diatreme are interpreted to have been derived from local basement and as such represent the only physical sample that exists of the crystalline basement underlying this region. A U-Pb zircon age of ~1140 Ma was determined by Jefferson and Parrish (1989) for one of the granitoid clasts, raising the possibility that at least part of the basement in this area is broadly Grenvillian in age.

The goals of the present study are, 1) to conduct detailed U-Pb geochronology and geochemistry of a number of crystalline xenoliths in the diatreme to better constrain the age and nature of the underlying basement in this area, and 2) to attempt to geochemically characterize the magmatic component of the diatreme and associated dykes in order to facilitate comparison and correlation with other mafic dykes and diatremes elsewhere in the Mackenzie Mountains.

UNCONFORMITIES IN THE SLAVE STRUCTURAL PROVINCE: EXAMPLES FROM THE POINT AND BENIAH LAKE AREAS

Mueller, W.U, Chown, E. H. Sciences de la Terre, Unversité du Québec;
Corcoran, P. L. Department of Earth Sciences, Dalhousie University;
Pickett, C. Geology Department, St. Mary's University

Unconformities are important time-lines to constrain the evolution of supracrustal sequences on Archean cratons. The recognition of unconformities in conjunction with precise U-Pb age determinations is of significance because they may be then employed to define the regional stratigraphy, determine the history of tectonic uplift, help interpret sedimentary facies successions, and facilitate paleogeographic reconstruction. The Slave Structural Province which straddles early Earth's evolution between 4.17 and 2.59 Ga, is a complex association of granitic basement complexes, unroofed magmatic arcs, oceanic to continental volcanic arcs, and platformal-, flysch- to molasse-type sedimentary basins. In this context, unconformities are essential in explaining basement-cover relationships or delineating different basin-forming events. The unconformities recognized in the Keskarrah Bay area of Point Lake and along the Beniah Lake fault at Beniah Lake help unravel this evolution.

Previous regional mapping identified an unconformable contact between the 3.15 Ga Augustus granite, a basement complex, and the overlying sedimentary rocks. Detailed mapping and sedimentary facies analysis of selected basement-cover contacts (a small bay 7 km east of Keskarrah Bay; long. 112°54′ / lat. 65°13′)

revealed exposed unconformable contacts between the Augustus granite and the 2.6 Ga molasse-type Keskarrah Formation as well as the ca. 2.7 Ga flysch-type Contwoyto Formation in one large outcrop zone. The Augustus/Contwoyto unconformity is a sharp erosive contact where the Augustus granite and mafic dykes which intrude the granite are overlain by pebble- to cobble-size, matrix-supported conglomerates interpreted as debris flow deposits. Two stratigraphic sections measured in this area indicate an alternation and interstratification of locally quartz-rich, graded bedded turbidites deposits (Bouma Ta, Tab, Tabd, Tae) with high-concentration polymictic turbidity and debris flow deposits. A subaqueous setting is inferred. The exposed Keskarrah unconformity is strikingly different, showing a diffuse and gradational contact with the Augustus granite and an aphanitic felsic dyke. Angular to subangular, felsic or granitic clasts, locally of boulder-size, are the prominent constituents of this interpreted talus scree deposit. In contrast to the subaqueous unconformity, the subaerial counterpart is characterized by a weathered (?) transition zone of in-situ granite breccia. The change from in-situ breccia to an inferred talus scree deposit occurs over several metres and is marked by the development of a crude stratification and mixing of granite and felsic dyke clasts.

The newly discovered unconformity at Beniah Lake (long. 112°29′ / lat. 63°27′) between the ca. 2.9 Ga, platformal-type, quartz-arenites of the Beniah Formation and conglomerates of inferred 2.6 Ga Keskarrah-type affinity serves to demarcate two distinct basin-forming events. The contact is irregular but erosional. The angular to subangular, cobble to boulder-size clasts in a dominantly matrix-supported conglomerate are interpreted as talus scree deposits shedding off an escarpment produced by the Beniah Lake fault. Quartz-arenite, mafic dyke and flow, and quartz clasts are the three principal components of this sedimentary breccia. The distinct mafic clasts originate from the (N-trending) dykes which intrude the quartz arenite succession throughout the Beniah Lake area but especially in the N-trending Beniah Lake fault zone. This mafic volcanic event is possibly correlative with the Beaulieu or Cameron River volcanic belts. Identification of other unconformities can be useful creating pan-Slave tie lines, correlating various sectors of the Slave Province and showing the polyphase evolution of this craton.

LARGE GOSSAN ZONES AND THEIR GOLD POTENTIAL DESPERADO CLAIMS BROWN WATER LAKE NWT, (86-B-12)

Nickerson, Dave

The Desperado claims were staked to cover large conspicuous gossans first observed by the author in July 1996. During June/July 1997 they were explored by test pitting, sampling and a limited amount of VLF-EM geophysics. Close to its margin with the Slave Structural Province the property lies within the Bear Province covering part of a NNE-SSW trending 10 km wide belt of rugged terrain underlain by highly metamorphosed and deformed Aphebian Snare Group sediments. The metamorphic grade appears to be upper amphibolite and most of the rocks could now be described as quartz-biotite schists and gneisses. Sill-like intrusions of coarse grained granitic rock 0.25m to 30m thick are common.

Two types of gossans were observed. The first occurs in bands a few to several tens of metres wide conformable with the general NE-SW strike. They presumably represent horizons of iron-rich sediments. Secondly large circular shaped gossans, some quite spectacular such as the 400m diameter Rust Hill gossan, are to be found especially on claim DESPERADO 2. In both cases the oxidized material appears to have been derived from pyrrhotite accompanied by magnetite. Garnet is a common accessory.

Of 39 samples taken and analysed for gold 11 contained anomalously high values. None were of ore grade and the highest was 114 ppb. The small geophysics program showed the presence of conductors which in places are coincident with the observed sulphide bearing zones.

The limited work done to date demonstrates that there is a gold potential in a heretofore neglected geological environment. Gold is to be found within an extensive system and mechanisms exist for its localized enrichment. It is recommended that the property be further explored by EM and magnetometer geophysics.

GEOLOGICAL ATLAS, MAGUSE RIVER (NP-15/16-G), DISTRICT OF KEEWATIN, NORTHWEST TERRITORIES, SCALE 1:1 000 000

A.V. Okulitch and S. Tella

The Maguse River Atlas set, expected to be released as an Open File in early January 1998, consists of the following 8 sheets:

Sheet1: Maguse River (Map NP-15/16-G), Bedrock Geology, 1:1000000 scale compilation

Sheet2: Precambrian geotectonic correlation chart

Sheet3: Phanerozoic geotectonic correlation chart, physiographic, lithotectonic and tectonostratigraphic features, and metamorphism

Sheet 4: Compilation sources, references, and precambrian basement contours
Sheet 5: Dyke swarms and geochronology
Sheet 6: Metallogeny
Sheet 7: Aeromagnetic anomaly map, scale 1:1 000 000
Sheet 8: Gravity map, scale 1:1 000 000

CONTRIBUTORS:
Sheets 1,2,&4: K.E. Eade, A.V. Okulitch, B.V. Sanford, S. Tella
Sheet 3: R.G. Berman, K.E. Eade, A.V. Okulitch, B.V. Sanford, S. Tella
Sheet 5: K.E. Eade, A.V. Okulitch, S. Tella
Sheet 6: K.E. Eade, A.R. Miller, A.V. Okulitch, S. Tella
Sheets7&8: Staff, Geophysics Subdivision, Continental Geoscience Division, GSC, Ottawa

Co-ordinator: A.V. Okulitch; Geological Atlas, The National Earth Science Series

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in press: Geology, Maguse River, District of Keewatin, Northwest Territories, Geological Survey of Canada Map NP-15/16-G, scale 1:1 000 000. (National Earth Science Series, Geological Atlas), GSC Open File xxxx.

SPECULATIONS ON THE GEOLOGICAL EVOLUTION OF THE YATHKYED LAKE GREENSTONE BELT, WESTERN CHURCHILL PROVINCE, NWT

C. Relf (DIAND NWT Geology Division), A. Mills, D. Irwin (RWED, GNWT), and K. MacLachlan (Memorial University of Newfoundland)

Ongoing mapping in the northeastern Yathkyed Lake area (Irwin et al., this volume) yielded three new geological contributions of regional significance: 1) the Yathkyed greenstone belt was recognized as an overturned panel; 2) a package of undifferentiated gneisses and migmatites were reinterpreted as high grade equivalents of Yathkyed belt rocks; and 3) a major mylonite zone was identified that may have important tectonic implications for the entire western Churchill Province.

The Yathkyed greenstone belt, as originally mapped by Eade (1986), is a moderately to steeply northwest-dipping package of mafic volcanic flows and volcanogenic sediments. Younging indicators such as graded bedding and pillow cusps consistently indicate southeastward younging, leading to the suggestion that the belt is an overturned panel. The distribution of metamorphic assemblages reveals that the highest grade rocks lie at the lowest stratigraphic (highest structural) level.

Northwest of the greenstone belt, a package of undifferentiated banded amphibolites, ortho- and paragneisses was remapped during this study. Close examination of outcrop-scale textures, contact relations, and metamorphic assemblages revealed that these "gneisses" are in fact distinguishable as amphibolites, pelites, psammites and biotite tonalite injected along their foliation by several phases of granitoids. The injected granitoid component gives the rocks a banded appearance that led to their interpretation as gneisses and migmatites. However, quartzofeldspathic layers are compositionally and texturally identical in mafic and felsic "gneisses", they locally transect foliation, and in places they coalesce into discreet mappable plutons. These observations do not support a metamorphic segregation origin for this banding.

Metamorphic mineral assemblages within the supracrustal portion of the high grade package suggest bulk compositions identical to lower grade rocks of the greenstone belt. Ongoing geochemical analyses will test this interpretation. If true, mapping has significantly expanded the thickness of the supracrustal belt, and therefore the potential target area for greenstone belt-hosted mineralization.

The Tyrrell shear zone is a northwest-dipping shear zone up to a kilometre wide that bounds the southeastern margin of the Yathkyed greenstone belt. It deforms the sedimentary rocks and associated granitoids that occupy the stratigraphic top of the belt, and is folded, along with bedding and foliation in the country rocks, about km-scale, upright, gently north-plunging Z-asymmetric folds. Kinematic indicators along the shear zone include rotated porphyroclasts, asymmetric folds and pull-aparts, foliation fish, shear bands, and rare C-S fabrics. They preserve evidence for two episodes of displacement: most record oblique (normal) dextral shear, whereas a few record reverse displacement. Overprinting relations indicate that reverse movement preceeded dextral-normal shearing. Samples of cross-cutting granitoids were collected for geochronological analyses to bracket the timing of the shearing events.

The discovery of the Tyrrell shear zone has several imporant tectonic implications. First, the evidence for early reverse shearing, coupled with the overturned bedding suggest the intriguing possibility that the belt is an overturned thrust nappe. If so, it present the possibility that the Yathkyed belt is not simply an imbricated slice of the Rankin-Ennadai belt, but may be a fault-bounded terrane of distinct origin. Geochemical and geochronological studies within the western Churchill NATMAP program area (e.g. Hanmer et al.; Aspler and Chairenzelli, this volume) will address this possibility.

Second, the extension direction related to dextral-normal shearing along the Tyrrell shear zone is parallel to that associated with uplift of the Nowyak core complex 60 km to the southwest. Late movement on the Tyrrell shear zone may therefore be related to a widespread extensional event.

Finally, the magnetic lineament that coincides with the Tyrrell shear zone (GSC Map 1567A) merges southwestward with the lineament along the Snowbird Tectonic Zone, suggesting the Tyrrell shear may be a splay of the Snowbird Zone.

GEOLOGY OF SOUTHERN BAFFIN ISLAND (KIMMIRUT-IQALUIT AREA): PALEOPROTEROZOIC TECTONIC EVOLUTION AND IMPLICATIONS FOR MINERAL EXPLORATION.

M. R. St-Onge,D. J. Scott, N. Wodicka and S. B. Lucas
Continental Geoscience Division, Geological Survey of Canada

The Geological Survey of Canada has now completed three summers of 1:100, 000-scale mapping on southern Baffin Island, covering an area of ~28000 km2. The new maps document an orogen-scale, tripartite subdivision of tectonostratigraphy. Exposed at the lowest structural level (Level 1), a ~2.88 Ga hornblende monzogranite - tonalite gneiss complex is tectonically imbricated with panels of supracrustal rocks (orthoquartzite, pelite, amphibolite, metaperidotite). The Archean orthogneisses are interpreted as the northernmost surface exposures of the Superior Province, and the supracrustal rocks as the ~2.04 Ga lower Povungnituk Group. At the intermediate structural level (Level 2), ~1.84-1.82 Ga orthopyroxene-bearing monzogranite - granodiorite - tonalite - diorite gneiss panels are interpreted as the plutonic root of calc-alkaline magmatic arc and are correlated with the ~1.86-1.82 Ga Narsajuaq arc of northern Quebec. At the highest structural level (Level 3), two assemblages of Paleoproterozoic supracrustal rocks are tectonically imbricated with ~1.95 Ga monzogranite - tonalite gneisses. The ~1.93-1.86 Ga Lake Harbour Group comprises marble, psammite and semipelite, and is interpreted as a north-facing shelf/off-shelf sequence. These rocks are structurally overlain by a thick succession of feldspathic quartzites and sulphidic pelites (Blandford Bay assemblage) that is interpreted as a foredeep sequence. Both Level 3 supracrustal sequences are intruded by ultramafic-mafic sills. Kilometre-scale, orthopyroxene-bearing monzogranite plutons of the 1.86-1.85 Ga Cumberland batholith intrude all map units of Level 3. Cumberland batholith plutons are not observed to intrude rocks of Levels 1 and 2, indicating that tectonic assembly of the three structural levels post-dates emplacement of the batholith.

Four principal phases of regionally extensive Paleoproterozoic deformation have been identified. The earliest recognized phase (D1) resulted in the imbrication of the supracrustal rocks of the Lake Harbour Group and Blandford Bay assemblages with the ~1.95 Ga orthogneisses along discrete faults that commonly display well-developed mylonitic fabrics. The presence of numerous repetitions and truncations of distinct tectonostratigraphic units, and the overall ramp - flat fault geometry of the map area, suggest that juxtaposition of units occurred along a system of SW-verging (?) thrust faults. As the imbricated panels of metasedimentary rocks and orthogneiss are truncated by plutons of the southern Cumberland batholith, much of the D1 deformation is interpreted to be older than 1.86 Ga. Prograde, upper amphibolite-facies metamorphism of the Level 3 supracrustal rocks (M1) is interpreted as a consequence of the emplacement of the Cumberland batholith.

A second generation of mylonitic thrust faults (D2), verging toward the southwest, juxtaposes the rocks of all three tectonostratigraphic levels. As Level 2 orthogneisses as young as 1.82 Ga are imbricated by this phase of deformation, D2 is bracketed to be younger than 1.82 Ga. The Mina mylonite zone, localized at the structural base of Level 2, separates ~1.84-1.82 Ga orthogneisses in the hangingwall from the underlying Archean orthogneisses of Level 1, and thus may represent a regionally significant decollement. Preliminary U-Pb dating of units within the Mina mylonite zone indicates that it was active between 1.82 and 1.80 Ga, therefore providing a lower bracket for D2 deformation. A second phase of metamorphism (M2) is associated with D2; it is characterized by the development of prograde, amphibolite-facies assemblages in Povungnituk Group supracrustal rocks (Level 1), and the local retrogression of orthopyroxene-bearing (orthogneisses) and upper amphibolite-facies (supracrustals) assemblages in adjacent to D2 faults and in the hinge zones of D2 fold structures.

Rocks imbricated by both generations of thrust faults have been folded into a series of relatively tight NW-trending folds (D3) that are broadly parallel to the strike of orogen. The effects of this folding are manifest regionally by the synform - antiform pair north of Kimmirut. D3 synforms have relatively shallow-dipping south limbs, and steep- to overturned north limbs, suggesting an overall southerly vergence. As rocks of the Mina mylonite zone are reoriented by D3 folds, this folding is bracketed to be younger than 1.80 Ga.

A second 'thick-skinned' folding event deforms all structural levels about folds with NNE-trending axes and upright axial planes (D4). Granitic pegmatites that crosscut D4 structures have been dated at ~1.76 Ga. The interference of D3 and D4 folds has resulted in sufficient systematic structural relief in the area to allow the identification and mapping of the three principal tectonostratigraphic levels.

The presence of ultramafic and mafic intrusions in pelites and psammites of the Lake Harbour Group and Blandford Bay assemblage represent conditions favourable for the formation of magmatic sulphide mineralization. Numerous showings of massive pyrite, pyrrhotite and rare chalcopyrite have been identified by explorationists working in the project area, both associated with the sills and also as isolated horizons within the metasedimentary rocks. Serpentinized ultramafic rocks that have been identified at numerous localities in the project area may provide material suitable for carving.

DEPOSITS AND MINERAL SHOWINGS IN THE CORDILLERAN OROGEN, NORTHWEST TERRITORIES: A PRELIMINARY COMPILATION

Sterenberg, V.Z.[1], and Fisher, M.[2]

NORTHWEST TERRITORIES, Department of Indian Affairs and Northern Development,

The Foreland and Omenica Morphogeological Belts represent the Cordilleran Orogen in the Northwest Territories. Here, tectonic elements of the Foreland Belt are the Mackenzie Platform, Peel Trough, Richardson Trough, and Blow Trough. The Selwyn Basin is the principal tectonic element of the Omenica Belt where it crosses into the Northwest Territories.

Past exploration has generally been stimulated by discoveries within equivalent terranes located in the southern Cordillera, however lack of infrastructure continues to be a serious impediment to development of any deposits where current reserves exist. Settlement of Inuvialuit, Gwich'in and Sahtu land claims and 1999 division of Northwest Territories into Nunavut and Western Arctic has and will change the land use regulatory regime. The Deh Cho claim is still outstanding. In addition, increased concern for the environment has raised the profile of protected areas, in particular Nahanni National Park and the proposed Tuktut Nogait National Park. All these factors will impact on the future of exploration and development in the Cordillera.

Historically, other than placer gold taken by prospectors from the Nahanni River drainage basin, the only producer has beenCantung Mine which ceased production in 1986. In addition to W±Cu±Mo skarn-type deposits, the Omenica Belt hosts shale-hosted stratiform Pb-Zn and placer Au deposits. Sediment-hosted stratiform Cu, Mississippi Valley-type Pb-Zn, shale-hosted Pb-Zn, vein-hosted Pb-Zn-Ag, sediment-hosted Fe and kimberlite-hosted diamond deposits are found in the Foreland Belt. Potential for other deposit types exists in both these belts; most notably Carlin-type gold and intrusive-hosted gold in Omenica Belt and shale-hosted Ni-Zn±Mo-PGE in Foreland Belt.

The compilation is created in ArcView and utilizes data from NORMIN (formerly NT MINFILE), and base map and geology from GSC Map D1860, Geological Map of Canada. Proposed future work includes a more comprehensive description of deposits/showings, addition of public domain geophysical, geochemical, remote sensing and oil and gas data and a database of current regulations and land claims applicable to the area.

1. Geological Mapping Division

2. IMAG

THE LEITH ALKALINE COMPLEX AND OTHER FEATURES OF THE LEITH-FISHING LAKES AREA, SOUTHERN SLAVE PROVINCE

M.P. Stubley (Stubley Geoscience, Nelson, BC)

The Leith Lake - Fishing Lake area, centred approximately 90 km north of Yellowknife in the southern Archean Slave Province, encompasses the northwestern extent of greenschist- and lower amphibolite-facies metaturbidites of the Yellowknife supracrustal domain. Farther north, the Nardin Core Complex exposes upper amphibolite- to granulite-facies equivalents of the metaturbidites and abundant anatectic granitoids. A DIAND-sponsored mapping project was undertaken in 1997 to investigate the boundary between these two domains. Previous models had postulated a south-dipping extensional décollement at the domain boundary to account for the proximity of rocks of disparate metamorphic grade.

The carbonatite-bearing Leith Alkaline Complex (ca. 2592 Ma; M. Villeneuve, pers. comm. 1996) intrudes the boundary between the two domains and is consistent with a model of late-metamorphic extension. Re-examination of the alkaline complex has delimited its margins and greatly enhanced its known areal extent. The original 1995 discovery is now known to be exposed in a 300 x 500m area on the south shore of Leith lake (informal name). Alkaline rocks also occupy a ca. 1.3 km^2 area on the north shore of the lake, 3.5 km NNW of the southern exposure. An enhanced aeromagnetic signature joins the two exposures and suggests that the alkaline complex is continuous beneath Leith lake. However, the alkaline complex comprises different rock suites on opposite sides of Leith lake. The southern exposure is dominated by syenitic phases and numerous pods of carbonatite. The northern exposure lacks carbonatite, and consists of a central melanocratic zone surrounded by syenitic and granitic phases. The melanocratic core consists predominantly of a medium-grained biotite-hornblende rock cut by an anastomosing network of moderately dipping, generally east-west striking, Kspar-rich dykes containing minor hornblende and quartz. On weathered surfaces, the melanocratic phase exhibits a pronounced shallow east-dipping compositional layering.

The alkaline complex is intruded by a multiphase granitoid suite consisting predominantly of variably textured granite and granodiorite. The granitoid suite occupies the interface between the two metaturbidite domains and masks all kinematic information on the nature of the domain juncture. The youngest phase of the granitoid suite consists of quartz-microcline pegmatite, commonly with abundant coarse tourmaline and muscovite. Similar pegmatite forms a NW-striking dyke swarm within andalusite- and sillimanite-bearing metaturbidites in a broad zone (ca. 10 km^2) between Leith lake and northern Fishing Lake. Pegmatite accounts for up to 25% of this zone, which represents one of the most extensive pegmatite fields in the Slave Province.

The metamorphic grade of metaturbidites is transitional from cordierite-bearing upper amphibolite facies (i.e. migmatites) in the northwest map area to greenschist facies in the southeast. Heavy lichen cover in much of the area hinders bedding top determinations and, hence, the definition of regional fold traces. Broad areas with indistinct bedding are dominated by homogeneous psammite. The southeastern part of the map area, however, is dominated by well-bedded and commonly graded pelite and psammite. The high proportion of pelite and locally preserved fine to coarse-grained felsic volcaniclastic layers in the southeastern zone suggest a different depositional environment for the two parts of the map area. Significant stratabound sulphide occurrences are restricted to this southeastern zone. The contact between the two zones is indistinct and appears transitional; relative stratigraphic position is undefined.

The deformational history recorded in the metaturbidites is in accord with other areas of the Yellowknife supracrustal domain. Tight to isoclinal regional folds (F1), defined by reversals in bedding tops, are transected by the dominant north- to northwest-striking foliation (S2). Subsequent fold and fabric development is of minor regional significance. Shallowly inclined granitoid sheets intrude the metaturbidites along the western margin and in the south-central region of the map area. In these areas, bedding in the metaturbidites commonly mimics the shallow intrusive contacts; outcrop-scale recumbent folds of migmatitic layering are locally preserved.

Two regional Proterozoic faults are traced through the map area. The north-striking Rowland Fault is expressed as a prominent lineament but records only minor subhorizontal displacement. The NW-striking Morris Lake Fault transects the central map area and sinistrally displaces subvertical features (e.g. upright folds, bedding) approximately 1.2 km, in accord with previous estimates farther to the southeast. The "migmatite-in" isograd and granite/supracrustal contact in the northwest map area are, however, apparently displaced 3 - 4 km sinistrally along the same fault. As the isograd and contact are assumed to dip easterly, these observations suggest a component of NE-side-down displacement on the Morris Lake Fault. Numerous other faults are recognized in the southeastern metaturbidite zone by truncation of F1 fold hinges and incompatible bedding orientations. Kinematics of these faults are difficult to reconcile; a mosaic of polygonal fault blocks with contrasting internal geometries is the net result. Several ENE-striking diabase dykes, presumably of the ca. 2.2 Ga Dogrib swarm, transect the Morris Lake Fault, but appear to be offset (<300m) sinistrally by the Rowland Fault.

THE ORMSBY BREAK: CRUSTAL-SCALE CONTROL ON GOLD MINERALIZATION ON THE DISCOVERY PROPERTY, SOUTHERN SLAVE PROVINCE

M. Stubley (Stubley Geoscience), J. Siddle (Covello Bryan & Associates) and W. Bleeker (Geological Survey of Canada)

The Discovery Property straddles a previously unrecognized crustal-scale fault zone, the "Ormsby Break", in the southern Slave Province. Two distinct stratigraphic sequences are juxtaposed across the fault zone: the Discovery Domain to the southeast of the break is dominated by turbidites (Burwash Formation) as preserved throughout much of the Yellowknife supracrustal domain; the Ormsby Domain to the northwest is host to unusual rock types including abundant amphibole-bearing metasedimentary rocks. Extensive alteration, possibly the most intense in the Slave Province, extends 350 - 700 m northwest from the boundary of the Ormsby Domain and hinders determination of protoliths. The unusual rock units of the Ormsby Domain are considered to be predominantly altered argillite and wacke, similar to those of the Walsh Formation exposed near Yellowknife. The southeast margin of the Ormsby Domain is host to two large bodies of amphibolite (the Ormsby and Discovery mafic bodies) which have been previously interpreted as mafic to intermediate metavolcanic rocks, in accord with their andesitic bulk composition. However, features previously attributed to primary volcanic deposition are re-interpreted as artifacts of *in situ* alteration. High-precision geochemical analyses are underway to evaluate the protolith of the amphibolites.

Four deformational events are recognized on the property. The first resulted in large-scale folding of the supracrustal package, commonly without a recognizable associated foliation. The second event produced numerous outcrop-scale Z-folds of veins and locally bedding, and is responsible for the development of the dominant foliation in metasedimentary rocks. The third event is represented by strike-slip movement along the Ormsby Break during waning stages of regional metamorphism. The final Archean event produced local crenulation cleavage and is of minor regional significance.

The Ormsby Break has a prolonged and complex history of movement and alteration. Widespread synsedimentary alteration and locally preserved sedimentary breccia within the Ormsby Domain suggest deposition within an unstable environment, possibly above an early normal fault system. Juxtaposition of the two domains is interpreted to have occurred during late stages of D1 deformation along a NW-dipping reverse fault system. Subsequent sinistral displacement along the break during waning stages of syn-D3 regional metamorphism produced the Ormsby Fault Zone (OFZ). The OFZ shows geometrical similarities to positive flower structures, and records vertical displacements of fault-bound segments during bulk sinistral displacement. A "releasing bend" in the master fault of the OFZ produced an extensional duplex structure and extensive zones of dilation. The Ormsby mafic body is host to abundant extensional structures resulting from the dilation accompanying strike-slip movement, including jointing, normal faulting, and quartz emplacement. Current exploration by GMD Resource Corp. is concentrated on the shear-induced dilational veins within the Ormsby mafic body. Coarse gold is most pronounced in moderately dipping quartz veins ("Ormsby Veins") and their associated alteration haloes, but high concentrations are also encountered sporadically throughout the intervening wallrock. This contrasts with past production at the Discovery Mine which exploited saddle reef-type veins in steeply plunging F1 fold hinges in metaturbidites.

Regional maps and geophysical images suggest the Ormsby Break can be extrapolated approximately 30 km to the southwest where it meets the northern extension of the Yellowknife volcanic belt. Numerous gold prospects are located within a 2 - 4 km wide zone along the northwest margin of the break. Shear zone-hosted gold deposits at Yellowknife share kinematic and temporal similarities to those of the Ormsby mafic body; it is postulated that the Ormsby Break may be an offset extension of the Banting Break at Yellowknife.

GEOLOGICAL INVESTIGATIONS IN THE MACQUOID LAKE SUPRACRUSTAL BELT, DISTRICT OF KEEWATIN, NORTHWEST TERRITORIES, CANADA - A PROGRESS REPORT

Tella, S., Davis, W., Berman, R.G., Stern, R., LeCheminant, A.N., Sanborn-Barrie, M., and Venance, K.E. Geological Survey of Canada

The MacQuoid Lake belt is one of several NE-striking, Archean supracrustal belts within the Western Churchill Province that has a complex, Archean and

Paleoproterozoic tectonothermal history. The belt is comprised of ca 2.75 Ga mafic to felsic flows and tuffs intercalated with volcaniclastic rocks, greywacke and iron formation, intruded by ca 2.68 Ga tonalite, ca 2.61 Ga porphyritic granite, ca 2.19 Ga mafic dyke swarms, and ca 1.8 Ga granites. Polymetamorphism and at least two deformational events affected the supracrustal rocks. Structural trends are predominantly east-northeast. They represent composite fabrics developed under greenschist- to amphibolite grade tectonothermal events. D_1 structures include: a) N-NW trending S_1 cleavage which is commonly parallel to transposed S_0, b) NE-ENE-trending, moderate- to steeply-plunging (35^0-70^0) mineral lineations, and c) rare SE-verging recumbent F_1-folds. D_2 structures include: NE-trending, shallow- to moderately-plunging (15^0-35^0) F_2-folds and associated S_2 crenulation cleavage, and mineral-stretching lineations. D_1 is a late Archean (pre 2.61 Ga) event that records amphibolite facies assemblages, and it is overprinted by a D_2 amphibolite facies event which attained peak conditions during early stage D_2. The main foliation in the 2.68 Ga tonalite and 2.61 Ga porphyritic granite is parallel to S_2 in the supracrustal rocks, indicating S_2 must, in part, post-date 2.61 Ga. The 2.19 Ga mafic dykes are weakly deformed and metamorphosed as a result of ca 1.9 Ga (ion probe: monazite) tectonothermal overprint. Additional contact metamorphic effects are locally present around 1.8 Ga granite plutons.

Field relations and metamorphic textures indicate that S_1/S_0 fabrics are overprinted by an S_2 fabric. Some plagioclase-rimmed garnet porphyroblasts in metasedimentary units, which overgrew D_1 fabrics and are wrapped by S_2, suggest that D_2 outlasted garnet growth and record a pre- to syn-D_2 decompression event. In gt-st-bi-ky-plg-qz assemblages, garnets with homogeneous low CaO cores contain high CaO overgrowths which decrease in CaO towards outer rims. Thermobarometry yields peak P-T conditions of ~9 kbar and 640^0C for D_2 metamorphism. SHRIMP II ion microprobe analyses of zircon inclusions within garnet, together with other microtextural evidence suggest ca 2.50 Ga garnet-growth which, in part, involved crustal thickening and decompression during pre- or early-D_2. Termination of the D_2 event is poorly constrained between 2.5 Ga and 2.19 Ga.

References

Berman, R.G., Stern, R., Tella, S.

1997: Constraints on the nature and timing of the tectonothermal events in the MacQuoid-Gibson-Barbour Bay supracrustal belt, Northwest Territories;

Abstract, Ottwa 97, GAC-MAC Annual Meeting, Abstract vol. 22, p. A10.

LeCheminant, A.N., Tella, S., Sanborn-Barrie, M., and Venance, K.E. 1997: Geology, Parker Lake South (55M/6), District of Keewatin, Northwest Territories.Geological Survey of Canada, Open File 3405, scale 1:50 000.

Tella, S., LeCheminant, A.N., Sanborn-Barrie, M., and Venance, K.E. 1997: Geology and structure of parts of MacQuoid Lake map area, District of Keewatin, Northwest Territories; in Current Research, 1997-C; Geological Survey of Canada, p. 123-132.

Tella, S., LeCheminant, A.N., Sanborn-Barrie, M., and Venance, K.E. 1997: Geology, parts of MacQuoid Lake (55M/7,8,10), District of Keewatin, Northwest Territories, Geological Survey of Canada, Open File 3404, scale 1:50 000 (3 sheets).

THE INCOGNITA NI-CU-PGE EXPLORATION PROJECT, SOUTHWEST BAFFIN ISLAND

M. Vande Guchte, Rubicon Minerals Corporation

The Incognita Ni-Cu-PGE Project, a joint venture between Rubicon Minerals Corporation (49%) and Northstar Exploration Limited (51%), is a new nickel play on the Meta Incognita Peninsula, southern Baffin Island. The joint venture conducted extensive prospecting, geological, airborne/ground geophysical and preliminary diamond drilling on its 1.5 million acre land position on southern Baffin Island in search of komatiite-associated nickel deposits. The region is underlain by Paleoproterozoic metasedimentary rocks containing komatiitic to tholeitic and locally alkalic mafic to ultramafic flows and/or sills. This Paleoproterozoic sequence, consisting of the Lake Harbour Group and the Blandford Bay Assemblage, is approximately 200km north of the Cape Smith belt of northern Québec. The Rubicon-Northstar joint venture ($5.0M expended to date) and recent GSC mapping (1995-1996) have established the southern Baffin Island area as a new a and significant Paleoproterozoic komatiite terrain on the margin of the Superior craton. These belts are rare on a worldwide basis and host nickel deposit districts such as the Thompson Nickel Belt, Manitoba (89Mt @ 2.50% Ni, 0.13% Cu) and Raglan, Quebec (18Mt @ 3.13% Ni, 0.88% Cu).

Exploration by the Rubicon-Northstar joint venture has led to the discovery of numerous massive sulphide showings within komatiitic rocks, at mafic-ultramafic and metasedimentary interfaces, and within metasedimentary rocks. Encouraging results include up to 28m of >10% to 80% pyrrhotite +/- chalcopyrite, and local niccolite in mafic host rocks. Surface and diamond drill core samples yield elevated values of Ni, Cu, Au, Pt, Pd, and Co.

Exploration results to date validate the geological environment as a new and permissive ultramafic belt for komatiite-associated nickel deposits.

STRATABOUND ZN-PB MINERALIZATION OF THE ESKER HORIZON, PALEOPROTEROZOIC ROCKNEST FORMATION, WOPMAY OROGEN, CANADA

Nawojka M.Wachowiak, University of Toronto; Peter K.Gummer, Rhonda Mining Corporation, Calgary; Mike Pope and John P. Grotzinger, MIT-EAPS

The Esker Project Zn-Pb deposit is part of the Epworth property, owner jointly by Rhonda Mining Corporation and Noranda Mining and Exploration Inc. The property is located approximately 50 miles south of the Arctic coast, 80 miles southeast of Kugluktuk and 255 miles north of Yellowknife, and occurs in the Rocknest Formation.

The Rocknest Formation, Wopmay Orogen, N.W.T., Canada is a Paleoproterozoic (1.89 Ga) carbonate platform formed during thermal cooling of a passive continental margin. It forms an eastward-thinning prism, 300 - 1,100 m thick, extending for over 220 km parallel to strike, and over 200 km perpendicular to strike. It exhibits strong paleogeographic zonation including, from west to east, slope, outer-shelf reef, evaporitic shoal complex, and lagoonal inner shelf facies. The Esker Zn-Pb deposit occurs in rocks of lagoonal inner shelf facies. Lagoonal facies are meter-scale, peritidal shallowing upward cycles formed by episodic progradation of shoal complex facies over subtidal facies. Individual cycles are correlatable over the extent of the Rocknest Formation.

Small scale cycles probably formed in response to eustatic oscillations in sea level and each cycle represents an event of transgression, followed by progradation of the evaporitic shoal complex over an increasingly restricted (evaporitic) lagoon. Generally, cycles area few meters thick and involve simple transitions from lagoonal dolosiltites passing up into simple domal stromatolites, which in turn are capped by restricted tidal flat tufas. However, in two specific cases, cycles are anomalously thick (>10 m) and the stromatolitic unit is marked by large fenestral and thrombolitic stromatolites enveloped by Conophyton stromatolites. The two conophyton bearing units are basin wide stratigraphic markers, located at the top of the Lower and Middle members and divide the Rocknest Formation into three members.

Conophytons are cone-shaped, columnar stromatolites formed by communities of microorganisms and inorganic early marine cement. Individual conophytons are 0.1 to 20 cm in length and have diameters of up to 2 cm. The conophytons in the Rocknest Formation favor growth atop fenestral and thrombolitic domal stromatolites forming distinct biohermal colonies and reefs in a radiating finger-like morphology, collectively creating their own primary domal topography, while retaining primary, intercolumn porosities of up to 20%. Massive colonies of conophyton bioherms form when networks of fenestral, thrombolitic and conophyton stromatolites coalesce. Collective bioherms at the Esker deposit have developed elongate domal morphologies, possibly reflecting prevailing wind conditions, with long axes up to 4 times the widths (ie: 60m X 15 m), and a thickness of up to 10 meters. The peaks and troughs of the upper coalesced bioherms develop specific wavelengths of 5-15 m between bioherms. Under favorable conditions the collective bioherms themselves coalesce to form massive reefs.

The stratabound Esker deposit occurs in the conophyton stromatolite cycle at the top of the middle member of the Rocknest Formation. The base of the cycle is a flat small scale disconformity developed on a 0.5 m thick cryptalgal laminite. This is overlain by a unit of interclastic packstone and dolosiltite (1m). The dolosiltite grades into a dololutite/dolosiltite (1.5m) unit which in turn is capped by cryptalgal laminite or silicified flat fenestral stromatolite (1m). The fenestral unit becomes domed upsection with up to 30 cm of relief. Overlying the fenestral stromatolite unit is the principle Zn-Pb sulfide bearing horizon, up to 10 meters in thickness, of silicified coalesced domes of fenestral and thrombolitic stromatolites, each enveloped by conophytons. The stratigraphic hanging wall of the mineralized horizon consists of thickly laminated dolosiltites and lutites, infilling the biohermal depressions and marking the base of the next eustatic cycle.

The Esker Zn-Pb deposit is largely controlled by the lateral extent as well as the overall shape and size of the conophyton bioherms. However sphalerite and galena does occur in the fenestral foot wall, as well as up to 10-15m in to the hanging wall. Mineralization has also been encountered locally in columnar fenestral bed of a separate cycle located 20 m stratigraphically below the main mineralized horizon.

Within the mineralized biohermal horizon, the primary textures have been largely replaced by a buff white chert believed to be associated with mineralizing fluids. Dissolution and collapse breccias occur in the cores of some of the larger bioherms creating a high secondary porosity. The Zn-Pb mineralization is coarse grained infilling both the primary and secondary porosity within the conophyton horizon. The mineralization consists of galena, honey colored sphalerite, and very minor amounts of chalcopyrite and pyrite.

The Esker deposit has been folded into a series of gently south plunging synforms and antiforms thus creating the opportunities for various mining methods. Thrust and high angle normal faults in the area have allowed for repetition of the favorable stratigraphic sequence. In the field, a strong spatial correlation has been observed between the mineralized horizon and right lateral strike-slip, northeast trending D4 faults. D4 faulting is frequently associated with coarse grained, mineralized (Cu, Pb) quartz veins. The relationship between the quartz veins and the mineralization is being investigated further with the use of fluid inclusion analysis.

A large scale Zn:Pb metal zonation has been observed within the Esker deposit. Ratios of Zn:Pb vary from less then 0.1:1 in the SE and up to 5:1in the NW of the deposit. Using the Kupfershifer deposit as an analogue the increase in the Zn:Pb ratio implies a flow path for the mineralizing fluids from the SE to the NW.

Currently, the stratabound mineralization in the Esker horizon has been interpreted to have formed as the result of large volumes of metalliferous brines moving upwards through D4 fault conduits. The brines subsequently moved laterally through the conophyton horizon, utilizing both primary and secondary porosity. Precipitation of the sulfides occurred upon the reaction of the brines with the reducing environment of the conophyton horizon. Preliminary fluid inclusion studies of the Esker sulfide forming fluids yield salinity's averaging 21wt% NaCl equivalent with a minimum precipitation temperature of 100 to 150 C. Thus the preliminary fluid inclusion chemistry is consistent with an MVT style of mineralization for the Esker horizon.

The Esker 1997 spring/summer drill program completed 114 drill holes and 7905 m of drilling over a 12 X 8 km area. Mineralization was intersected in 110 of the holes. The average grade/true width of eighteen 1996 drill hole intercepts is 7.1% combined Zn/Pb over 2.95 meters. Based on the 1997 field season and drilling program, Rhonda Mining Corporation has outlined a geological resource of a 100 million tons at the Esker property. The original pre-erosion Esker deposit is estimated to have contained in excess of 200 million tons. The possibility of discovering other base metal deposits with these dimensions has justified Rhonda's ongoing exploration in the Epworth basin.

WESTERN CHURCHILL AND SLAVE NATMAP PROJECTS - GIS PROGRESS REPORT

Lori Wilkinson, Jeff Harris and John Broome; Geological Survey of Canada

Paul Budkewitsch, Canada Ccentre for Remote Sensing

The Geological Survey of Canada's (GSC), GIS (Geographic Information System) activities in the North are concentrated within the NATMAP (National Mapping Program) sponsored Slave Province (62-69° N latitude and 104-116° W longitude) and Western Churchill Province (60-68° N latitude and 90-104° W longitude) projects, located in the Northwest Territories (Figure 1). Both projects exemplify the cooperative, multi-agency and multi-disciplinary goals of the NATMAP program. Elements of the GIS component of NATMAP projects include:

- Compilation
- Achiving
- Distribution of a digital geoscience database
- Transfer of GIS technology to the mining, exploration and academic communities
- Practical demonstration of GIS analytical abilities to solve specific geologic problems.

Data visualization, integration and analysis techniques available in the GIS will aid in the creation of a new, more complete tectonic understanding of both the Western Churchill and Slave Provinces, which will help the exploration community by defining favourable mineral deposit environments.

GIS activities in the Western Churchill NATMAP are centered around the fundamental need for compilation, archiving and distribution of existing digital data. A current summary of the status of data compilation is available on the World Wide Web (see http://gis.nrcan.gc.ca/natmap/). It is anticipated that a CD-ROM release of existing digital data will occur in late 1998.

Although NATMAP work in the Slave Province is winding down, GIS is continuing to play a strong role in managing the digital data through the maintenance of an archive and the continued distribution of digital data to project participants. To date, two CD-ROM's of data from the Slave Province NATMAP project have been released. A third CD-ROM of unreleased GSC data is planned, as is a digital compilation atlas of the Slave Province.

Spatial analysis using the GIS integral to developing, testing and producing new visualization techniques, finding new relationships between disparate data types and predictive modelling of deposit types. A primary concern in this work is always the quality, quantity and availability of the necessary data. In the Slave Province, the diamondiferous Lac de Gras area is covered by two geochemical surveys of differing ages, sampling media (lake sediment vs. till) and analytical techniques. Evaluation of the differences between two sets of data can be aided by the use of GIS, which allows both spatial and statistical relationships to be quantified and visualized.

Possible sources of error in the geochemical data can be divided into several key areas:

effects of analytical precision (split duplicates, control samples)

1) effects of analytical method variations (INAA vs. XRF vs. ES)
2) effects of disparate sources (source 1 XRF vs. Source 2 XRF)
3) effects of media (lake sediment vs. till)
4) effects of fraction (-250 mesh vs. -63 mesh)

Preliminary work suggests analytical precision can be problematic but data are often screened for this type of problem before release. The remaining variables each affect the identification of anomalous populations and therefore may lead to the generation of "false" anomalies and obscure "true" anomalies. Since underlying bedrock lithologic variation could contribute to anomalies in overlying till, till chemistry was normalized (average bedrock values of underlying lithology subtracted from overlying till value) to bedrock chemistry. Removal of the bedrock component in the till/lake sediment chemistry populations increased spatial correlation of anomalies from different sources and analytical methods. This suggests that despite glacial transport of the till and lake sediment material, underlying bedrock is a strong contributor to till/lake sediment chemistry and can lead to the detection of "false" anomalies. A "weights of evidence" technique will be used to test if these remaining, bedrock-normalized anomalies are spatially related to known kimberlite pipe locations.

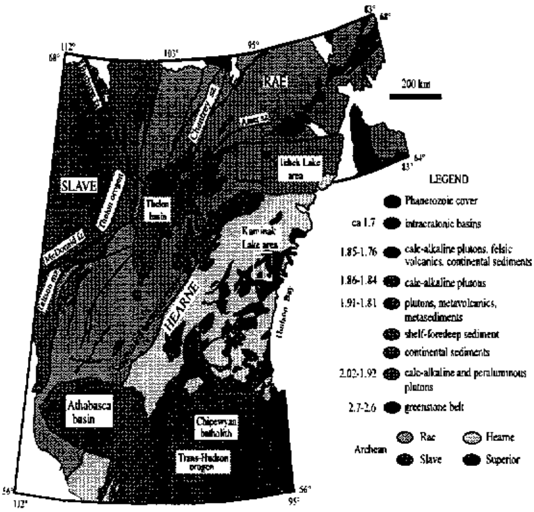


Figure 1: Generalized geology of the Churchill (Rae and Hearne) Province (Hoffman, 1898). Main study areas, Tehek and Kaminak Lake are shown in black and white boxes, repectively.

Initial investigative efforts for the Western Churchill NATMAP project center on the evaluation of remotely-sensed imagery (Landsat-TM, Landsat-MSS, RADARSAT-1) for base map generation, outcrop delineation and geologic mapping. In the Woodburn area where 1:50 000 hydrographic data is not available, lakes were readily extracted from both Landsat-TM and RADARSAT-1 data. Limitations in using remotely sensed data include cloud cover which obscures lakes in Landsat-TM imagery and high winds which can make lakes difficult to distinguish from land when small incidence angles are chosen with RADARSAT-1 data. Both Landsat-TM and RADARSAT-1 data proved to be useful discriminators of outcrop distribution. Bright areas on RADARSAT-1 indicate high signal return from rough surfaces, such as outcrop, while low signal returns usually correspond to smoother surfaces, such as drift covered terrain or lakes. False-colour composite images were used to define areas of outcrop in Landsat-TM imagery.

Preliminary examination of RADARSAT-1 stereo pairs over the Kaminak Lake area of the Western Churchill suggest that stereo pairs are of limited use in regions where relief is low (on the order of 200 meters over the area examined), even when large differences in incidence angles are chosen to ensure maximum vertical exaggeration of the terrain. Although the data were both collected in early summer (June 22 and July 4), different weather conditions made stereo pair viewing difficult. In the July 4 image, lakes are virtually indistinguishable from land due to high wind at the time of data collection. This necessitated using lakes from Landsat-TM to mask out water in the RADARSAT-1 image and increase contrast of land features. Little in the way of bedrock structure is visible due to a lack of differential erosion and/or differences in surface roughness amongst the various bedrock units in the area.

WESTERN CHURCHILL NATMAP: AN OVERVIEW

L. Wilkinson1, S. Hanmer1 and C. Relf2.
Geological Survey of Canada
Geology Division, Indian and Northern Affairs

The Western Churchill NATMAP project is a collaborative, multidisciplinary, multi-agency initiative involving the Geological Survey of Canada (GSC), the Government of the Northwest Territories (GNWT), and Indian and Northern Affairs Canada (INAC). The principal objective of the Western Churchill NATMAP project is to provide modern geological maps of late Archean greenstone belts in a part of the Canadian Shield with great mineral potential, but lacking an adequate geoscientific infrastructure. The maps will underpin an enhanced geoscience knowledge base of the scale and scope required to formulate a predictive framework for crustal growth, tectonic evolution and mineral potential, and the establishment of environmental baselines for the western Churchill Province.

Seven integrated multidisciplinary objectives are central to this initiative: (1) Establish the tectonostratigraphy and tectonic settings of the late Archean greenstone belts. (2) Determine the extent, nature and significance of Paleoproterozoic tectonothermal events. (3) Investigate the evolution of the late Archean and Paleoproterozoic subcontinental mantle and lower crust. (4) Identify the fundamental (plate?) tectonic boundaries. (5) Decipher the relationship of the mineral wealth to regional geology and tectonic history. (6) Track the Quaternary history of the Keewatin Ice Divide. (7) Develop an accessible digital geoscience knowledge base using GIS technology.

HIGHLIGHTS:

Bedrock mapping was undertaken in 1997 in three targeted areas:

Heninga-Kaminak-Quartzite lakes (S. Hanmer et al., GSC,), Yathkyed Lake (D. Irwin, GNWT and C. Relf, INAC) and Angikuni Lake (L. Aspler and J. Chiarenzelli, INAC). The Archean Kaminak Group appears to contain relics of a volcano-plutonic arc in the Heninga-Kaminak-Quartzite lakes area. The tectonic setting of the arc is the subject of ongoing petrological and geochronological study. Two gravimetry transects were measured acrossthe Kaminak greenstone belt. The raw data suggest that the northern boundary of the steeply dipping volcanic pile is not vertical, but dips to the southeast. The Yathkyed greenstone belt appears to be overturned, and underlain on its eastern side by a polyphase shear zone. The timing of initial dip-slip and later oblique strike-slip movements will be constrained by geochronological studies. In the Angikuni Lake area, Archean greenstone belt rocks and higher grade gneisses are juxtaposed across plastic to cataclastic shear zones which appear to form a three-dimensional anastomosing network. The shear zones are similar in appearance to the local segment of the Snowbird tectonic zone (STZ), which may not represent a major structural break. A preliminary date of ca. 2610 Ma (B. Davis, GSC) on a synkinematic granite indicates that at least some of the shearing is coeval with the main events along the STZ to the southwest.

These results complement GSC bedrock mapping in the Meadowbank-Tehek (Zaleski et al., GSC, Current Research 1997) and Gibson-MacQuoid areas (Tella et al., GSC, Current Research 1997) undertaken in 1996. The Gibson-MacQuoid greenstone "belt" comprises two belts, the one dominated by volcanic rocks, the other by clastic sediments. Initial SHRIMP geochronology has highlighted the potential existence of a ca. 2.5 Ga middle amphibolite facies tectonothermal event (R. Berman and R. Stern, GSC; GAC-MAC 1997), and deformation of ca.2.2 Ga mafic dykes indicates the presence of Paleoproterozoic shear zones of uncertain extent. In the Meadowbank-Tehek area, the Woodburn Lake Group is deformed about regional F1 folds associated with map-scale shear zones. Preliminary geochronological results indicate two periods of volcanism in the Woodburn Lake Group, the younger of which (ca. 2710 Ma; see Zaleski et al., this meeting) is only slightly older than published ages from greenstone belts to the south (see also Tella et al, this meeting). Extensive, Quaternary mapping and fieldwork were undertaken by the GSC in the Kaminak Lake, Yathkyed Lake and Meliadine areas in 1997. A history of multiple generations of ice-flow indicators was established in the vicinity of the Keewatin Ice Divide. A "Metals in the Environment" (MITE) project was initiated to study the distribution and possible source of mercury in lake water. Field work related to the mineral deposit/metallogenic component of the NATMAP was undertaken in the Kaminak, Woodburn and Yathkyed belts.

The GSC will shift the emphasis of its fieldwork efforts northward, following through with bedrock mapping initiated in the Gibson-MacQuoid and Meadowbank-Tehek areas. Quaternary mapping and fieldwork will focus on the MacQuoid Lake area, and continue in the vicinity of Meliadine.

GNWT and INAC will pursue bedrock mapping in the Yathkyed and Angikuni lakes areas. Geochronological and petrological studies will continue to be integrated with the bedrock field program in order to elaborate and test tectonostratigraphic models. In addition, a new SHRIMP initiative will be proposed to identify and trace the distribution of potentially voluminous late Archean (ca. 2.6 Ga) and Paleoproterozoic (ca. 1.8 Ga) granitoids in the poorly exposed terrain between the Kaminak and MacQuoid project areas.

Geophysical field experiments, using teleseismic and magnetotelluric methods, will be deployed in 1998 to image the three-dimensional expression of the STZ in its Chesterfield Inlet segment. These experiments will also yield valuable information regarding the crustal and lithospheric structure of the adjacent parts of the Hearne and Rae domains. Preparation of a CD-ROM release of archived, compiled and current data continues to be a priority for the Western Churchill NATMAP project.

In keeping with the spirit of NATMAP, a field workshop was hosted by GSC in the Kaminak Lake area. A similar field workshop is planned for 1998, either in the Yathkyed Lake area, or between MacQuoid Lake and Chesterfield Inlet.

USING GIS TO EXTRACT HYDROGRAPHIC INFORMATION FROM OPTICAL AND RADAR DATA IN CANADA'S NORTH

Lori Wilkinson, Geological Survey of Canada

Paul Budkewitsch and Marc D'Iorio, Canada Centre for Remote Sensing

In many remote regions, particularly Canada's North, digital National Topographic Series (NTS) map information at 1:50 000 scale is not available. Substitution for smaller scale (1:250 000) information results in spatial discrepancies up to several 100 meters between the location of geologic features and the digital base map, which are particularly evident where the data are later combined with 1:50 000 scale information. To circumvent this problem we evaluated the use of optical data such as Landsat-TM and -MSS, and microwave data such as C-band airborne radar from the Canada Centre for Remote Sensing and RADARSAT-1 data to generate hydrographic base maps. The study area lies in the Kaminak - Tehek Lake region of the Northwest Territories where geological map revision, under the Western

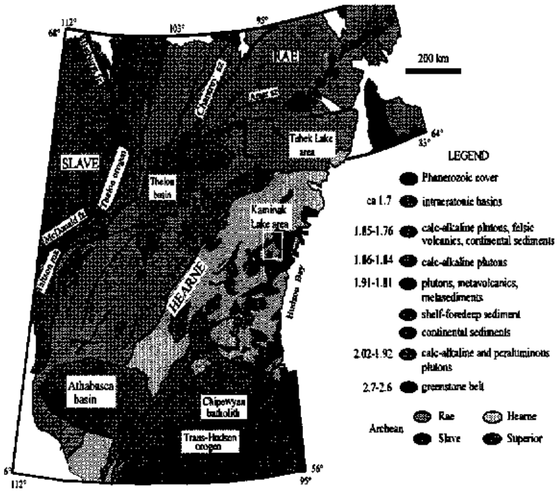
Churchill NATMAP (National Mapping Program) project, is currently in progress (Figure 1). The new hydrographic maps are registered and were used as an alternative to digitized 1:50 000 scale information in the field and in the production of final published maps.

THE LAKE EXTRACTION PROCEDURE IS OUTLINED IN THE FLOW CHART OF FIGURE 2 AND IS SUMMARIZED HERE.

Step 1 is to determine an approximate threshold to separate land from water by examination of the image histogram. A threshold value is selected in order to separate land from water and is used to classify the image (Figure 3). Pixels values near the threshold value usually represent "mixed" land and water pixels, such as shorelines, thus the threshold value chosen affects the shape of final waterbodies. For example, a threshold set too low may not recognize near-shore areas or shallow lakes as water features, but often does not misclassify shadows (caused by clouds) as waterbodies. A threshold set too high, on the other hand, may misclassify swampy or flooded areas and cloud shadows as waterbodies (Figure 3). These "false lakes" can, however, be removed through later data editing.

Step 2 involves the vectorization of the bitmap in a GIS (Geographic Information System). The editing tolerance parameters are critical in this process. If not enough vertices are created, the resulting vector map may have a very angular appearance (Figure 4). A large number of vertices creates a smoother lake outline, but at the cost of a larger data volume. The editing tolerances also affects the minimum size of the lakes ultimately preserved (Figure 4). This is advantageous since many small waterbodies in the vector data can be automatically eliminated.

Results indicate that lakes extracted from properly geocoded (i.e. using 1:50,000 hardcopy NTS topographic sheets for ground control point collection) Landsat-TM and RADARSAT-1 data are as spatially accurate as lake boundary locations obtained by manual digitization of NTS map sheet information. It must be noted however, that although the ca. 25 m resolution of Standard beam RADARSAT-1 data has the potential for lake extraction, orthorectification (requiring an appropriate resolution DEM) of the data is necessary to improve spatial accuracy. Without



'igure 1: Generalized geology of the Churchill (Rae and Hearne) Province (Hoffman, 1898). Main tudy areas, Tehek and Kaminak Lake are shown in black and white boxes, repectively.

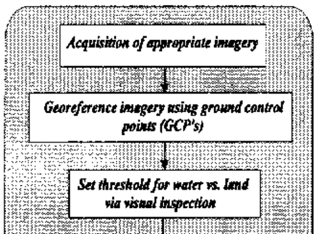


Figure 2: Flow chart summary of vector drainage extraction proceedure from remotely-sensed imagery.

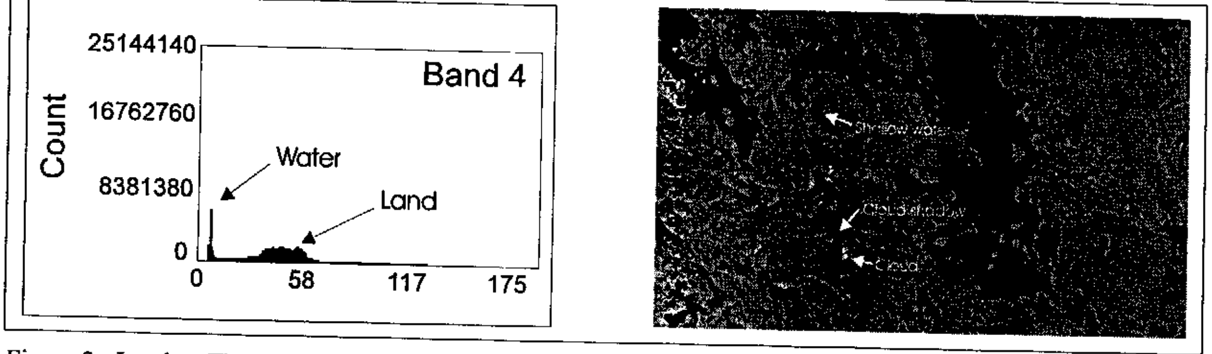


Figure 3: Landsat-TM Band 4 histogram. Water data form cluster at low end of histogram, land at high end.

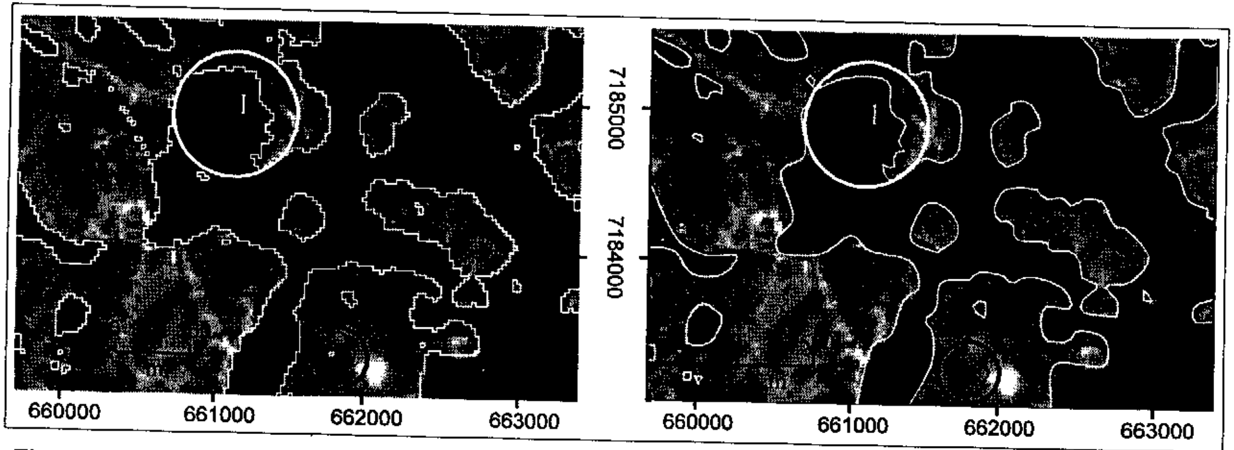


Figure 4: Comparison of vectorization tolerances and their effects on the resultant vectors extracted from remotely-sensed imagery. Left shows stair-step from two few vertices, right shows smooth vectors using many more vertices.

orthorectification, there is an additional relative positional error in lake locations which is roughly equivalent to the difference in elevation between the mean elevation and that of the lake level, for incident angles of about 45 degrees.

The difficulty with utilizing remotely sensed data for performing lake boundary extraction is due mainly to unfavorable weather conditions during data acquisition. In optical data sets, cloud cover obscures land and creates areas of shadow. C-band radar easily penetrates cloud cover, however the effect of wind stress on water causes high backscatter and the distinction between lakes and land is difficult. Lake ice also has high radar backscatter and for these reasons a simple classification of land and waterbodies based on low and high backscatter was not possible in the radar scenes examined. For optimal distinction between waterbodies and land masses in radar images, data should be acquired during ice-free conditions, using the highest radar incidence angle in order to reduce the effects of backscatter due to surface waves. These environmental effects emphasize the need for the continued maintenance of good archival data from Landsat and other Earth-imaging satellites.

Base map extraction from satellite images, Landsat-TM in particular, is rapid and provides valuable ancillary terrain information. It must be noted however, that the satellite imagery examined was not capable of providing all the information normally available on digital NTS 1:50 000 scale maps, such as drainage networks, elevation contours, and cultural features. Landsat-MSS data, with a ground resolution of 80m, are similar in accuracy to digital 1:250 000 scale available from *Geomatics Canada*, but are not recommended for creating digital base maps at 1:50 000 scale.

When choosing between optical and microwave imagery, the value of ancillary terrain information provided by the data should also be considered. Landsat-TM can be useful for mapping surficial patterns and alteration in bedrock, while microwave data such as RADARSAT-1 may be more useful for mapping structures. Evaluation of the value of RADARSAT-1 and Landsat-TM data in support of geologic mapping efforts in the far North is currently underway.

CAMSELL LAKE PROJECT

N.W.T.

Winspear Resources Ltd.

INTRODUCTION

The Camsell Lake Project is a joint venture between Winspear Resources Ltd. (57.3%), the operator and Aber Resources Ltd (42.7%). The Camsell Lake property comprizes 277,360.6 acres, is located 220 km northeast of Yellowknife, N.W.T. and has been explored for diamonds since 1993.

GEOLOGICAL SETTING

The property is situated within the Slave Structural Province, an Archean segment of the North American Craton. The Slave Structural Province, a granite – greenstone – turbidite terrain encompasses approximately 213,000 sq. km (Padgham and Fyson, 1992) and includes a number of turbidite – filled supracrustal basins and associated volcanic belts, remnants of pre-existent granite crustal rocks, and numerous later granitoid intrusives (Padgham and Fyson, 1992). The volcanic – turbidite sequences comprise the Yellowknife Supergroup and return age dates in excess of 2.8 Ga to younger than 2.6 Ga.

Recent seismic tomography studies suggest the presence of cool mantle roots (Anderson et al, 1992) beneath the Slave Craton, indicating a classical setting for diamondiferous kimberlites. Proterozoic diabase dyke swarms cut the Slave supracrustal sequence including the dominant north northwest trending Mackenzie swarm (1.27 Ga).

EXPLORATION METHODS AND RESULTS

Since 1993, exploration activities including prospecting, surficial geological studies, basal till sampling, airborne and ground magnetic, and multifrequency electromagnetic and gravity surveys and diamond drilling have been undertaken on the Camsell property. To date in excess of 3,500 till samples have been collected and processed, approximately 13,300 line-km of reconnaissance and detailed airborne geophysical surveys, and a further 290 km of detailed ground geophysical surveys have been completed.

A total of 179 NQ diamond drill holes have tested a wide variety of targets on the Camsell property.

These exploration activities have resulted in the discovery of two diamondiferous kimberlite pipes, CL25 and CL174 located near the eastern property boundary. Both pipes responded positively to a HLEM survey and a basal till sampling survey. The indicator mineral suite is characterized by abundant pyropes, picro-ilmenites, chromites and occasional chrome diopsides, and has been identified as extending 50 km down-ice from the pipes.

Extensive basal till sampling, prospecting, and airborne and ground geophysical surveys have identified a prospective kimberlite area at Snap Lake located in the northwest corner of the Camsell property. Kimberlite boulders discovered on the northwest shore of Snap Lake resulted in the recovery of 143 diamonds from 34 kg of kimberlite including 33 macro diamonds. In this area, 20 diamonds were recovered from 7 till samples and an additional 8 diamonds were recovered from a green clay pit believed to represent weathered kimberlite. Thirteen kimberlite dyke intersections in this area resulted in the recovery 401 diamonds from 137.1 kg of kimberlite core. The kimberlite intersections are believed to represent a narrow body from one to three metres thick, dipping gently to the east.

A geophysical magnetic target was drill tested on the east shore of Snap Lake and resulted in the intersection of a complex diamondiferous kimberlitic breccia overlain by approximately 100 metres of granite and granite breccia. Sediments within the granite breccia were found to contain micro fossils of Tertiary age.

In 1997, basal till sampling and prospecting identified an indicator mineral train and widespread kimberlitic debris on the south shore of Snap Lake. A total of 290 kg of kimberlite boulder material was collected from 4 separate sites within the train. The size (to 50 cm in length) and angularity of these boulders is consistent with a proximal source which field evidence suggests is in Snap Lake. Approximately 600 m up-ice from this area, four drill holes intersected kimberlite breccia dykes in 1996. A total of 23 diamonds were recovered from 11.8 kg of kimberlitic core submitted for caustic fusion.

Exploration success, on the Camsell Lake property, has been achieved by means of an integrated program of sampling, prospecting, geophysical surveying and geological studies. An aggressive exploration program is planned for 1998 focusing on the Snap Lake area and the vicinity of CL25/CL174.

REFERENCES

Anderson, D.L., Tanimoto, T. and Zhang, Y. 1992. Plate Tectonics and hotspots: The third dimension. Science, V. 256, p. 1645-1651

Padgham, W.A., Fyson, W.K. 1992: The Slave Province: A distinct Archean craton; Can. Jour. Earth Sci., Vol, 29, p. 2072-2086

ULU GOLD OCCURRENCE- UNDERGROUND EXPLORATION PROJECT

Lara Woodhouse

Echo Bay Mines Ltd.

The Ulu gold occurrence is located above the Arctic circle, approximately 525 kilometres north of Yellowknife. The deposit is situated in the southwestern portion of the High Lake Volcanic belt, within the Archean Slave Structural Province.

The main showing on the property, the Flood zone, was discovered by BHP Minerals in 1988. They performed surface exploration on the property until 1995 at which time the gold rights were sold to Echo Bay Mines.

Since acquisition of the property in 1995, Echo Bay Mines has carried out 3400 meters of diamond drilling into the Flood zone from surface. A decline running parallel to the mineralized zone has been driven to a depth of 155 meters below surface, with five crosscuts into the mineralized veins. An additional 16 000 meters of drilling was preformed from underground, its primary target being a block of ore 350 meters in length at a depth of 100 to 250 meters below surface.

The focus of the geological work performed since 1995, has been to better define the mineralization and to use this information to produce an ore body model from which a mine design may be generated.

The ore body lies within a mafic metavolcanic unit along the western limb of a regional anticline. Volcanics are bounded by an underlying metasediment unit and overlying mafic intrusives, they are cut by post-mineralization diabase and quartz-feldspar porphyry dikes. At present fourteen individual auriferous quartz veins have been modelled extending across the basalt unit for a strike length of 450 meters.

Vein orientations vary slightly from one another, have a general orientation of 109° and dip steeply to the southwest. Individual veins pinch and swell, and are definable along strike lengths up to 250 meters. The veins plunge down the western limb of the anticline and are presently open at depth. Individual veins range in thickness from two to eight meters and collectively span across widths of up to 65 meters.

Gold at Ulu occurs within quartz veins and associated zones of strong calc-silicate alteration, often occurring within altered wallrock fragments. Mineralization of the gold appears to be post-deformational, it is fine grained with common visible specks and displays a strong association with fine grained matted crystals of acicular arsenopyrite. Lesser amounts of weakly magnetic pyrrhotite and fine grained pyrite is also common.

Grade across the veins is erratic, commonly reaching peaks of 30 to 50 grams per tonne over true widths of one to three meters. The average grade over typical intersections is 12.78 g/t.

Using all available data, the ore body model indicates an undiluted resource of 1.36 million tonnes. The density of sampling throughout the veins is not sufficient to accurately determine a reserve. At present, development activity at the Ulu site has been suspended and a feasibility study is in progress.

PRELIMINARY RESULTS OF MAPPING, STRUCTURAL STUDIES AND GEOCHRONOLOGY IN THE ARCHEAN WOODBURN LAKE GROUP, WESTERN CHURCHILL PROVINCE

E. Zaleski, W.J. Davis, and J.A. Kerswill
Geological Survey of Canada, Ottawa

The Woodburn Lake group in the Rae terrane north of Baker Lake comprises an assemblage of Archean quartzites, komatiites, iron-formation, felsic to intermediate volcanic rocks and derived sedimentary rocks. It forms part of a semicontinuous zone of Archean supracrustal rocks characterized by quartzites and komatiites that extends northeasterly for at least 1000 km. The Archean rocks lie close to deformed Paleoproterozoic sedimentary sequences, and distinguishing Paleoproterozoic and Archean quartzites and the timing ofdeformation in Archean rocks are fundamental geological problems throughout the region.

The Woodburn Lake group lies 25 km southeast of the Paleoproterozoic Amerfold-and-thrust belt (Patterson, 1986). The Amer group unconformably overlies ca. 2610 Ma massive to weakly foliated basement granite (LeCheminant and Roddick, 1991), whereas granites of similar age that intrude the Woodburn Lake group were interpreted by Roddick et al. (1992) as late kinematic with respect to the major deformation events recorded by the Archean rocks.

The Woodburn Lake group can be broadly subdivided into: 1) mature sedimentary rocks including orthoquartzite, interbedded ferruginuous slate and oligomictic conglomerate; 2) ultramafic and mafic rocks comprising komatiites, basalts and derived schists; 3) chemical sedimentary rocks, primarily oxide- and sulphide-facies iron-formation, but also carbonate-facies and silicate-facies; 4) felsic to intermediate volcanic rocks, mostly crystal tuffs, lapilli tuffs and breccias; and 5) greywackes and slates in part dominated by volcanogenic detritus (Zaleski et al., 1997a, b). The iron-formation is host to significant gold mineralization at the North Portage, Third Portage and Goose Island prospects. The stratigraphic sequence and, in particular, the relative ages of quartzites, komatiites and other volcanic rocks are uncertain. Previous workers interpreted the quartzite as a platformal sediment overlying komatiites and volcano-sedimentary rocks, and oligomictic conglomerate as a basal conglomerate underlying quartzite (Ashton, 1988).

Our field observations suggest that at least some volcano-sedimentary rocksstratigraphically overlie quartzites. Evidence for this relationship includespossible quartzite clasts in debris-flow deposits and local transitions fromoligomictic conglomerate to coarse grained quartz-rich wackes which, in somecases, apparently contain quartzite pebbles. The clasts in oligomicticconglomerate along many quartzite contacts with volcano-sedimentary rocksconsist almost exclusively of rounded quartzite and vein-quartz clasts,suggestive of a basal conglomerate developed on older quartzite. The presenceof quartzite clasts implies that the quartzite was lithified before erosion andincorporation into overlying sediments.

U-Pb dating of detrital zircons in quartzite shows a range of ages from 2.81 to3.0 Ga, with a cluster around 2.95-2.97 Ga. The youngest grain constrains theage of sedimentation to <ca. 2.81 Ga. The zircon population is dominated byprismatic multifaceted grains showing little evidence of abrasion, and there isno correlation between morphology and age. These features suggest that thequartzite could represent a chemically mature, but texturally immature sedimentsuch as might be derived from intense chemical weathering, and that depositionwas not in a high energy platformal environment (e.g. Chandler, 1988).

Northeast of Third Portage lake, felsic volcanic rocks associated with adebris-flow deposit (containing quartzite? clasts) have an age of ca. 2710 Ma.This age is significantly younger than 2798+24/-21 Ma dacite porphyry northwest of the Meadowbank River (Tella et al., 1985), and >ca. 2740 Ma titanite in dacite porphyry north of Whitehills Lake (Roddick et al., 1992), and implies that there are at least 2 ages of volcanic rocks in the Woodburn Lake group.The results thus far do not constrain the relative ages of quartzite and theolder volcanic rocks.

Three generations of ductile fabrics and structures can be recognized onoutcrop-scale, but north of Third Portage lake, the map pattern is dominated by first generation folds (F1) to which the dominant schistosity (S1) has an axial planar relationship. Several high strain zones that attenuate the limbs of folds and are parallel to the dominant schistosity are associated with the first deformation (D1). In high strain zones, the orientations of planar and linear fabrics are similar to orientations reported by Patterson (1986) for thrust-related fabrics in the Amer belt. In order to bracket deformation, we have dated a foliated (S1) quartz-feldspar porphyry dike that intrudes quartzite, and a foliated (S1) granite that intrudes volcanic rocks on the eastern margin of the Woodburn Lake group. The quartz-feldspar porphyry and the granite gave ages of ca. 2620 Ma and ca. 2610 Ma, respectively. The ages of the foliated intrusions, and the similarity in structural style and fabric orientations, support a Paleoproterozoic regional tectonic event that affected both the Woodburn Lake group and the Amer group.

Ashton, K.E., 1988; unpublished Ph.D. Thesis, Queen's University, Kingston.

Chandler, F.W., 1988; Sedimentary Geology 58, 105-126.

LeCheminant, A.N., and Roddick, J.C., 1991; in Radiogenic Age and Isotopic

Studies: Report 4, Geological Survey of Canada, Paper 90-2, 91-99.

Patterson, J.G., 1986; Canadian Journal of Earth Sciences 23, 2012-2023.

Roddick, J.C., Henderson, J.R., and Chapman, H.J., 1992; in Radiogenic Age and Isotopic Studies: Report 6, Geological Survey of Canada, Paper 92-2, 31-40.

Tella, S., Heywood, W.W., and Loveridge, W.D., 1985; in Current Research, Part B, Geological Survey of Canada, Paper 85-1B, 371-374.

Zaleski, E., Corrigan, D., Kjarsgaard, B.A., Jenner, G.A., Kerswill, J.A., and Henderson, J.R., 1997a; in Current Research 1997-C, Geological Survey of Canada, 91-100.

Zaleski, E., Corrigan, D., Kjarsgaard, B.A., Kerswill, J.A., Jenner, G.A., and Henderson, J.R., 1997b; Geological Survey of Canada, Open File 3461, scale 1:50000.